THE FAA AIR TRAFFIC SYSTEM
VISION OF THE FUTURE

1995 TO 2015

U.S. Department
of Transportation
**Federal Aviation
Administration**

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The United States air traffic system is the safest and most technologically sophisticated in the world. As we plan for the next century, we must strive to maintain that posture and improve upon it, even as we are faced with the challenges of increasing traffic and pressures for improving efficiency. To meet those challenges, we must set forth a vision of what the future air traffic system should be like and a road map of how to get there.

The FAA Air Traffic System Vision of the Future provides our picture of what the System will be in the year 2015 and 5-year "snapshots" of it along the path between now and then.

Significant changes are on the horizon as we increase our customer focus and benefit from technological advancement. While the "vision" projects what the air traffic system will be like, we fully expect revisions to it as customers' needs change and yet unforeseen technologies emerge.

Bill Jeffers

Bill F. Jeffers
Director of Air Traffic

**"Progress and growth are impossible
if you always do things
the way you always did things."**

Anonymous

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FOREWORD

This publication is a complete view of the U.S. Air Traffic Control (ATC) system from the perspective of those who operate it within the Federal Aviation Administration. The publication details current operations and presents a prospective of the air traffic control system as it is envisioned by the Air Traffic Service. Since the components of ATC are tightly interrelated, an understanding of how such relationships exist today--and how they will evolve tomorrow--will provide assistance in the comprehension of system problems, while also enhancing the possibility for problem solving.

Although this publication is intended primarily for use by air traffic controllers and others in the aviation community--including research and development engineers--the authors recognize that there is broader interest in its subject matter. To meet this challenge, they considered a number of ideas before arriving at a format that fully accomplishes this goal.

The document takes a series of "snapshot" looks at the air traffic control system. The first section is the baseline, a look at the system at the time of publication. The second section looks at the system in 2000, taking into account the system enhancements scheduled to be installed during this period. The ensuing sections describe how the system is expected to evolve, in five year increments, out to the year 2015. Planned changes to the system at the time of publication will be included. Then, a visionary look, considering to the extent possible how other known technologies might be incorporated into the future system, will outline further improvements to what is already the best ATC system in the world.

The publication contains six levels of understanding. The authors believe a complete understanding of the subject matter requires a reading of each section from beginning to end. While there may be a temptation to skip certain sections in a search for easy answers to hard ATC questions, only a complete study will afford the reader an understanding of the fundamentals of air traffic control. Such understanding is necessary to realize how individual controllers work, and how the addition of new technologies will affect the entire system as the implementation of the Capital Investment Plan (CIP) programs become operational in the National Airspace System (NAS) of the future.

Each section of the document is divided as follows:

Level One

A Trip Through the System places the readers in the system as a passenger aboard a corporate jet and allows them to experience and understand the general steps of air traffic control as the flight proceeds from takeoff to landing. The activities described in this section are similar for all users of the system. The scenario of a corporate operator was selected because each of the steps taken by that operator is distinct and must be taken in sequence by an individual or small group of individuals. Air carrier, air taxi, and military operators take the same steps, but they are supported by large organizations that generally have teams of specialists performing tasks such as weather collection, obtaining preliminary clearances, etc. The approach taken in this document permits the most fundamental understanding of the interaction between the end

user--the pilot--and the FAA Air Traffic Control system. Where different approaches between commercial, military, and independent operator are taken, they are detailed within the text.

Level Two

The ATC System Process introduces a more technical look at how the system handles flights such as the one sampled in Level One, including preflight activities, the generation of clearances, and control of the aircraft as it moves about the surface and through the airspace. This is a detailed look at what actions are taken within the system, and who is responsible for these actions.

Level Three

ATC System Methodology is a more in-depth look at the ATC system, taking the reader further into the details of how the system functions. This level looks at individual systems and describes how they are interrelated. This level is written in parallel to Level Two in terms of following the flight through the system, from preflight activities to landing at the destination airport.

Level Four

ATC Controller Functional Descriptions provides a complete description of each air traffic control function, including Flight Service and Traffic Management functions. It describes each position, the inputs, the process, the outputs of each position, and the systems used by the personnel who operate the position.

Level Five

ATC Technology and Support Interfaces provides the descriptions of the systems used to control traffic. Using the same basic format as the position descriptions in Level Four, the descriptions provide a brief technical look at how the system is used for the purposes of ATC, the inputs, process and outputs of each system, and a list of the other systems to which each is connected.

Level Six

ATC Flight Scenarios describe commercial, general aviation, military, rotorcraft, and other selected types of flight operations, detailing the actions taken by controllers and by pilots. These scenarios can be tracked through the outyear sections of the book to gain an understanding of how the changes to the system affect operations within the NAS.

Because the subject matter covered in the book is so voluminous, a matrix is provided to present a kind of road map of how and when new systems are scheduled to come on line; a visual aid to promote understanding of the implementation schedule of the 1994 Air Traffic Automaton Strategic Plan. The matrix appears on page xix, following the Master Table of Contents. Flow diagrams for understanding of the ATC process, an operational discussion of

the Traffic Management function of the ATC system, a description of the airspace, and an acronym list and glossary appear in appendices at the end of the book.

While every effort has been made to detail technical information, it should be noted that this only includes systems and technology within the ATC system. No attempt was made to address anticipated advances in avionics other than to show how changes in ATC technology have and will impact users of the system.

Further, the book's direction is based on several assumptions regarding the future of the NAS, the current and anticipated state of advanced technology, agency policy as it exists today and the direction it is expected to take in the future, current economic conditions and forecasts, and anticipated growth in air travel. These assumptions include:

- there will be no new major airports within the time frame spelled out in this publication; however, some additional runways may be constructed, reflecting positive impact on system capacity
- traffic growth will continue at present levels through 2015;
- traffic stratification--the relative proportions of different types of aircraft--will not change significantly as new types of aircraft are introduced between now and 2015;
- the evolution of the NAS system to the year 2005 is limited to the technologies defined in the 1994 Air Traffic Automation Strategic Plan (ASP);
- automation within the ATC system will evolve into datalink communications. Air traffic managers do not envision a time when voice communications will not play a significant role in the control of traffic. Even at the highest levels of automation, there will be the need for voice communications, if only for intervention to resolve a potential conflict; and
- the document will undergo continuous updates, including annual republication, if necessary, as prominent changes or new technologies occur.

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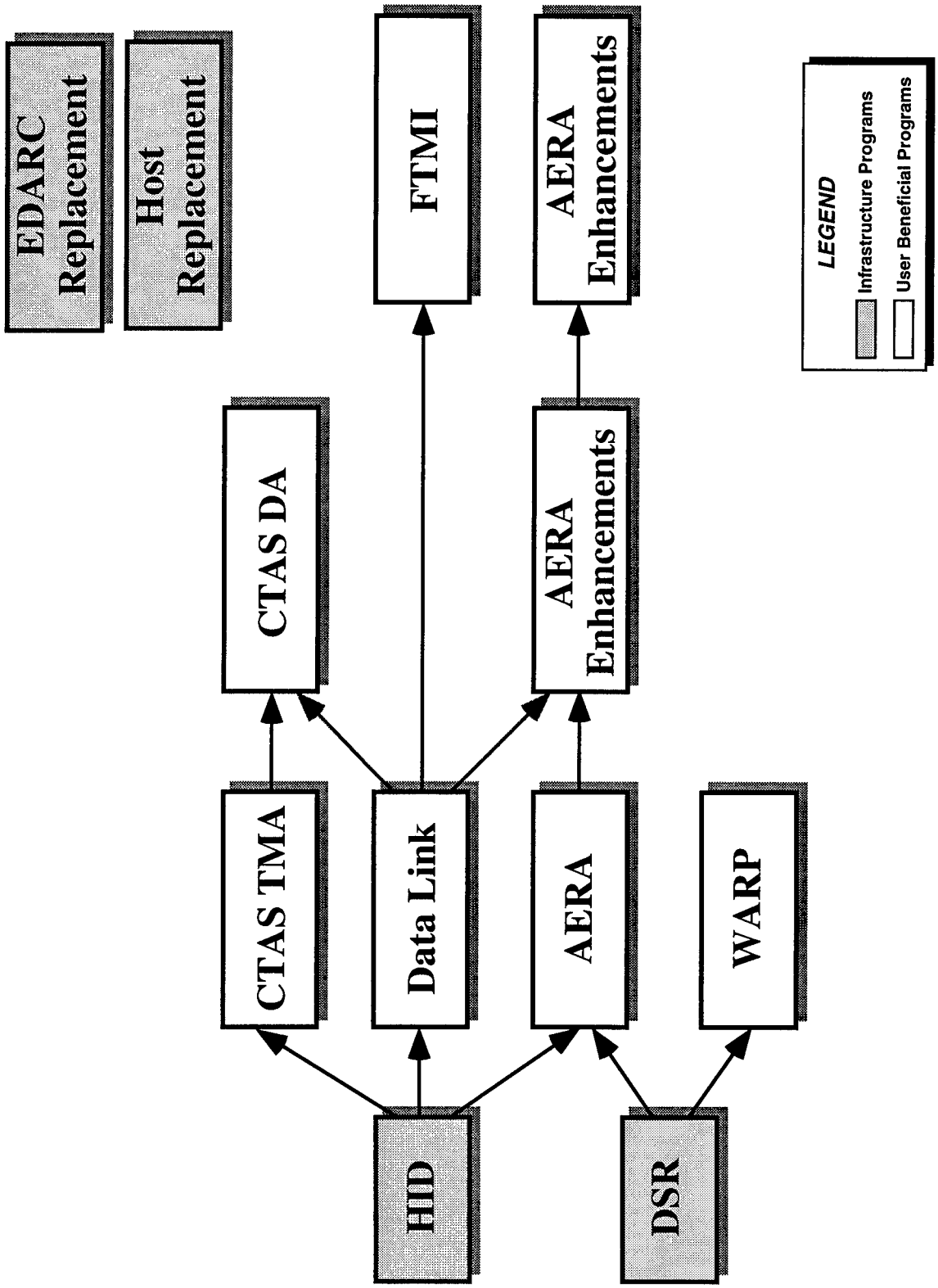

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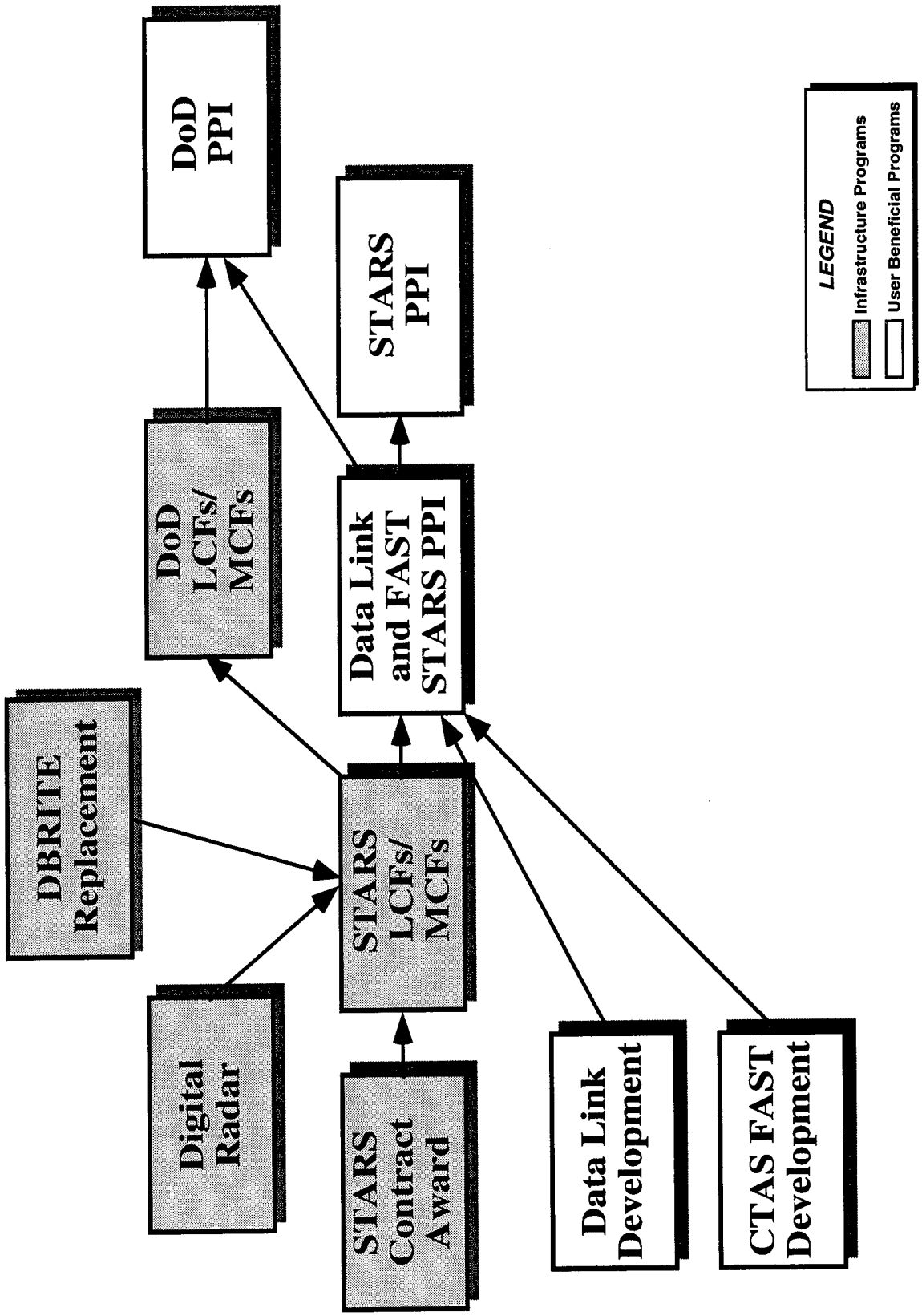

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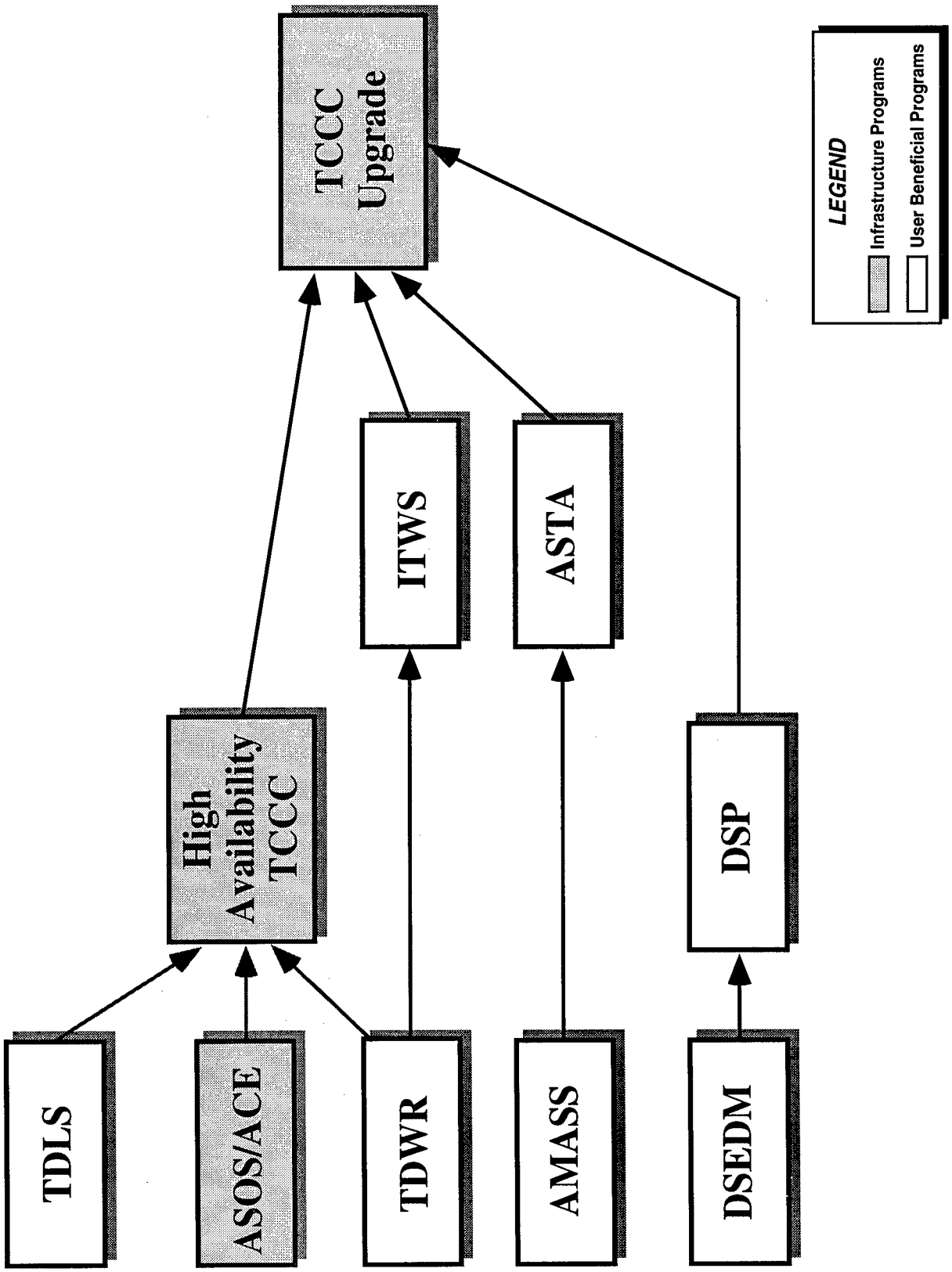

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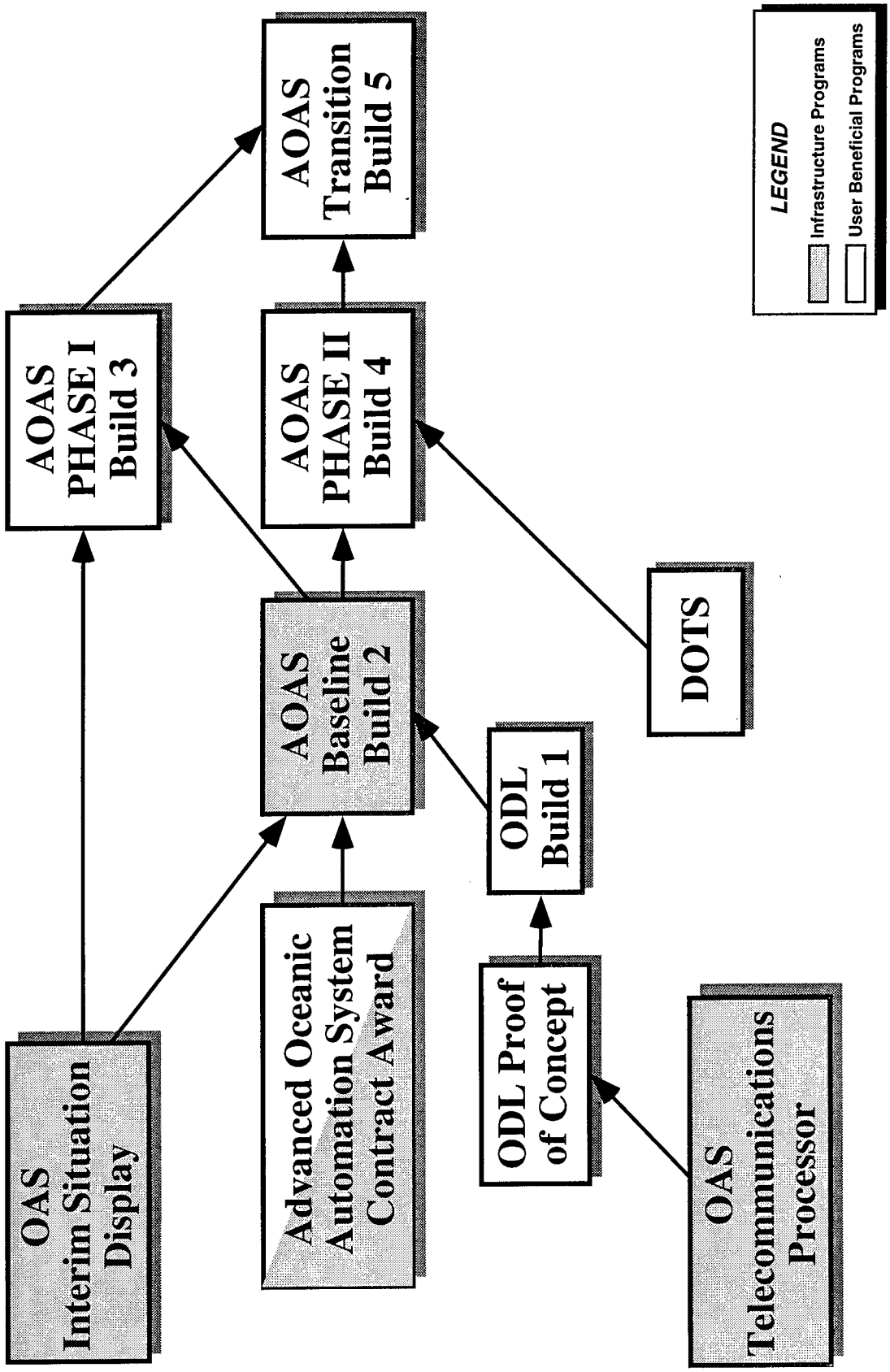

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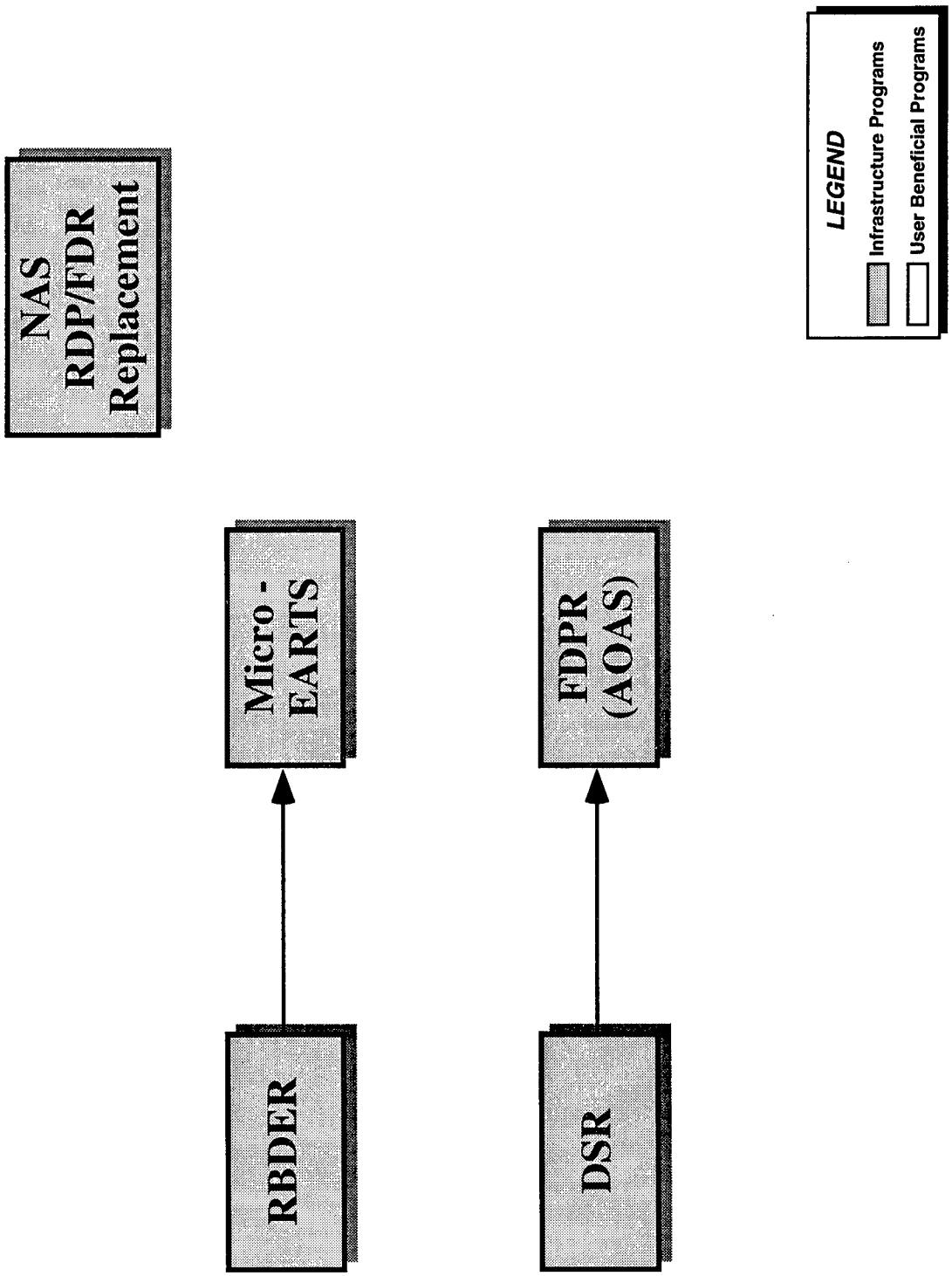

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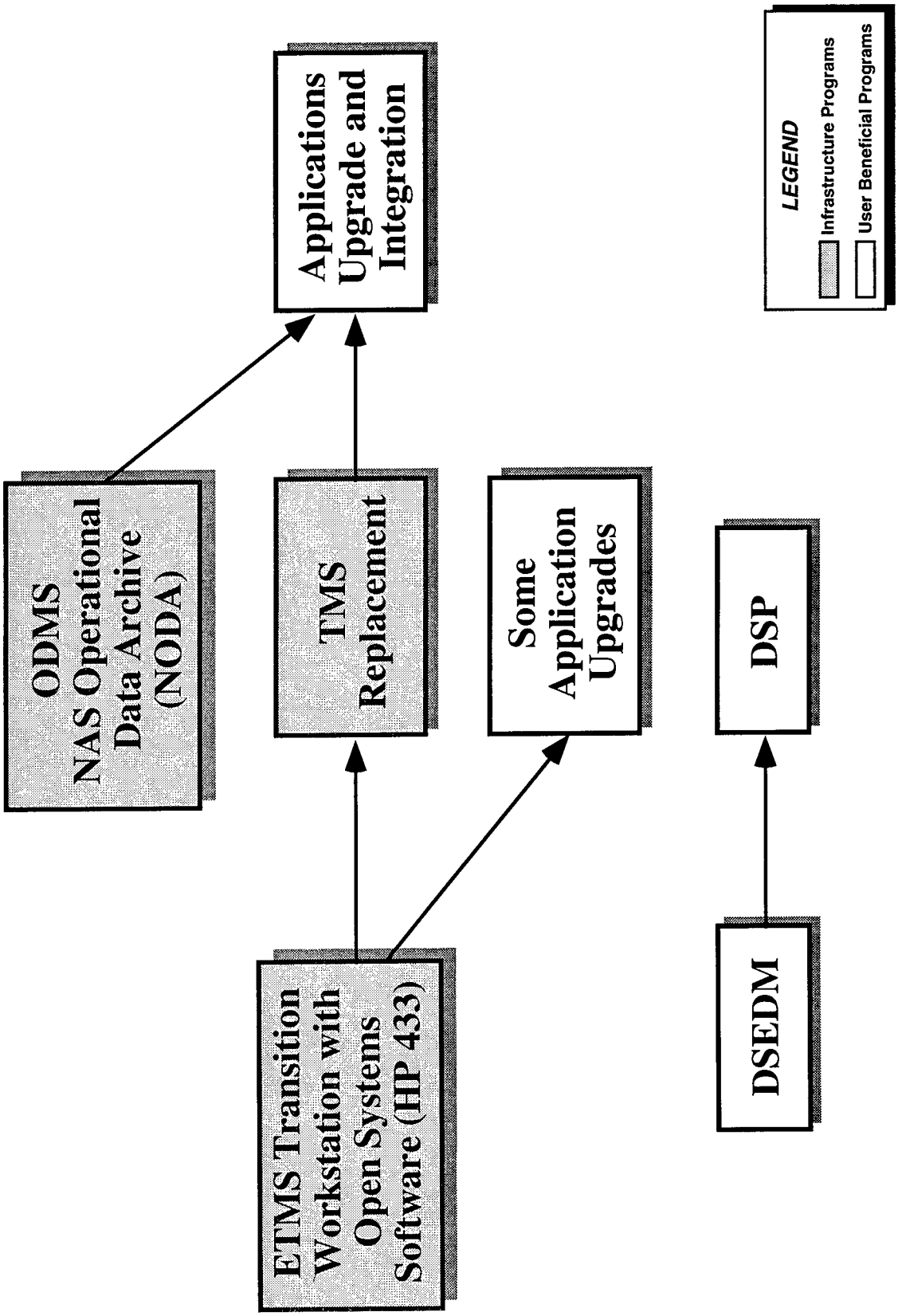

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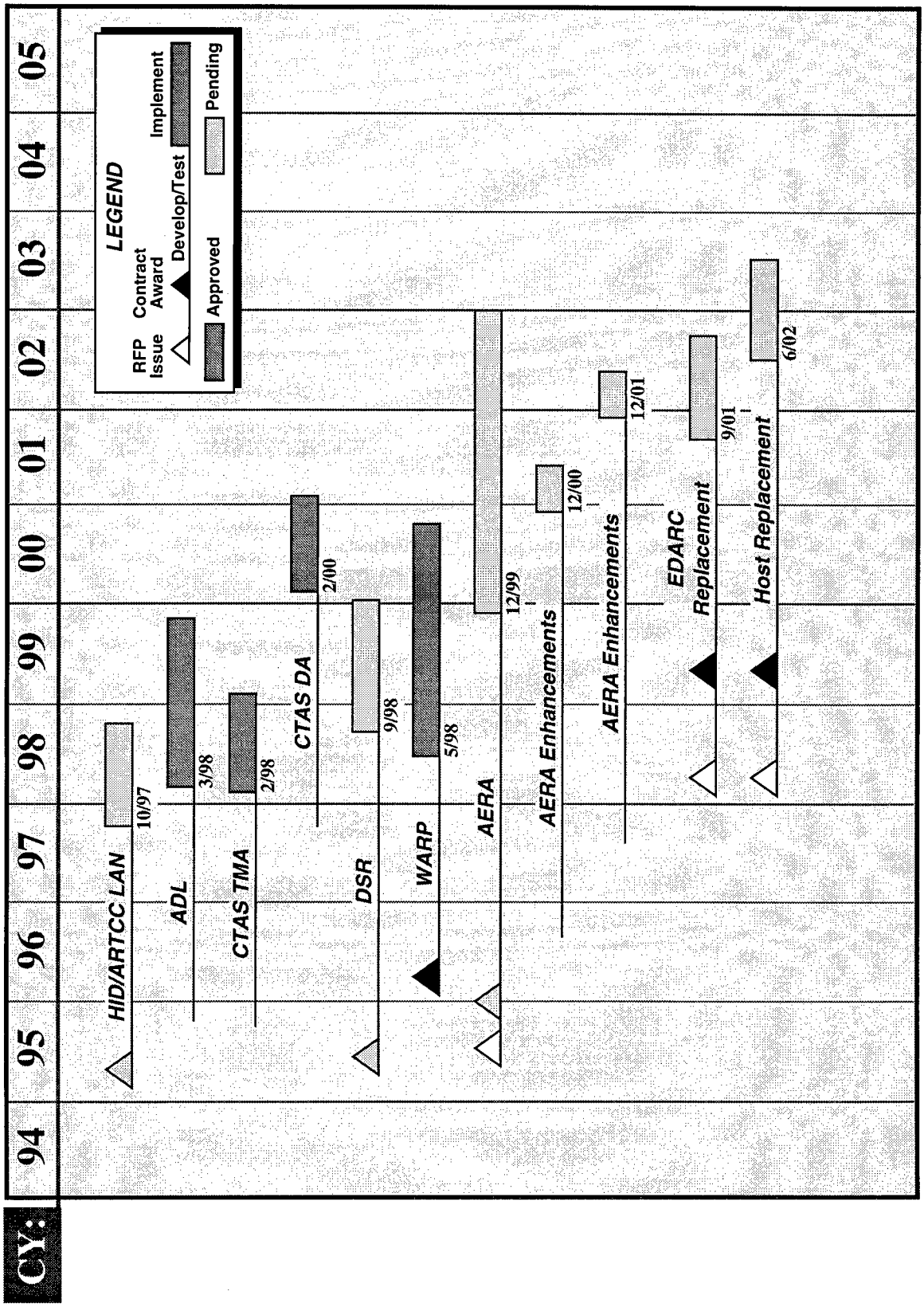

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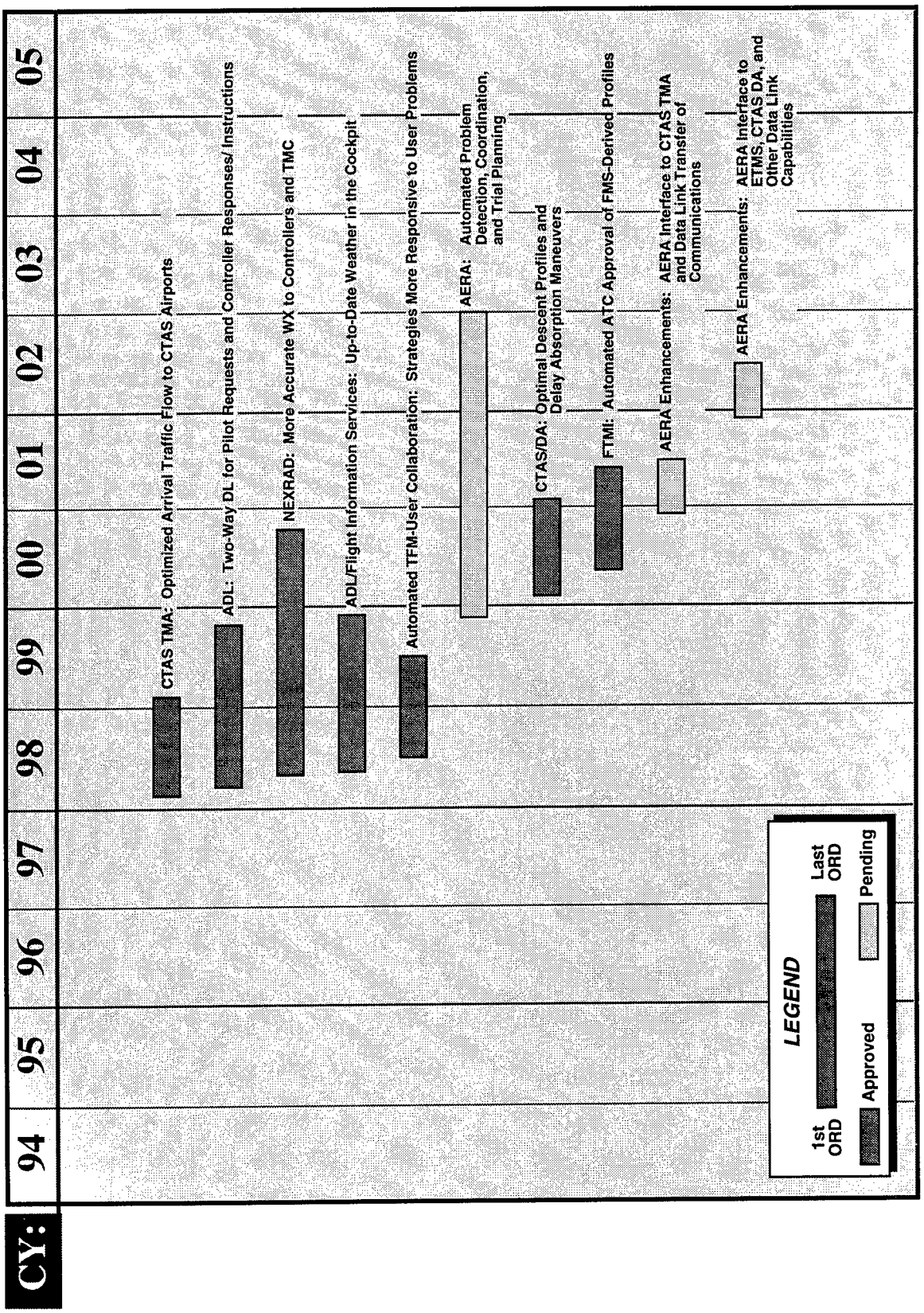

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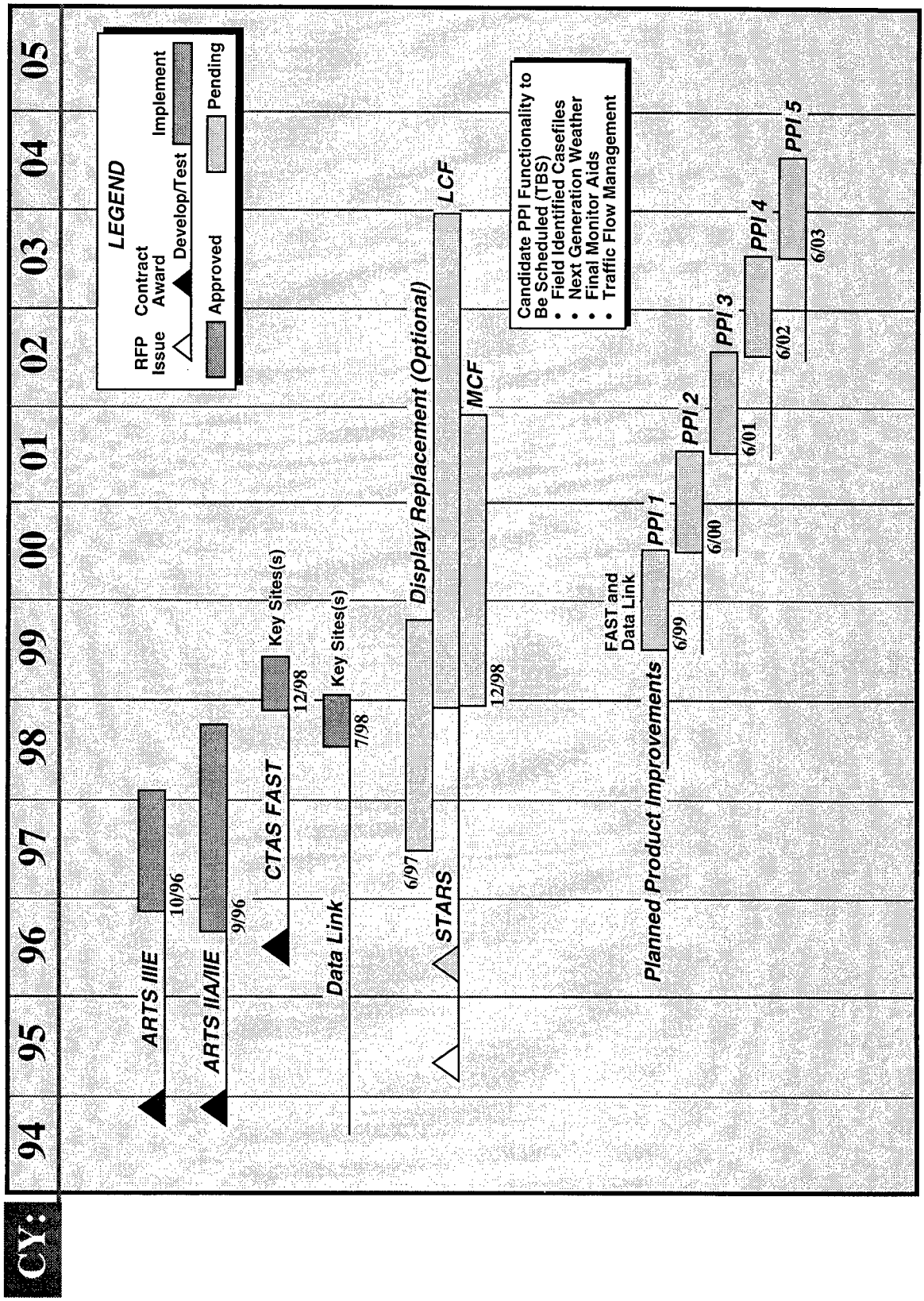

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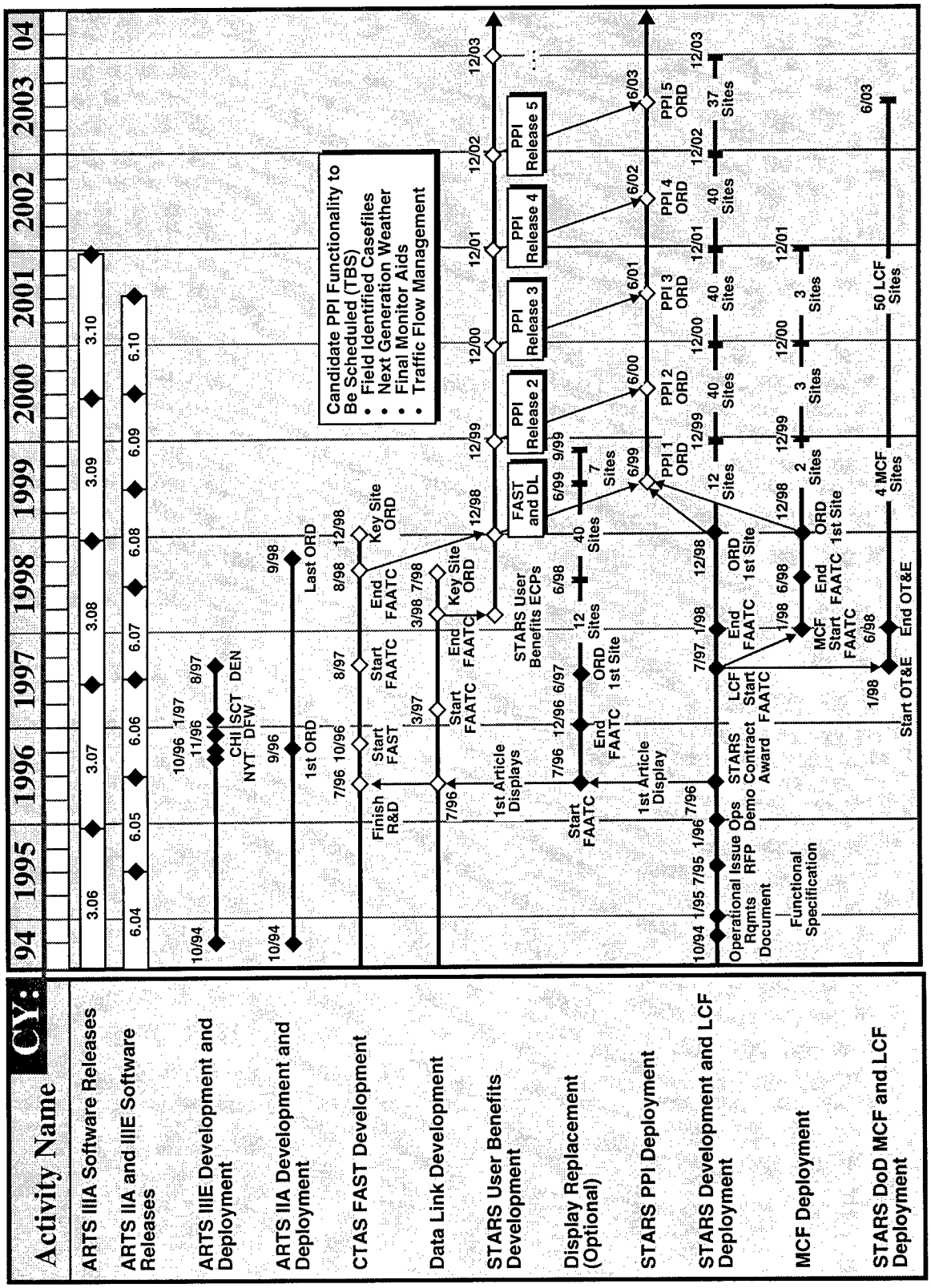

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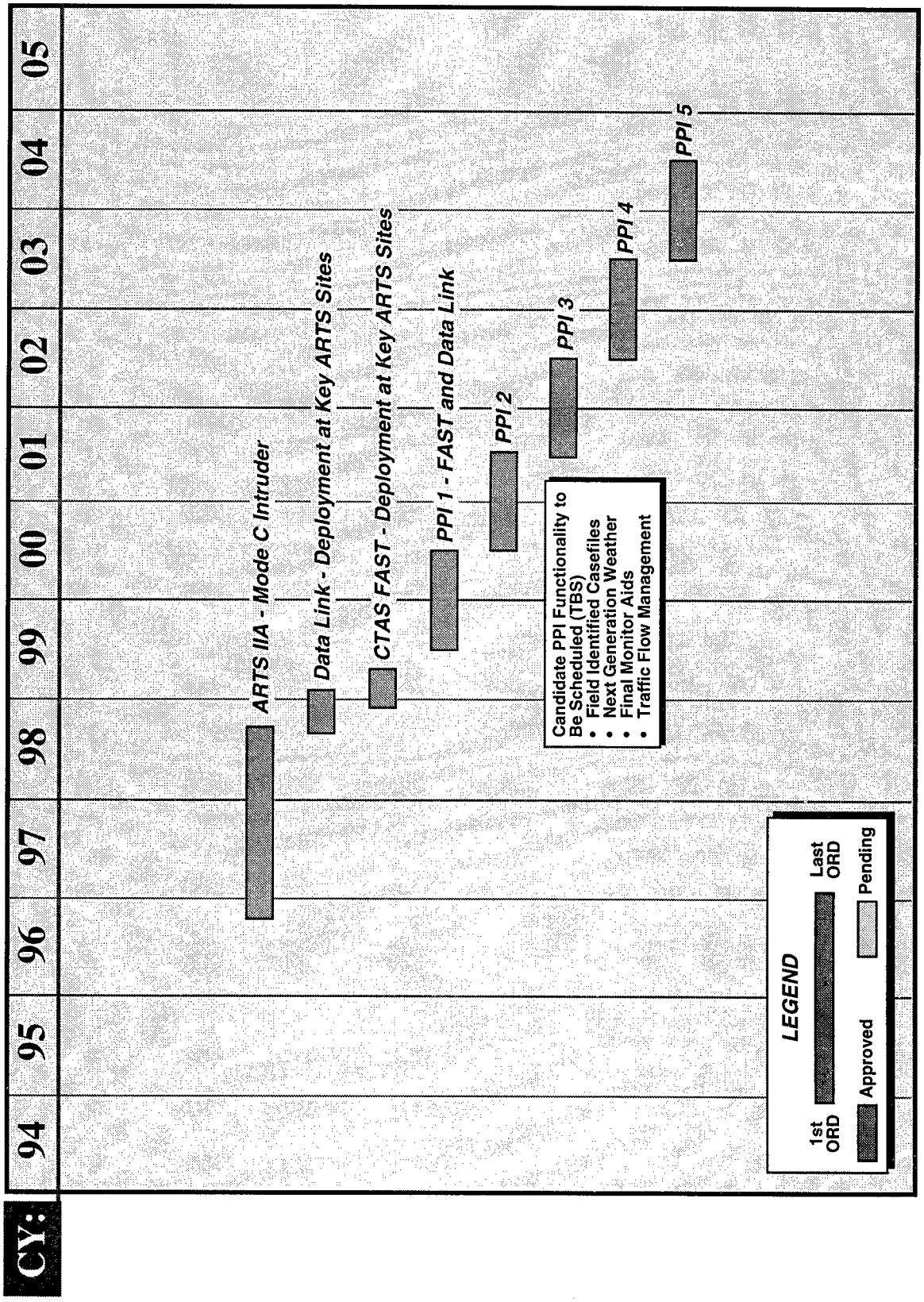

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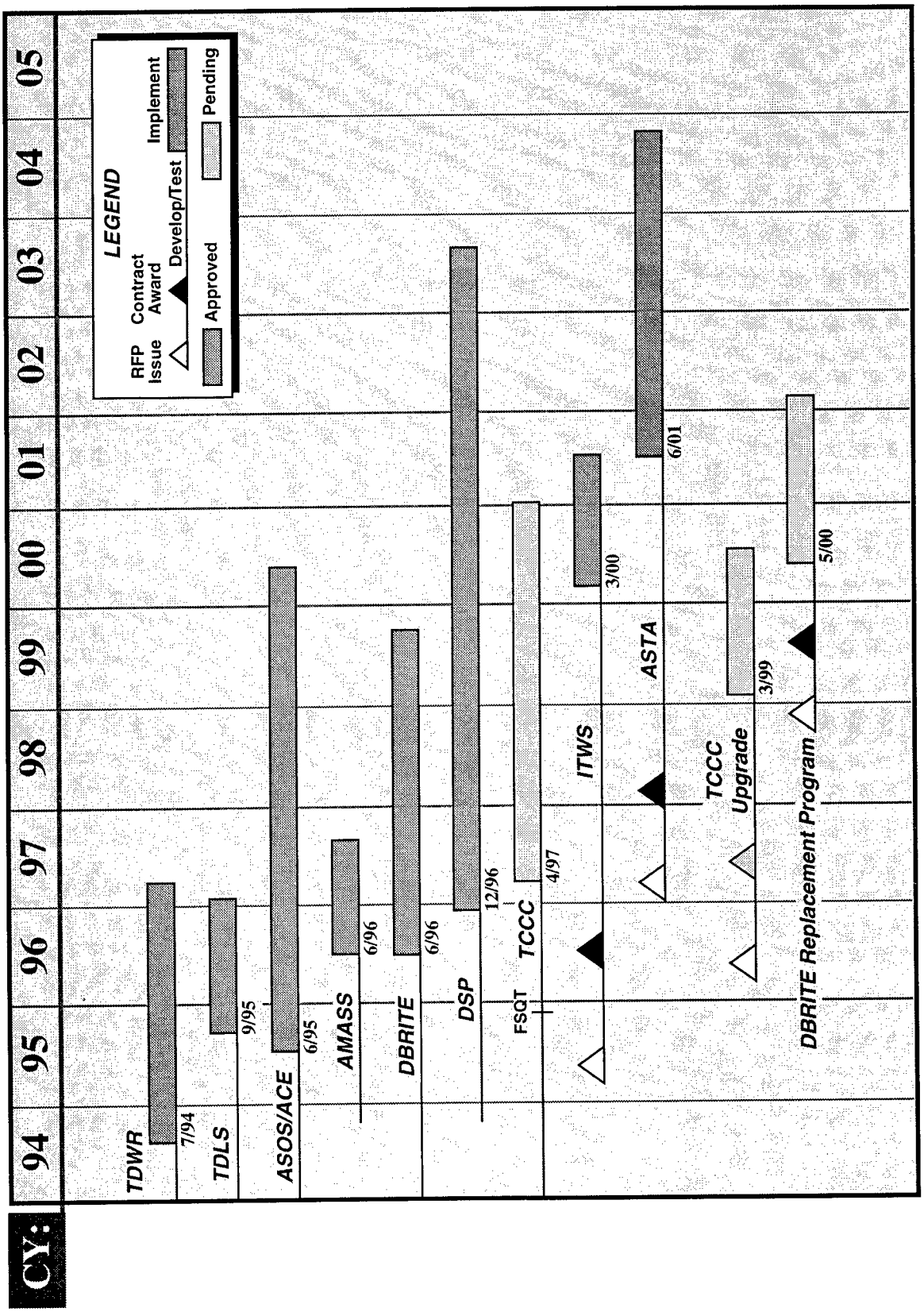

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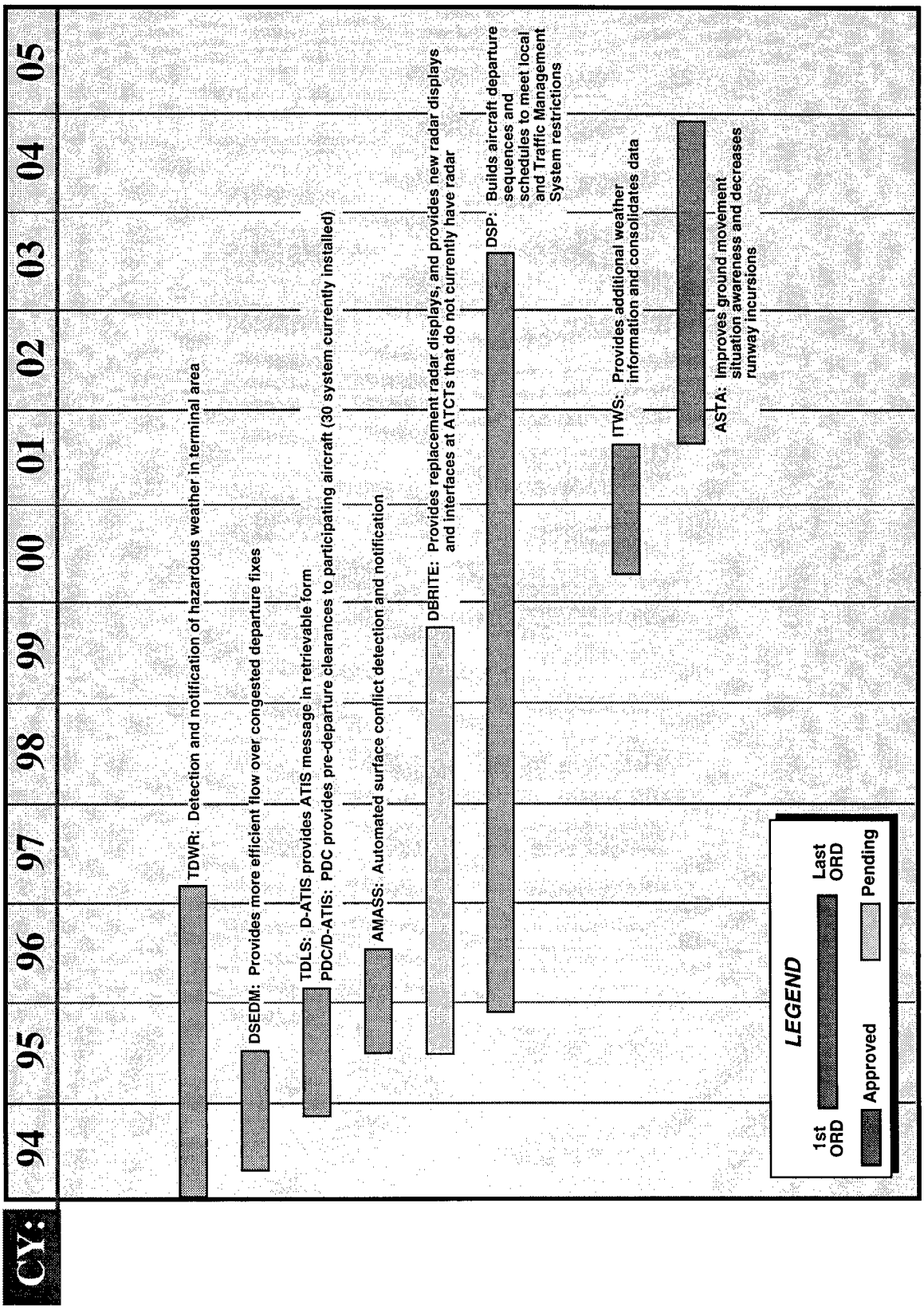

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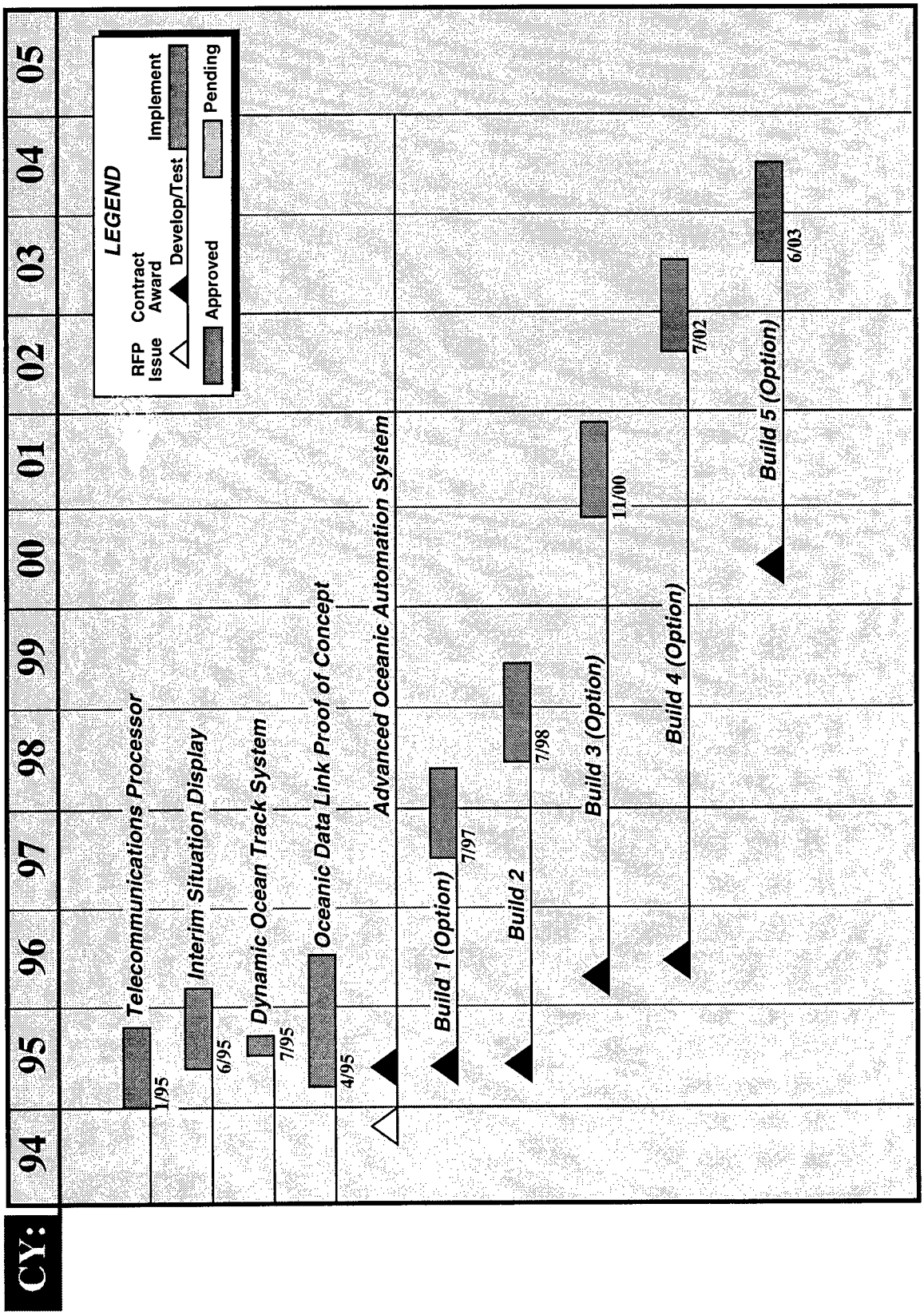
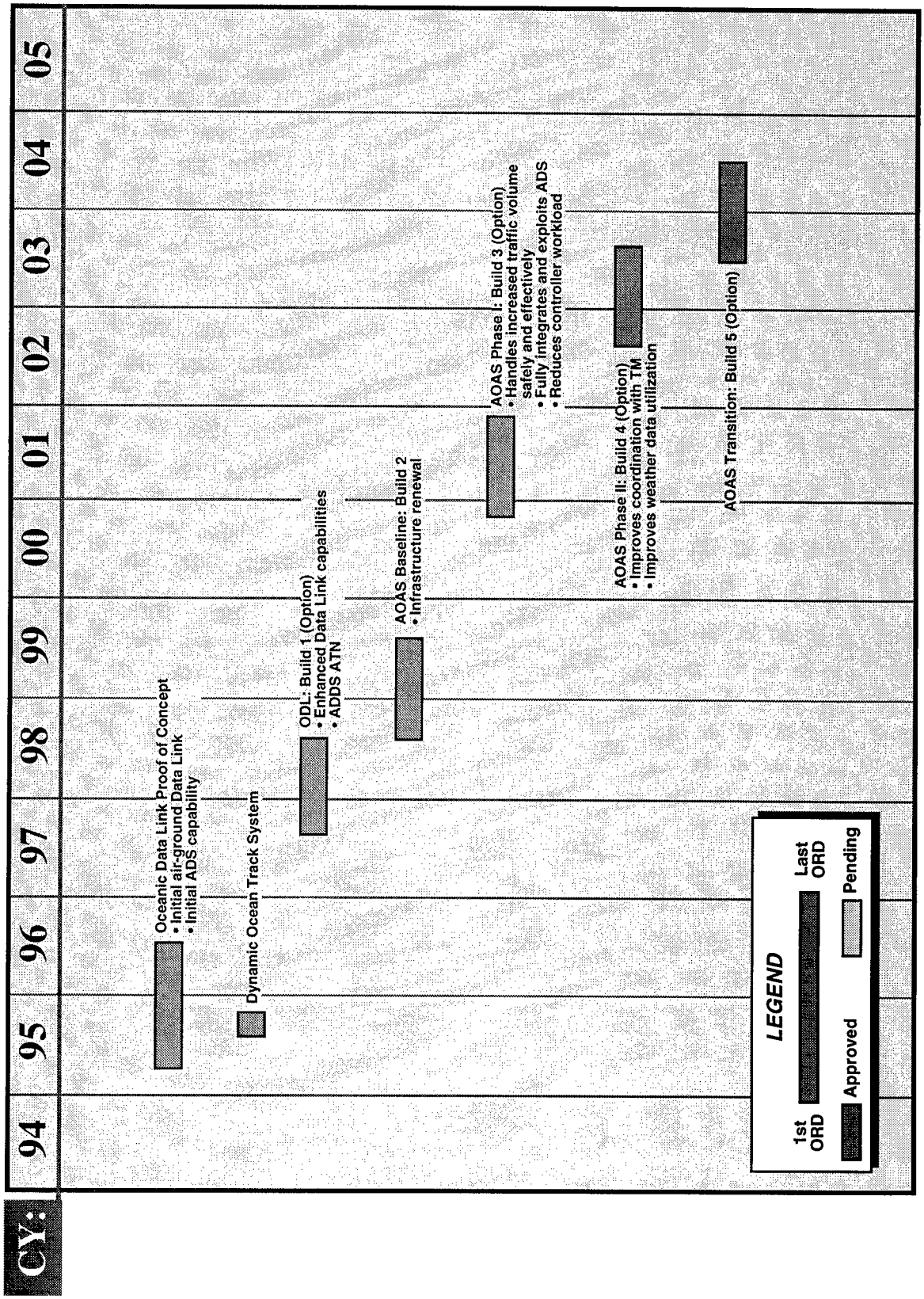


OCEANIC TIMELINE FOR USER BENEFICIAL CAPABILITIES



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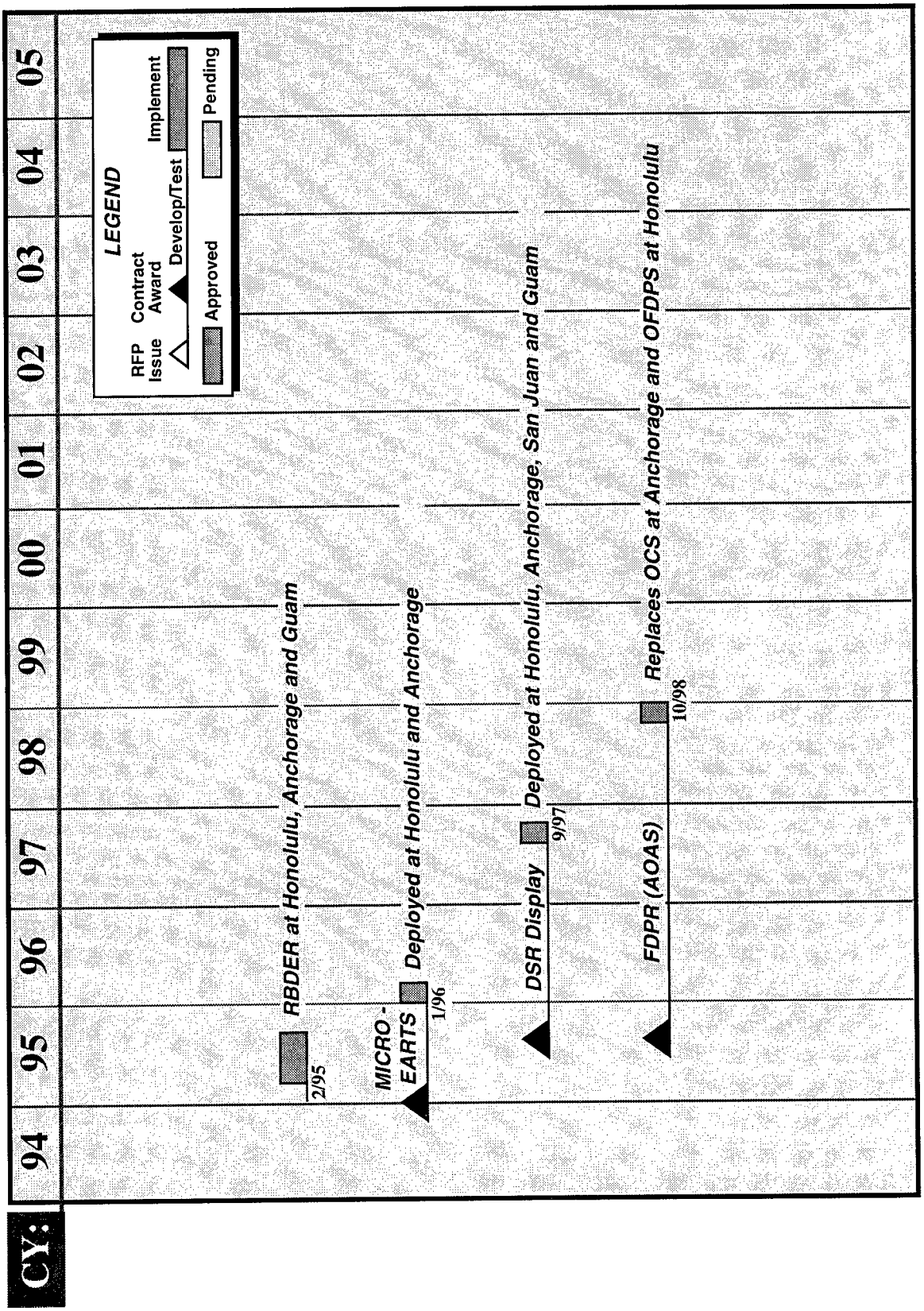

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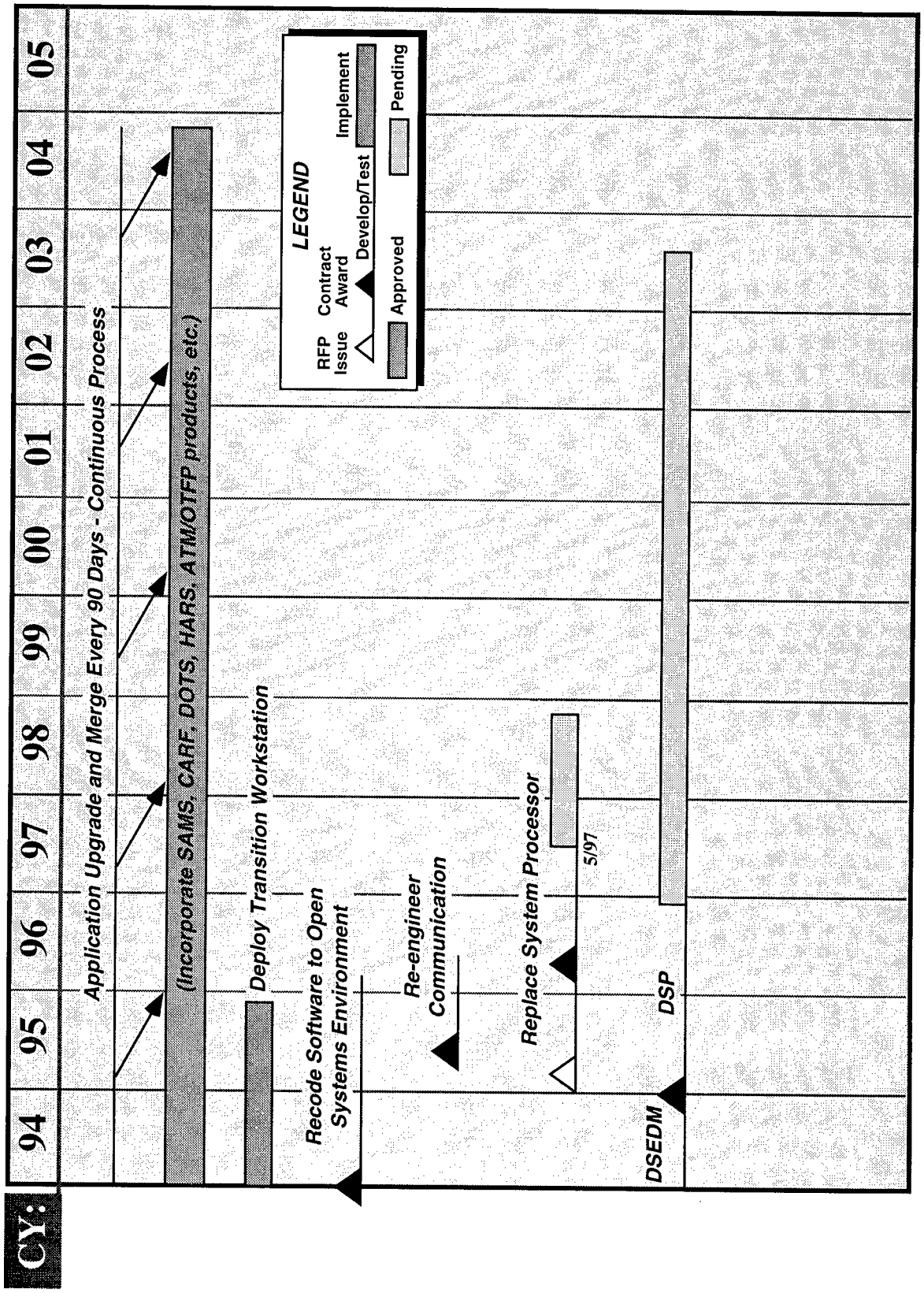

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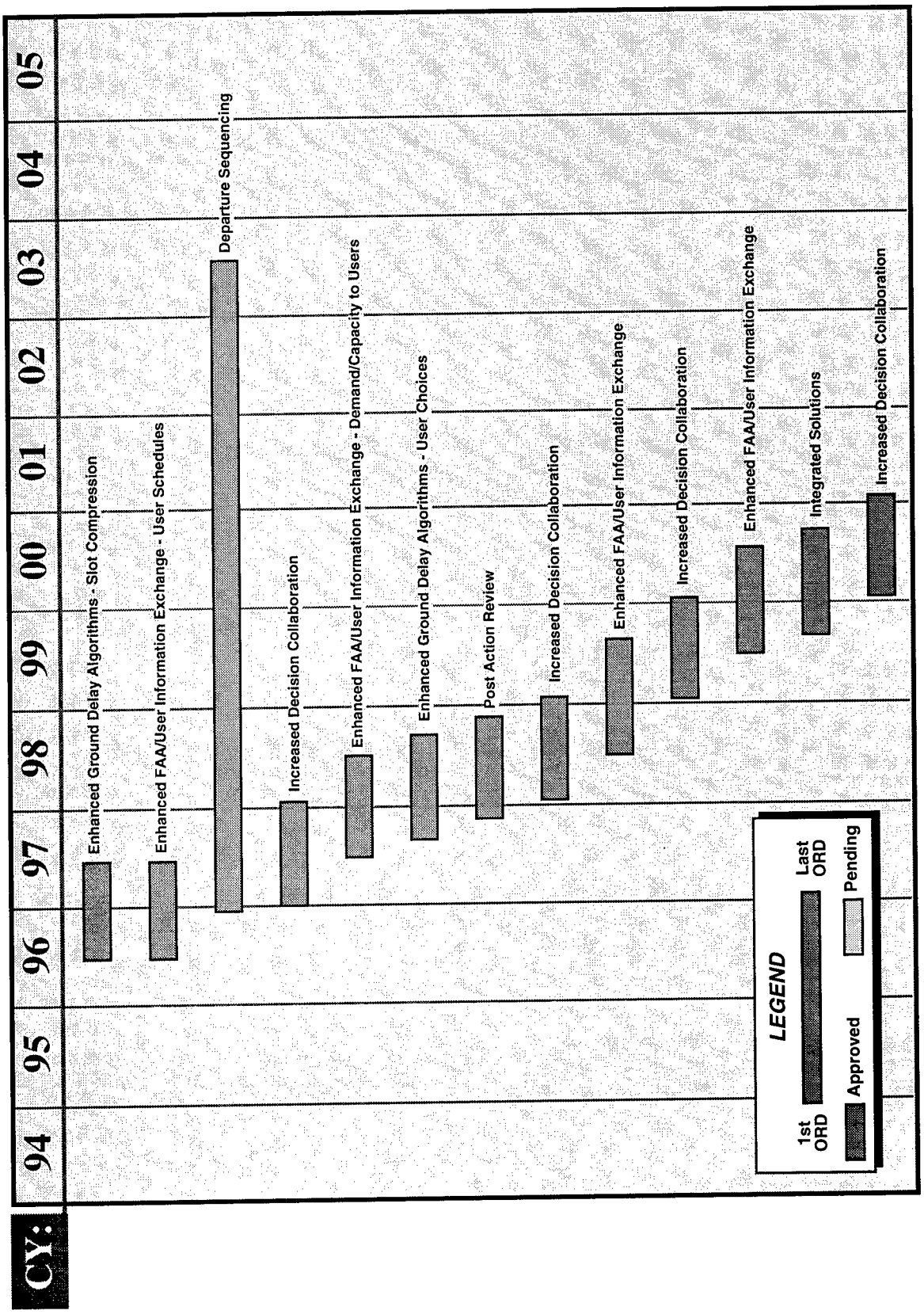

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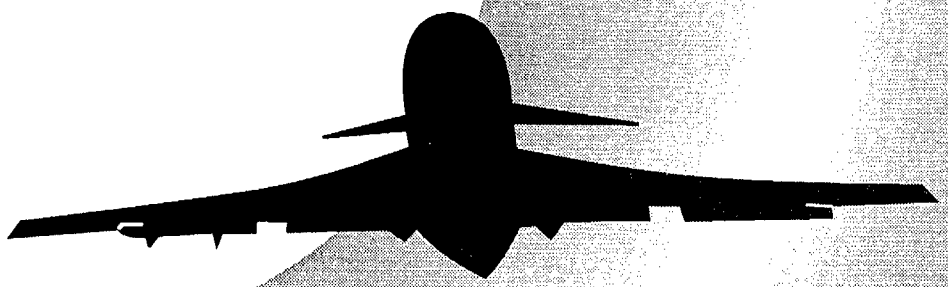
VISION OF THE FUTURE



BASELINE:
1995

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A TRIP THROUGH THE ATC SYSTEM — 1995

NOTE: *To provide a comprehensive vision of future development of the nation's air traffic control system from 1995 to 2015, Level One contains a "Trip Through The System." This entry level narrative begins the journey to understanding the technical descriptions of present and future ATC systems and controller actions.*

A. Domestic Flight

The flight begins as an executive in Chicago is being summoned to a meeting in Washington, DC, the next day. A phone call is made to the company's pilot with instructions to prepare the corporate aircraft for flight. Within hours, the executive arrives at Midway airport to find both pilot and co-pilot already aboard the company aircraft in preparation for the trip. They are busy using the aircraft's radio to communicate with air traffic controllers at the airport and receive current and forecast weather information. They must also obtain air traffic control clearances necessary to operate their flight within the system. At larger airports, the airline operators utilize a somewhat different clearance process called Pre-Departure Clearance (PDC). This program transmits clearances electronically to the flight deck, thus reducing frequency congestion. Currently operational at only 30 of the busiest air carrier airports, the PDC program continues to expand.

The pilot and co-pilot have extensive training and are certified by the FAA to fly in all types of weather conditions. Together they perform all preflight procedures and receive appropriate clearance instructions pertinent to the flight. The aircraft is also equipped and certified to operate according to FAA-issued Instrument Flight Rules (IFR) and regulations. These rules establish the procedures and conventions to which all-weather pilots must adhere.

Several hours prior to the arrival of the executive at the airport, the flight crew was already busy with numerous tasks such as obtaining a weather briefing from the FAA. An FAA Automated Flight Service Station (AFSS) was contacted for a briefing because of its convenience, but there was an option to obtain the briefing from an independent source through a computer or telephone. Some users rely on contractor- and vendor-provided automated briefing services. Direct User Access Terminal System (DUATS) and other automated briefing systems are widely used by both commercial and general aviation pilots. Quality preflight briefings are just one of the rapidly growing weather services being commercially provided. Experienced pilots with access to the necessary equipment can receive clear, precise and accurate weather in a simple format that is both comprehensive and requires little interpretation. For this trip, the AFSS briefing provided the weather and aeronautical information to complete the flight safely and efficiently. After obtaining the necessary information, the pilot filed a flight plan with the AFSS for input into the ATC system. The flight plan is the key to flying within the system. It provides all FAA facilities affected by the pilot's route and altitude with timely information about his/her flight enabling transition into and through a national airspace system that controls thousands of other aircraft daily.

Shortly after the executive boards, the pilot starts the aircraft's engines and the journey begins. The aircraft heads from the boarding area out toward the runway. During this period, the pilot is in communication with controllers in the airport traffic control tower. As the aircraft heads toward the runway, the pilot talks with a ground control air traffic controller who is responsible for the safe and efficient movement of aircraft on the airport surface. Throughout the entire process, aircraft movement to and from the active runway is directed by an air traffic ground controller. Figure 1-1-1 will help visualize the details and procedures of aircraft surface movement, advisories and separation during sequencing for departure. At a number of larger airports a system of lights placed at runway and taxiway intersections augments controller instructions and sophisticated ground tracking systems in the tower cab, such as ASDE, ensure safe movement of all airport surface traffic, even in low visibility.

The aircraft moves toward the active runway and stops behind another jet in line to depart. As it awaits its turn, the pilot receives updated instructions from the tower concerning traffic, any amendments to his/her clearance and other information such as changes in airport surface wind direction or intensity. If hazardous weather conditions exist—specifically wind shear or microburst activity— the pilot will receive timely and reliable alerts from controllers. When the aircraft is next in the departure sequence, another controller--the local controller--issues a clearance onto the active runway and a release for departure. The pilot throttles up the engines, the aircraft rolls down the runway, and lifts off. As the aircraft gains altitude, the process begins for its transition into the existing flow of traffic already in the system.

The executive looks out the cabin window at the airport vanishing below as the flight makes its way clear of the Chicago Midway Airport Traffic Area (ATA), a defined volume of airspace immediately around and above the airport surface. When the aircraft is clear of traffic in the ATA, the local controller at Midway Airport transfers control of the flight to departure air traffic controllers in a Terminal Radar Approach Control (TRACON), another FAA facility with a larger volume of airspace jurisdiction located not too far away at the Chicago O'Hare Airport. The TRACON controllers guide the aircraft away from Midway through sectors within their area of jurisdiction and on to even larger FAA control facilities called Air Route Traffic Control Centers (ARTCCs) . Figure 1-1-2 provides the details and procedures of the air traffic control activities while aircraft are airborne. When the jet climbs away from the Chicago area, it passes a designated point during its ascent and joins a pre-defined air route, literally a highway in the sky. This route, unless amended , is the one which was filed with the AFSS during the pre-flight activities prior to departure.

The next phase of the flight occurs as the aircraft transitions from the Chicago TRACON airspace to its en route segment between Chicago and Washington, DC. It now enters a large volume of airspace under the watch of en route controllers at the Chicago ARTCC — one of many large facilities that control the nations en route airspace. The pilot views the navigable airspace and communicates with the air traffic controllers as the aircraft continues through one sector after another, making its way through that airspace toward its destination. As the flight proceeds in the en route environment, its course, altitude or speed may be adjusted to ensure a safe and orderly flow of traffic across the nation.

Four ARTCCs and 90 minutes after leaving Chicago, the flight nears Washington, DC, and descends into the TRACON airspace around the city. The aircraft is now under the jurisdiction

of arrival air traffic controllers at a control facility located at Washington National Airport, who will sequence the jet onto the final approach course for landing. When within radio range of Washington National, the co-pilot tunes one of the aircraft radios to the Automated Terminal Information System (ATIS) provided by the tower to obtain pre-recorded information on the runway in use, type of approach to expect and airport weather information. The controllers in the Washington TRACON give the pilot traffic and updated weather advisories, specific speed and altitude instructions, and guide the aircraft into a stream of arriving traffic as it descends toward the airport. At a point on the final approach segment, communication is transferred to a local controller in the Washington National tower who provides final approach instructions, surface wind conditions, and clears the aircraft to land.

Once on the ground and clear of the active runway (see Figure 1-1-3 for the details and procedures of ground movement activity on arrival), the ground controller communicates with the pilot and directs the aircraft away from the active runway giving similar advisories and instructions as his/her counterpart did at Chicago Midway prior to departure.

The aircraft is subsequently directed to a gate or parking ramp. When the engines are stopped, the flight that began in Chicago has ended. Throughout the flight, from takeoff to landing, a vast network of professionals worked to ensure and maintain safety for it and the thousands of other aircraft flying in the National Airspace System.

Now, look at a similar scenario to see how the air traffic control system works for international flight.

B. International Flight

In this scenario the meeting is in London, England. As illustrated in Figure 1-1-4, when flying out of Chicago the same air traffic control process is followed as in the Domestic Flight scenario. The aircraft departs and transitions into en route airspace.

However, instead of a route into a U.S. city, the flight plan takes the aircraft to a designated egress point from which it leaves contiguous U.S. airspace and moves out over the Atlantic Ocean. As the aircraft exits U.S. airspace, it enters a sector of international airspace known as a Flight Information Region (FIR). A FIR is a large region of oceanic airspace defined and controlled according to international agreements. FIRs extend across both the Atlantic and Pacific oceans. The flight to London traverses the U.S. North Atlantic FIR until it reaches the boundary of the area controlled by U.S. controllers. At this point, control is transferred to Canadian controllers who are responsible for control of the Canadian North Atlantic FIR. When reaching the midway point across the Atlantic, control is transferred to European controllers in a facility responsible for yet another FIR. Tracking of the flight is continued as it makes its way toward London. There is no radar coverage for separation of aircraft over the oceans. Oceanic controllers provide separation and track the position of the aircraft based on sophisticated non-radar techniques utilizing mach speed, altitude and position reporting. The pilots provide mandatory radio reporting of their aircraft's position to the controlling air traffic facility as instructed and every ten degrees of longitude. Mandatory reporting is also necessary

when crossing the boundary of a FIR. The controllers enter position data into their systems to ensure separation standards are adhered to and base the application of separation criteria on the information received.

As the aircraft approaches the coast of the British Isles, it re-enters radar-covered airspace. From that point it is controlled the same way as in the U.S. domestic flight scenario; i.e., the aircraft moves through en route airspace and transitions into the terminal airspace of Heathrow Airport in London. Once in terminal airspace the procedures are similar to those followed upon entering the Washington, DC, terminal area. In the return scenario from London to the U.S. mainland the procedure is reversed.

Late 1995 will usher in a new era of oceanic control. The international pilot will find safer and more flexible oceanic travel. The introduction of satellite-assisted guidance and surveillance will make navigation more accurate and likely reduce the constrained separation criteria of non-radar control techniques. A new system, known as Automatic Dependent Surveillance, or ADS, will utilize satellites in the position reporting process to more accurately and reliably update aircraft data for separation purposes. Transmitted automatically by on-board communications systems, this data will be relayed by satellite and ground stations to the responsible oceanic control facility. ADS will replace the procedure of the pilot making periodic position reports via radiotelephone. In addition, data link communications via Very High Frequency (VHF) radio and satellites will improve air-to-ground communications capabilities for the transmission of voice, data, and weather messages to aircraft thousands of miles from land.

C. Summary

In the real world of air traffic control, the events described herein happen thousands of times daily as large and small aircraft enter, fly in, and depart the system. This activity takes place throughout the nation and beyond U.S. boundaries as airports large and small feed airplanes into the U.S. National Airspace System. This federal network is designed to monitor and control airborne activity within U.S. airspace. Such airspace management is only possible through an intrinsically structured, coordinated, and efficiently administrated air traffic control system.

As indicated in this publication, the highly complex and technologically advanced combination of manpower, systems and procedures function to direct and control the nations civil, military, and general aviation fleets.

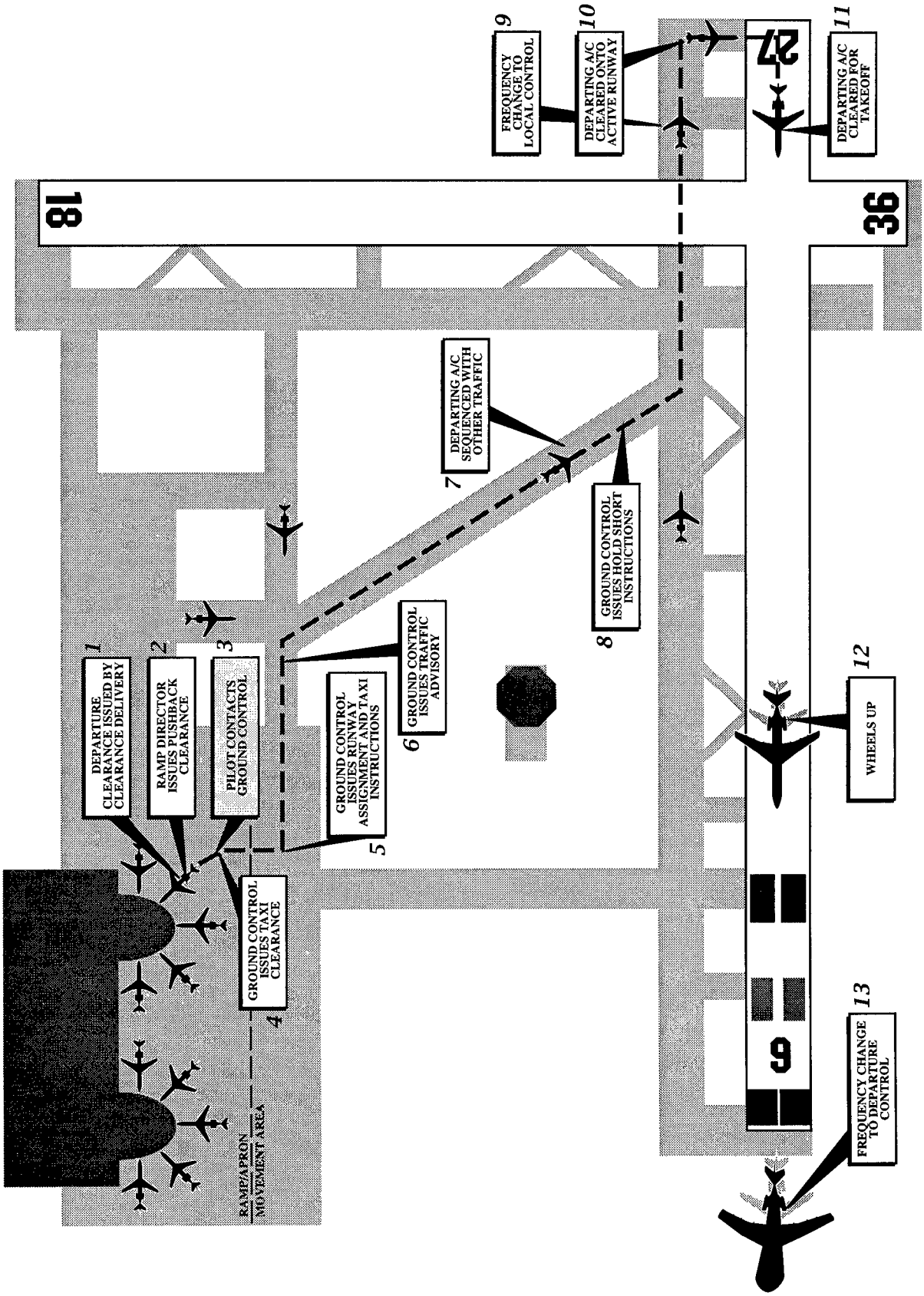

Figure 1-1-1. Surface Movement (Departure Phase)

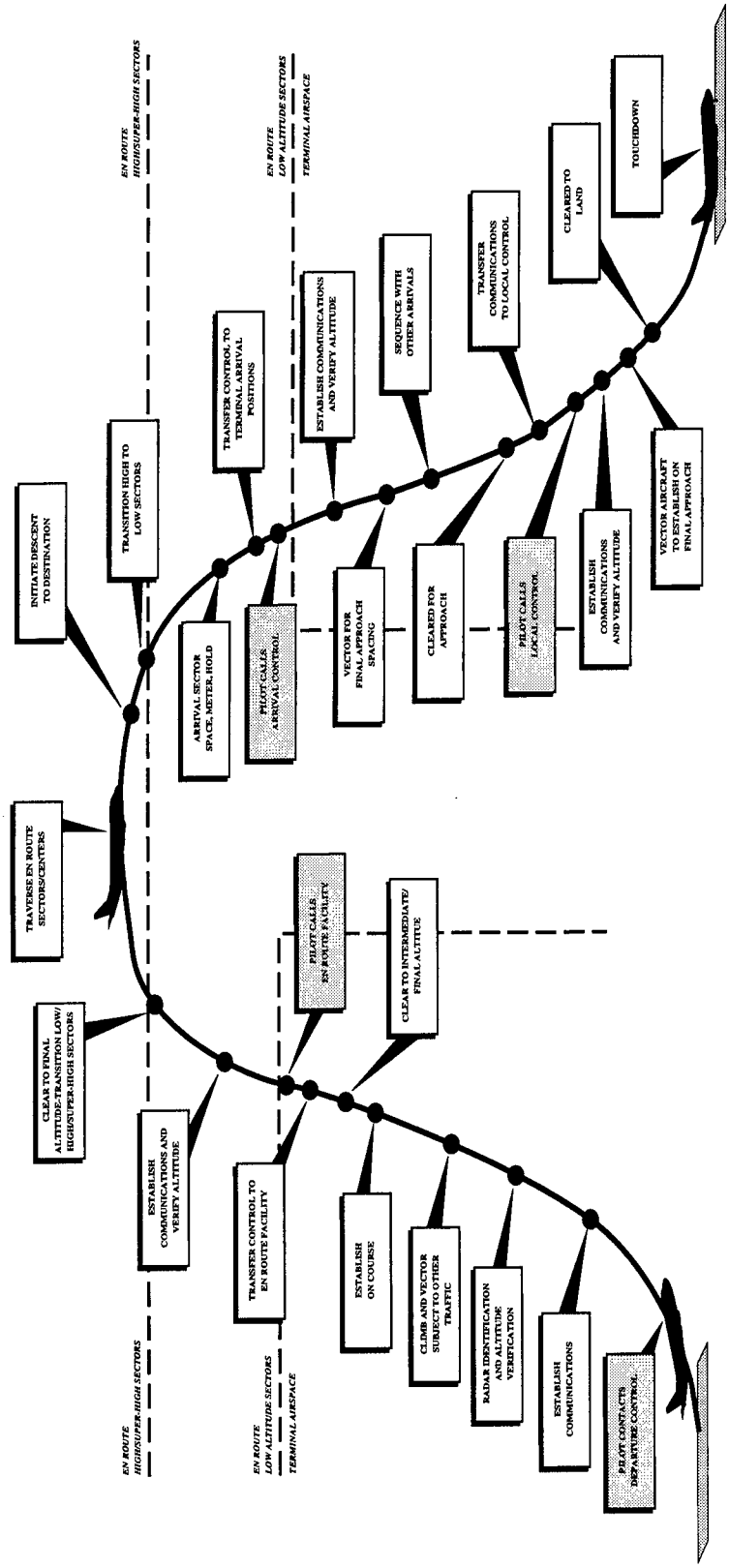

Figure 1-1-2. Movement Control (Airborne Phase)

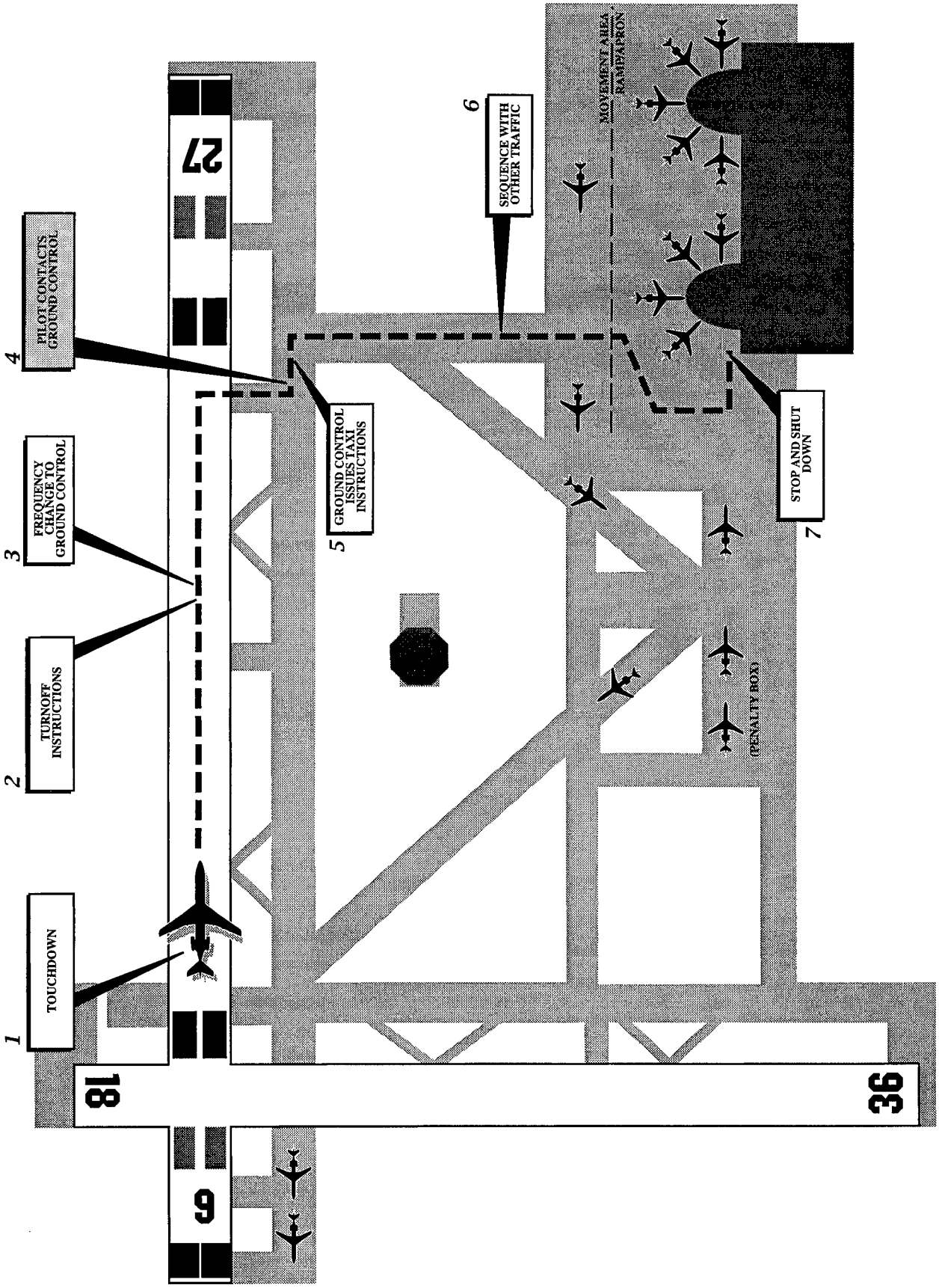

Figure 1-1-3. Surface Movement (Arrival Phase)

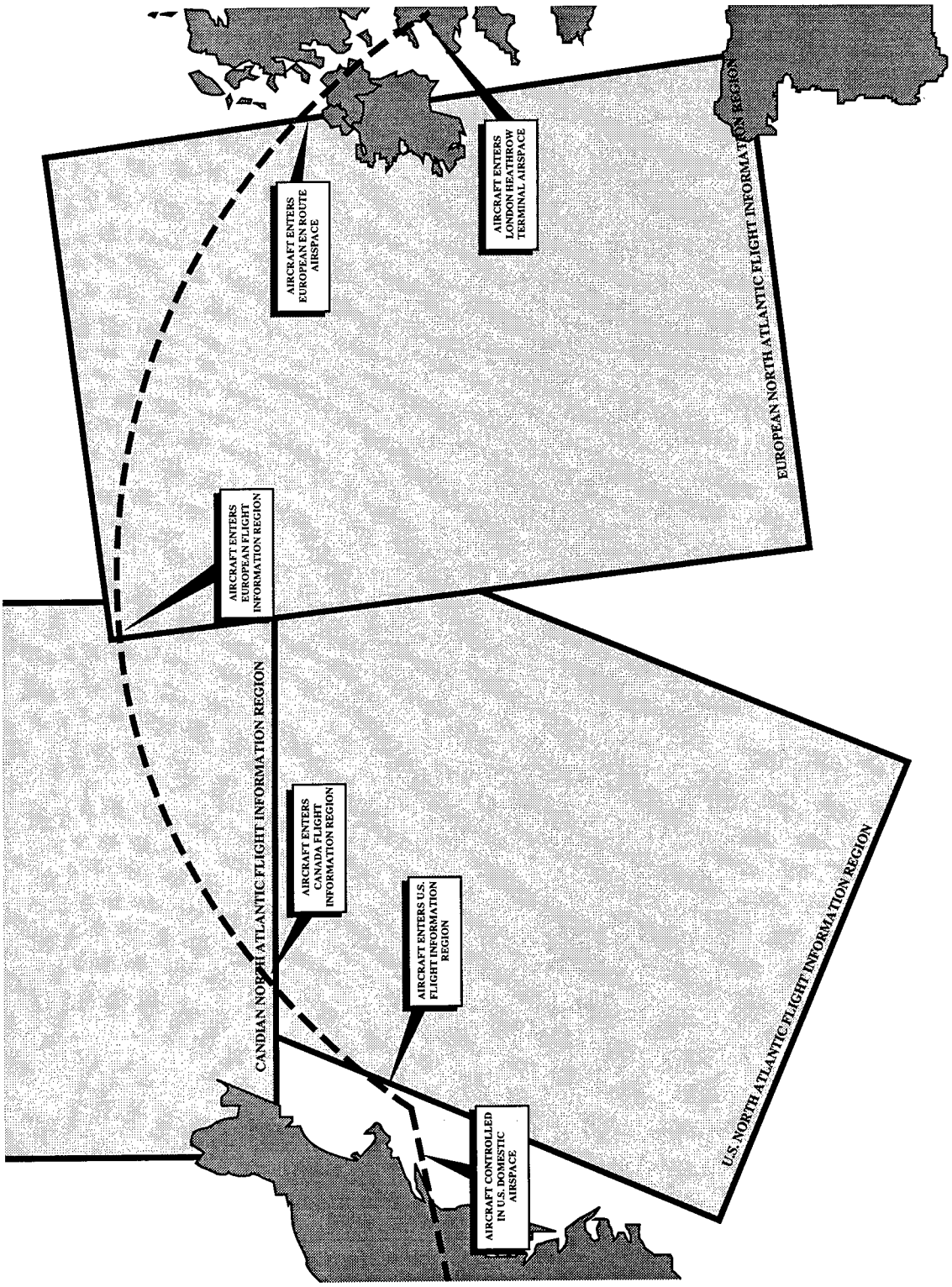

Figure 1-1-4. Movement Control (International Flight)

THE ATC PROCESS

NOTE: *Level Two is a more technical look at how the system handles the flight described in Level One*

When the need to fly arises, the pilot begins a process (see Figure 1-2-1) of information gathering and sharing that starts with a weather briefing and continues until the completion of the flight. Information gathering involves determination of whether conditions are good enough to fly given the capabilities of the pilot and the aircraft. If the pilot is qualified and the aircraft properly equipped to make the trip, the process moves forward. If not, the pilot decides not to go. If the determination to go is made, the whole FAA Air Traffic Control system is at the pilot's disposal to help complete the flight successfully.

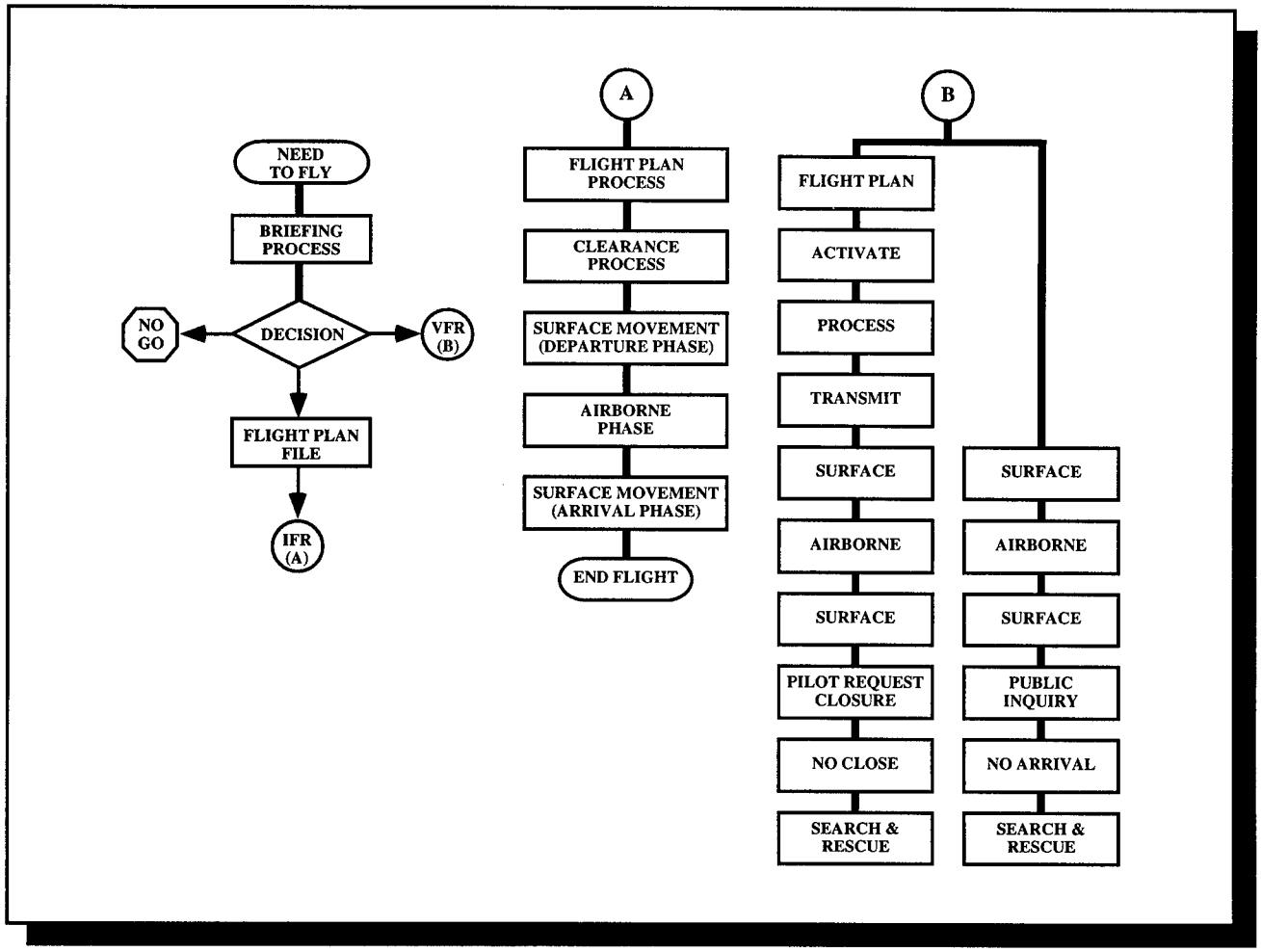

Figure 1-2-1. The Decision-Making Process

The FAA flight service station (or other source) presents the pilot with the necessary aeronautical and weather information, reviews proposed flight plans, and assists in determining a route of flight that is acceptable to both the pilot and the system. Then the FAA Air Traffic Control System provides the necessary guidance, on the ground and in the air, to get the flight to its destination. The process of making that happen is detailed in the following pages, dividing the

FAAs efforts into five activities that take place during the flight: A) preflight activities; B) the clearance process; C) surface movement on departure; D) airborne movement; and E) surface movement on arrival.

A. PREFLIGHT ACTIVITIES

The FAA ATC system is in place for all aviation activities that are conducted in the NAS. The system includes three types of facilities: terminal, en route, and flight service. The terminal and enroute control facilities provide guidance and separation assurance for all aircraft flying under Instrument Flight Rules (IFR), and Visual Flight Rules (VFR) traffic in and around the airspace of the nation's airports. The FAA Flight Service Station system provides weather and aeronautical data to any pilot who requests it, regardless of whether the flight is operating under IFR or VFR. Flight Service Stations can be either "automated" (AFSS) or "non-automated" (FSS) depending upon which equipment they utilize.

Weather forecasts used in preflight briefings are generally accurate and reliable. High levels of automation give briefers speedy access to more and better weather products as the result of sophisticated weather radar systems and state-of-the-art data interchange with the National Weather Service (NWS). Through computer distribution networks and the use of digital communications services, pilots have the ability to receive weather products quickly. The task of weather briefers has evolved to the point where they can formulate detailed weather briefings into route-specific information packets transmitted rapidly and in a clear format. Pilots receive voice briefings via radio and telephone.

Instrument Flight Rules, issued by the FAA, establish procedures for flying under conditions in which visual navigation and separation of aircraft are not possible. They also establish the minimum equipment aircraft must carry for IFR flight, and minimum weather conditions below which aircraft may not operate. VFR operations are also regulated by the FAA, who establishes rules for flying where visibility/ceiling are at or above established VFR minima.

Flight Service System

Flight Service monitors the status of flights flying under Visual Flight Rules when those flights file a VFR flight plan. In certain areas, procedures are established for mountain and lake reporting monitoring services. When a pilot requests these services, he must provide a position report to the appropriate AFSS/FSS at specified intervals when flying over mountainous terrain or large lakes. Failure to make one of these reports will result in the initiation of search and rescue procedures for the aircraft. The VFR flight plan provides the FAA with an itinerary of the planned flight. The AFSS/FSS specialists provide weather briefings and other information about change, either temporary or permanent, to the NAS—such as runway closures or navigation aid outages, and recent reports concerning local turbulence, icing conditions, etc., by pilots who have been flying in the area.

The AFSS/FSS is a gateway for independent pilots connecting to the air traffic control system. Most general aviation pilots who plan to fly IFR within the ATC system file a flight plan with Flight Service. The flight plan is entered into the system for approval and clearance by ATC.

Use of the system begins with the first action a pilot takes upon deciding to fly: a preflight briefing (Figure 1-2-2 details the briefing process.) Every pilot rated and operating under IFR, and pilots qualified to fly under VFR, begin each flight with this process. The objective of the preflight briefing is to gather information necessary for a safe and efficient flight from the latest information available. The information comes from many sources, and includes both meteorological and aeronautical data.

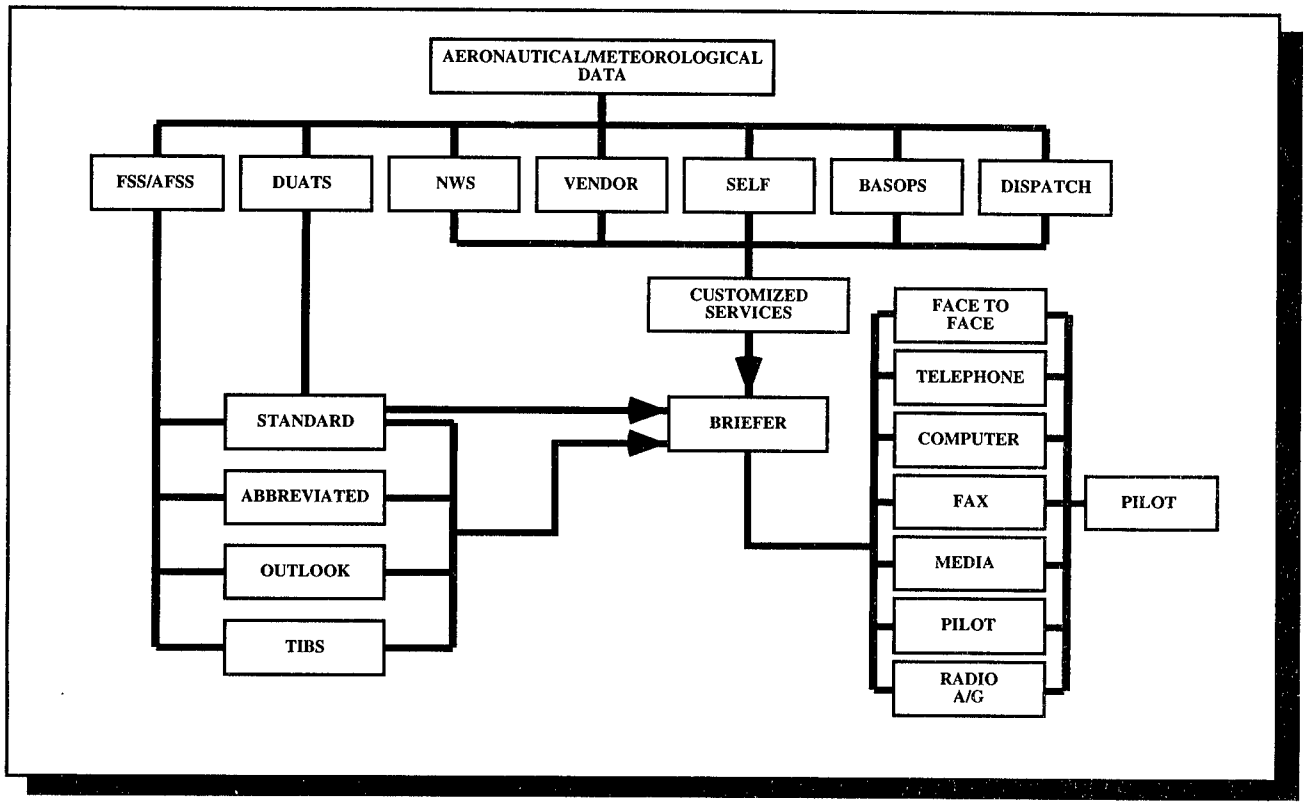

Figure 1-2-2. The Briefing Process

Types of Briefings

Preflight briefing information comes in many forms, as do the types of briefings in which the information is presented. Most general aviation pilots—those not flying for the airlines or the military—use the FAA Flight Service system. AFSS/FSS specialists collect, analyze, and disseminate information to pilots as requested. They have at their disposal current and forecast meteorological and aeronautical information available within the FAA system, and can provide a pilot all the information needed to make informed decisions.

A standard briefing from an AFSS/FSS specialist contains pertinent surface, airborne, and en route weather, plus currently available aeronautical information. A standard briefing is provided to all who request a briefing, unless the request is for an abbreviated briefing. An abbreviated briefing is a request only for specific information, or an outlook briefing for a flight more than two hours in the future. The outlook briefing is normally used for planning purposes only, and is available with forecast data for the proposed flight prior to the actual flight time.

Rather than read the information verbatim, pilots and briefers in the AFSS/FSS discuss the information. Briefers continually update and analyze data so that the information is current and relevant to the flight in question.

The information provided to pilots during a standard preflight briefing includes: 1) adverse conditions; 2) VFR not recommended when visual limiting conditions are present or forecast; 3) a synopsis of weather systems and air masses; 4) current conditions along the route of flight; 5) en route forecast; 6) destination forecast; 7) winds aloft forecast; 8) unpublished Notices to Airmen (NOTAMS); 9) ATC delays; 10) requested information, such as published NOTAMS, density altitude, etc. The briefer will also request Pilot Reports (PIREPs) from the pilot when certain conditions exist and advise the pilot of the availability of the Enroute Flight Advisory Service (EFAS).

An additional source of briefing information is the Direct User Access Terminal System (DUATS)—an automated service provided by vendors to pilots, at no charge to the user, under an agreement with the FAA. DUATS can be accessed by any personal computer or user terminal via modem, and provides data in a format compatible with most systems. Any pilot with a current medical certificate in the 48 contiguous United States can access the system. Limited service is available in Alaska and Hawaii DUATS provides the preflight briefing information of a standard Flight Service briefing, including current and forecast weather data and aeronautical information, and allows pilots to file domestic flight plans directly into the NAS computers.

Another method of obtaining information is a service called the Telephone Information Briefing System (TIBS), recorded weather messages accessed by a touch-tone telephone. TIBS plays recordings of meteorological and aeronautical information especially helpful to VFR pilots, area and/or route briefings, airspace procedures, and special announcements concerning aviation interests. Information is also available through the Pilot's Automatic Telephone Weather Answering Service (PATWAS), which is a continuous recording of meteorological information. Generally, the TIBS is provided by Automated FSSs and the PATWAS by non-automated FSSs.

There are a number of other sources that provide customized briefing services, depending upon who the pilot works for and how the information is to be used. Military pilots get full briefings from their Base Operations (BASOPS) as part of the preflight preparation process. The military briefing is similar to that provided to civilian pilots, but the briefing is customized to include mission-specific information the pilots need. Airline pilots typically receive a full preflight briefing from their dispatch office, again containing all the information provided by an AFSS/FSS, and additional information specific to the operation they fly.

Pilots may also obtain customized briefing services from commercial vendors, who provide both automated and personal briefings, including graphic weather information. This service is provided at a cost to the pilot.

A pilot may supplement a briefing by obtaining additional information on his own. This may include calling a destination source for current weather information, or even simply looking out the window to determine the existing conditions. The pilot may talk with other pilots who have just landed at an airport, or follow weather developments on television, where there are various sources of weather, some specifically tailored to pilots. Self-briefing alone is not encour-

aged by the FAA to take the place of a full preflight weather briefing. However, a look out the window might provide enough information to tell a pilot to go back to bed and fly another day.

Meteorological Information

Since some of these standard briefing elements concern meteorological data, the briefing normally includes current surface and airborne conditions at the departure airport, current and forecast weather, cloud and wind conditions on the ground and in the air along the route of flight, and current and forecast weather conditions at primary, alternate, and other nearby airports. Such information is derived from weather reports and forecasts, maps, charts, weather radar, and satellite pictures—depending on the level of detail of the weather service being requested.

Meteorological information comes from various sources, as detailed in Table 1-2-1. Much of the weather is gathered by the NWS and passed along to the FAA via automation or through weather service units staffed by NWS personnel located in the ARTCCs. Observations taken by the Department of Defense (DOD), airlines, contract observers, and local stations are included in the system. The FAA also maintains various sources of their own weather collection. Additionally, observations are obtained from automated systems such as the Automated Weather Observing System (AWOS) and Automated Surface Observing System (ASOS). The AWOS and ASOS systems may be owned by the FAA, DOD, State Governments, or local municipalities. PIREPS provide a valuable source of "real-time" weather information. This information comes from pilots in the system reporting encounters with hazardous flying conditions such as thunderstorms, turbulence, icing, and wind shear (sudden changes in the direction of the wind relative to the direction of the aircraft).

Table 1-2-1. Meteorological Data

	SURFACE CURRENT	SURFACE FORECAST	ALOFT CURRENT	ALOFT FORECAST
VENDOR			RADAR COMP	RADAR COMP
FAA	SA		WIND FD	WIND FD
NWS	SA	FT FA	FD	FD
DoD	SA	FT FA	FD	FD
AIRLINES		FT FA		
LOCAL	PIREP TV		TV	TV

Aeronautical Information

Aeronautical information comes from numerous sources and data bases, as detailed in Tables 1-2-2 through 1-2-5. Aeronautical data specifically relating to navigation aids (NAVAIDS), airport landing areas, airspace, ATC Procedures, hours of operation, and unique events, come from a variety of sources. Some of these include aeronautical charts, FAA handbooks, and other publications designed by the FAA for use by pilots.

Table 1-2-2. AERONAUTICAL CHARTS INFORMATION

CHART	NAVAID	AIRPORT LANDING AREA	AIRSPACE	ATC PROCEDURES	HOURS OPEN	UNIQUE EVENT
WAC	●	●	●		●	
SECTIONAL	●	●	●		●	
VFR TERMINAL	●	●	●	●	●	
LO EN ROUTE	●	●	●		●	
HI EN ROUTE	●		●		●	
N. ATLANTIC	●		●	●	●	
N. PACIFIC	●		●	●	●	
* FLIGHT CASE	●	●	●		●	
GULF/CARIB.	●	●	●		●	
IAP	●	●	●	●	●	

Table 1-2-3. AERONAUTICAL DATA

	CHART	PUBLICATIONS	NOTAMS	OTHER
NAVAID	●	●	●	
LANDING AID	●	●	●	
AIRPORT	●	●	●	
AIRSPACE	●	●	●	
RADIO COMM	●	●	●	
ATC PROC. HOURS OF OPS.		●	●	●
UNIQUE EVENTS	●	●	●	●

*** Flight Case chart cancelled — will be re-issued in March, 1995**

Table 1-2-4. FAA HANDBOOKS INFORMATION

	NAVAID	AIRPORT LANDING AREA	AIRSPACE	ATC PROCEDURES	HOURS OPEN	UNIQUE EVENT
ATC 7110.65				●		
FSS 7110.10				●		
FACILITY OPS. 7210.3				●		
SP. MIL. OPS. 7610.4				●		
POS. STAND. 7220.2						
AIRSPACE 7400.2				●		
COMP. 7400.6	●		●		●	●

Table 1-2-4. FAA HANDBOOKS INFORMATION

	NAVAID	AIRPORT LANDING AREA	AIRSPACE	ATC PROCEDURES	HOURS OPEN	UNIQUE EVENT
AIM			●	●		
AFD	●	●	●	●	●	●
AIP	●	●	●	●	●	
IFIM	●	●	●	●	●	
NTAP	●	●	●	●	●	●
INTA	●	●	●	●	●	●

NOTAMs are often a vital source of operational information. They contain uncharted or unpublished data such as airport, runway or taxiway closures, newly-erected obstructions, changes in the status of navigation aids and instrument landing systems (ILS), radar service availability, and other information essential to en route, terminal or surface operations. NOTAMs of a permanent nature are incorporated in the FAA-published Notice to Airmen publication. These NOTAMS are carried in the system until they are either charted or published in the FAAs Airport/Facility Directory (AFD).

Preparing Flight Plans

After the pilot is briefed, the next step is to fill out and file a flight plan. As suggested by its name, the flight plan provides the FAA with the type of flight planned—IFR or VFR. IFR flight plans are required to be entered at least 30 minutes prior to the proposed departure time. This requirement allows the ATC system time to check and validate the flight plan, and provide the flight plan data to the appropriate ATC facilities to avoid any delay when the departure clearance is requested. If a VFR flight plan is filed, it is held by the departure area AFSS/FSS until it is activated or for an hour after the proposed departure time. If a VFR flight plan is not activated within that time frame, it is removed from the system and the pilot is required to refile.

The flight plan includes the type of flight (IFR or VFR), aircraft identification, aircraft type and special equipment code, true airspeed, departure point, proposed departure time, proposed/requested altitude, route of flight, destination, pertinent remarks, fuel on-board in time, pilot's data (name, phone number, and aircraft home base), number of souls on board, the color of the aircraft, and (for VFR) 3-letter identifier for the closure AFSS/FSS. The FAA needs this information to issue IFR clearances and to initiate search and rescue procedures for overdue aircraft.

Filing Flight Plans

A flight plan is filed for any IFR flight and many VFR flights. Flight plans entered into the system follow various routes into the NAS, depending on where they originate (Figure 1-2-3). Whether a flight plan originates in the dispatch office of an airline, a military BASOPS, an AFSS/FSS, or a personal computer, the flight plan is routed to NAS computers for verification and acceptance by the system. The filing activity is similar whether IFR or VFR and regardless of the entry point into the NAS.

Canceling or Closing a Flight Plan

Once a VFR flight being conducted on an active flight plan is completed (or if the pilot decides to cancel a VFR flight plan for any reason), it is the pilot's responsibility to contact the nearest AFSS/FSS with that information. If an AFSS/FSS is not readily available, the request can be made to an ATC facility to relay the cancellation to the AFSS/FSS. Simply landing at a controlled airport and being in contact with ATC at that location does not automatically close or cancel a VFR flight plan. Towers and enroute facilities do not maintain records of VFR flight plans. This is a function of the appropriate AFSS/FSS. Failure to properly close an active VFR flight plan within the designated time frame (30 minutes after the ETA) will automatically initiate a costly search and rescue procedure.

An IFR flight plan may be canceled by a pilot at any time the flight is operating in VFR conditions outside Class A Airspace. At the time the request is received, ATC separation, traffic information, and radar services are terminated. The aircraft may choose to remain in contact with ATC for flight following or other advisory service while maintaining VFR for the duration of the flight. This service, however, is an additional service and availability will be determined based on controller workload. When a pilot seeks to operate with an IFR

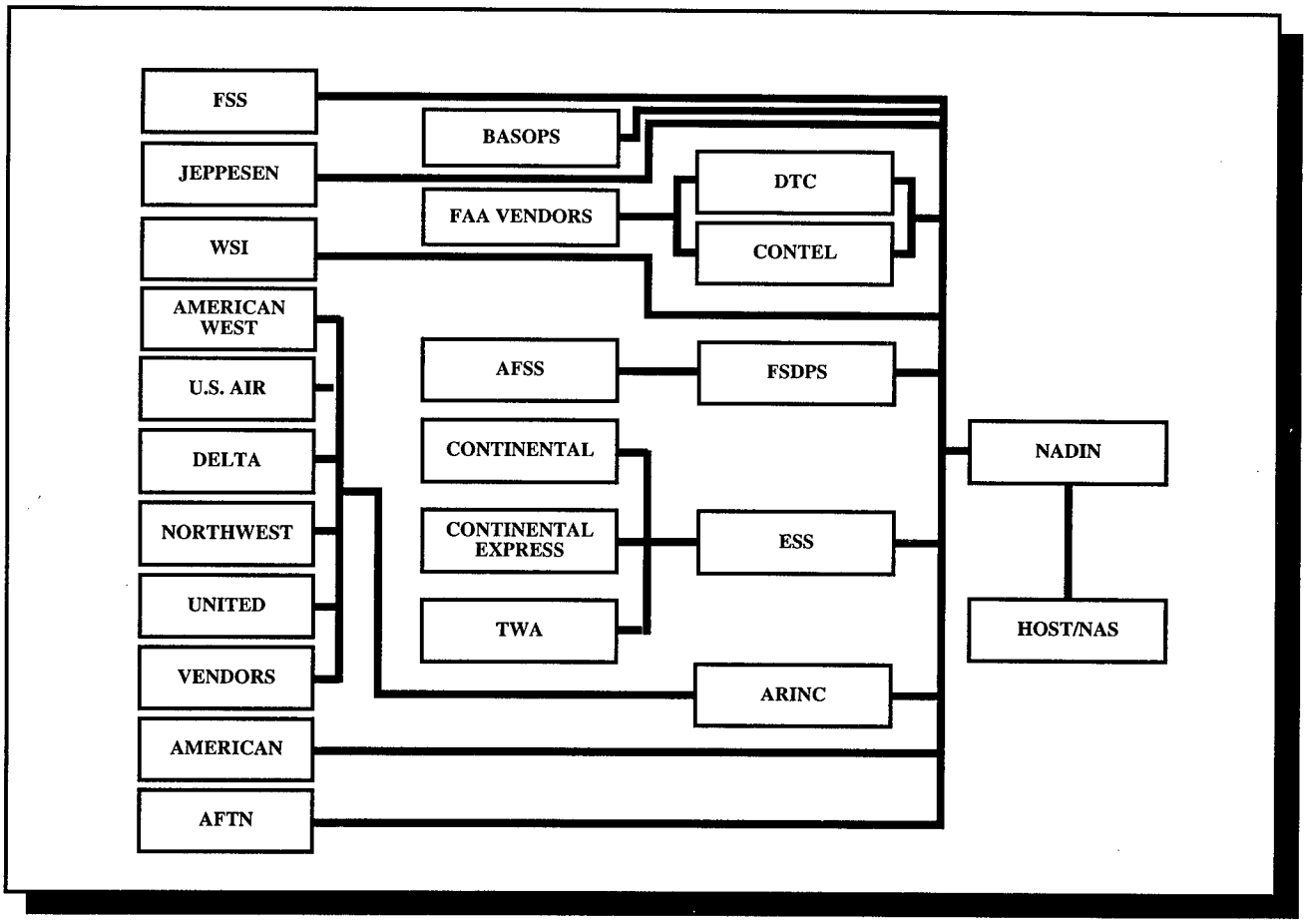

Figure 1-2-3. Flight Plan Filing

flight plan to an airport with a functioning control tower, the flight plan is automatically closed upon arrival. If operating on an IFR flight plan to an airport where there is no functioning control tower, the pilot initiates cancellation of the flight plan. This is done after landing through an AFSS/FSS or other means of direct communication with ATC. In the event there is no method to contact AFSS/FSS, or no ground communication with ATC is available, the pilot cancels the IFR flight plan while still airborne. IFR flight plans may not be closed while an aircraft is still airborne and destined for an airport reporting weather at or below IFR minimums.

B. THE CLEARANCE PROCESS

A clearance authorizes a flight to proceed. An IFR departure may not be attempted without one. Clearances are authorizations derived from concise ATC planning to insure that separation is established and maintained. As situations evolve tactically, clearances may be altered to separate an aircraft from other air traffic to manage a constantly changing situation. This may be done by issuing clearances with revised headings to fly, altitudes, and aircraft speed.

The clearance process is the activity (Figure 1-2-4) that takes place within the system once the pilot finishes with the necessary research and preparation, and presents a flight plan to the FAA. After the flight plan is filed, checked at the local filing station, and entered into the NAS,

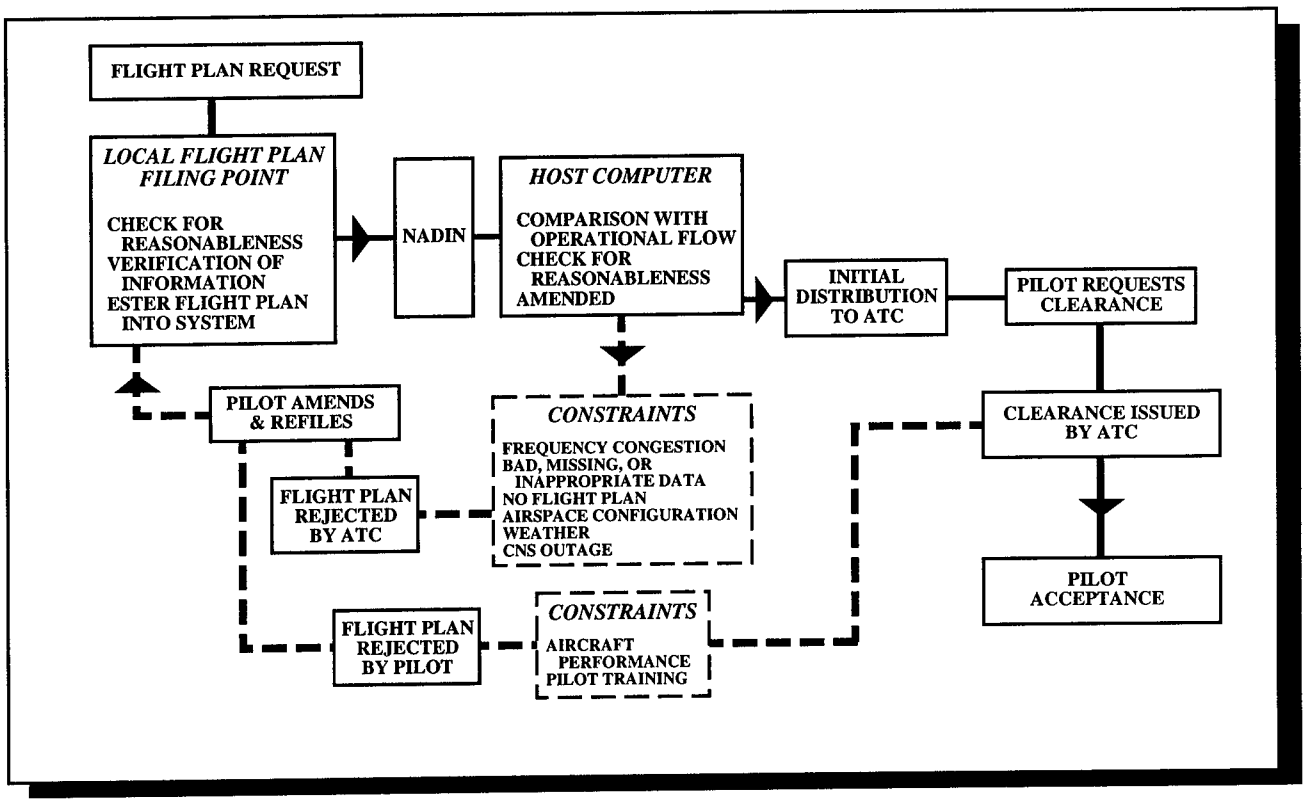

Figure 1-2-4. The Clearance Process Check and Validate

it is verified by the Host Computer located in the appropriate ARTCC. The Host computer generates a flight profile for each request, based initially on pre-set flight routings stored in its memory. These flight routings, called preferential departure routings (PDR), preferential departure-arrival routings (PDAR), and preferential arrival routings (PAR), are standard flight routes for departure, en route and arrival traffic. These routes make up what is called the National Route Program (NRP). Most flights are assigned these pre-prescribed routes which have been developed to enhance traffic flow over our nation's airways and in the terminal areas.

1995 and beyond will introduce an expansion of the National Route Program (NRP). This will provide for clarification and a wider implementation of "user preferred trajectories", "Free Flight", or "direct" routing. At the present time, there are limited altitudes available to accommodate these operations. However, as the decade comes to a close, projected enhancements in air traffic automation and traffic management procedures indicate more altitude availability and wider implementation of these procedures.

The clearance process actually begins when the FAA receives an IFR flight plan. At the local filing station, whether it be an AFSS/FSS, airline dispatch, or any of the other original filing points, the flight plan is subjected to a preliminary check for reasonableness and a verification of the information in the flight plan. It is then entered into the automated system.

Even though the flight plan is accepted at the initial filing station, it is still subject to further checks before a clearance may be issued. It may be rejected by the Host Computer for a number of reasons, including incorrect, missing, or inappropriate data, because the flight plan as filed does not conform to the current airspace configuration, or because of conflicts with other

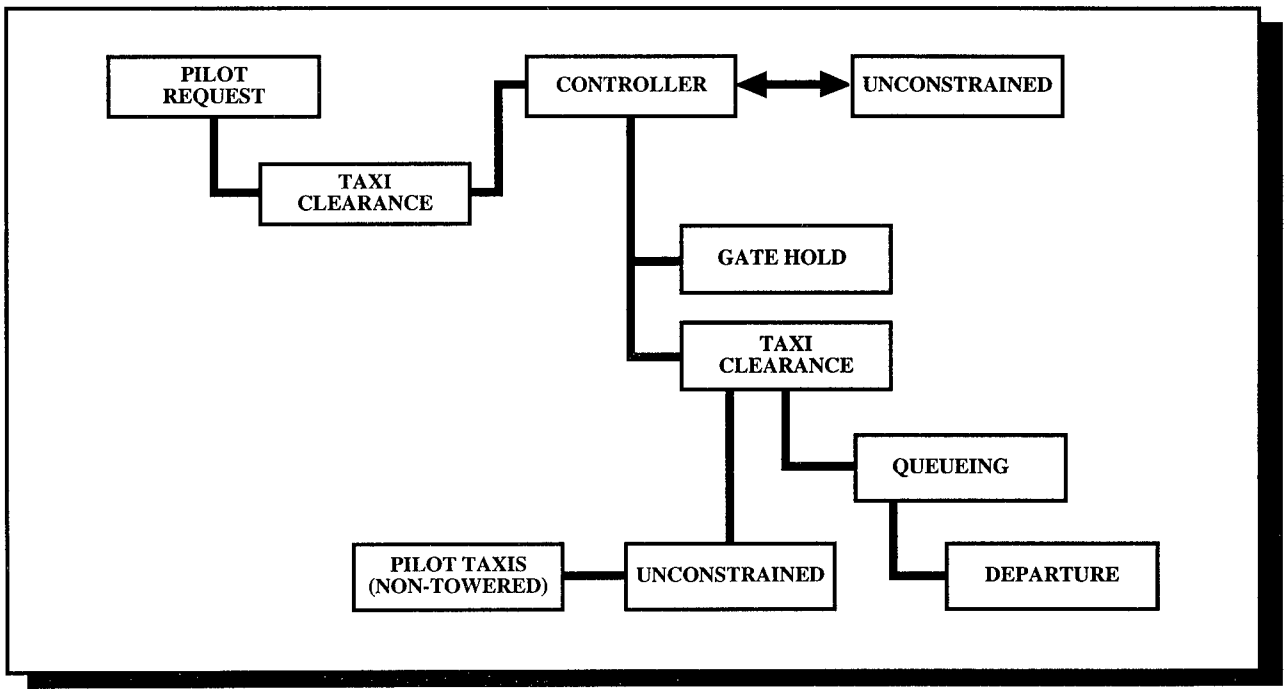

Figure 1-2-6. Surface Movement (Departure Phase) Movement Clearances

Towered Airports

Before an aircraft begins movement, its intentions are communicated to those responsible for maintaining separation, and others operating aircraft or ground vehicles in the airport environment. At controlled airports, the process begins with the pilot's request for a clearance to move the aircraft from its gate or parking position on the ramp. At major airports where air carriers control large numbers of gates, agreements are in place between the carrier and the FAA for control of parking areas. In these areas, a ramp director designated by the airline directs the movement of aircraft from the gates and on the ramp to a specific point that is defined by the agreement. At airports where no such agreement is available, both the pilot and ground service personnel work together to ensure the safe movement of the aircraft away from the gate and up to the point where ATC assumes movement control.

Ground Control

The FAA ground controller is responsible for determining if a condition exists that requires an aircraft to hold its position at the gate. Gate holding is generally (but not always) a scheduled condition, and pilots are advised of how long such a condition will exist so that they can plan their activities. Normally, pilots in a gate hold status do not start their engines until assured of clearance to taxi.

The process of movement begins when the aircraft is pushed back or taxis away from the gate (The process of Movement Control is shown in Figure 1-2-7). Upon approaching the common movement area beyond the gate and parking area, further ATC taxi instructions are delivered. When the taxi clearance is issued, the aircraft taxis onto the movement area where FAA ground controllers direct aircraft through the airport's system of taxiways that lead to the assigned departure runway. The controller issues traffic advisories to the pilot concerning

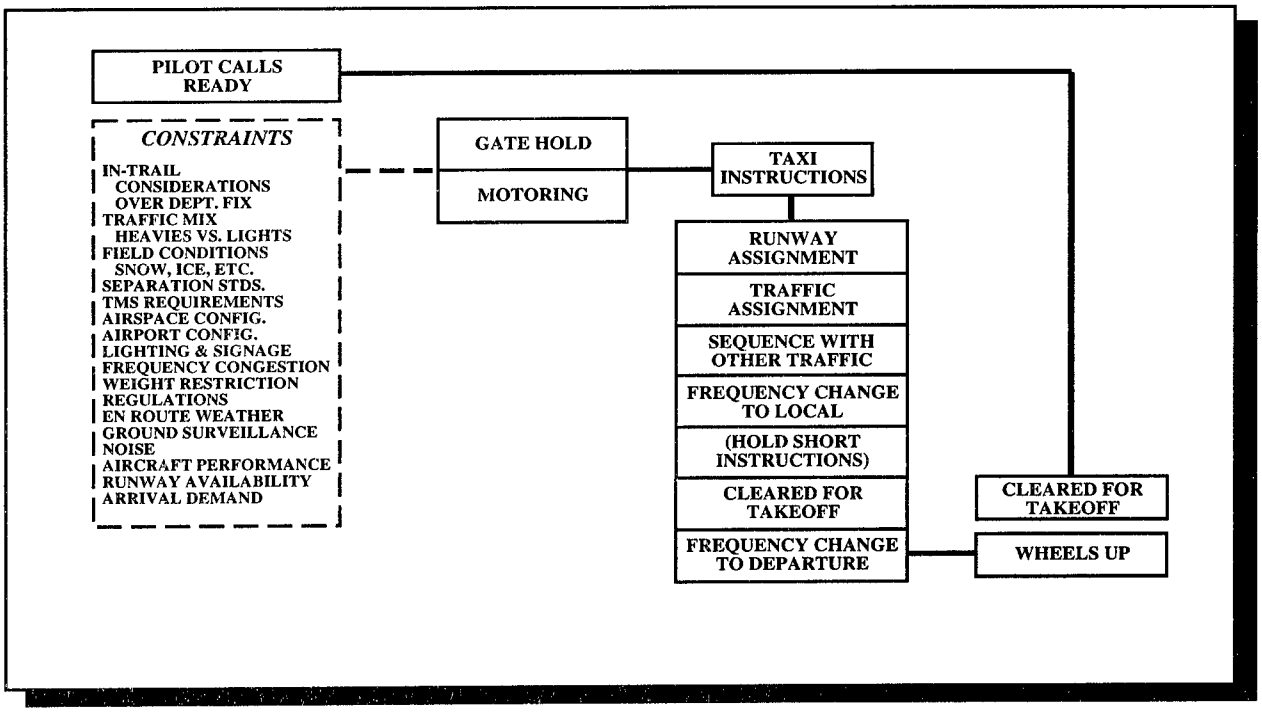

Figure 1-2-7. Surface Movement (Departure Phase) Movement Control

other traffic moving in the immediate area, and directs the aircraft to a position short of the active runway.

There are variations on this scenario. The ground controller directs movement to specific taxiways and runways based on the most efficient flow of traffic. The controller may issue a "taxi-to" instruction - a clearance through any runway or taxiway intersections up to a specified point short of the active runway. A "hold short" instruction may be issued, which requires the pilot to stop at an intersection or other point and await further clearance. If an aircraft is in a queue, the pilot follows the preceding aircraft to the active runway.

Local Control

The local controller directs all aircraft onto the active runway and clears them for departure. Additionally, the local controller is concerned with situations created by local air traffic at the airport, changing runway assignments, and volume of traffic utilizing the active runway. It is the local controller's responsibility to sequence departing aircraft into the stream of arrivals to ensure optimal use of the active runway. Large airports with multiple active runways may utilize more than one local controller. They must maintain close coordination to ensure an orderly flow of traffic to and from all active runways.

Non-Towered Airports Towered Airports

Control of surface movements at non-towered airports is primarily in the hands of the pilots themselves. Aircraft are unrestricted in their movements about the airport, and it is the responsibility of every pilot or other vehicle driver to operate in a manner that ensures safety.

Pilots are expected to announce their current position and intentions on the local radio frequency before beginning to move so that pilots know where aircraft movement will occur. The local common frequency at an airport is known as a Common Traffic Advisory Frequency (CTAF) - also known to pilots as UNICOM. A system of procedures utilizing CTAF or UNICOM is monitored by all users at non-towered airports. Pilots can obtain information regarding these procedures from the Airman's Information Manual (AIM).

The process for an IFR flight from a non-towered airport begins with a pilot requesting a departure clearance via the aircraft radio. If the frequency coverage is such that the pilot cannot communicate with an ATC facility, he/she must then obtain the clearance by telephone. A clearance from a non-towered airport normally includes a clearance void time. If the pilot is unable to depart or otherwise complete the procedure prior to the void time, he/she must advise ATC that there has been a change in plans, flight delay, or cancellation.

The departure clearance may be issued by a controller in the appropriate TRACON, ARTCC (if the departure airport is not located within a terminal area), or relayed from these facilities by telephone thorough an AFSS/FSS or local airport operator (called a Fixed Base Operator, or FBO). Aircraft may also depart from the non-towered airport VFR (weather permitting) and contact ATC in the air for a clearance to continue via the flight plan request.

D. AIRBORNE PHASE

The airborne phase of flight (Movement Control-Airborne Phase is shown in Figure 1-2-8) begins when the aircraft lifts off the runway, and continues until landing. With some exceptions, constant communications between the aircraft and controller occurs.

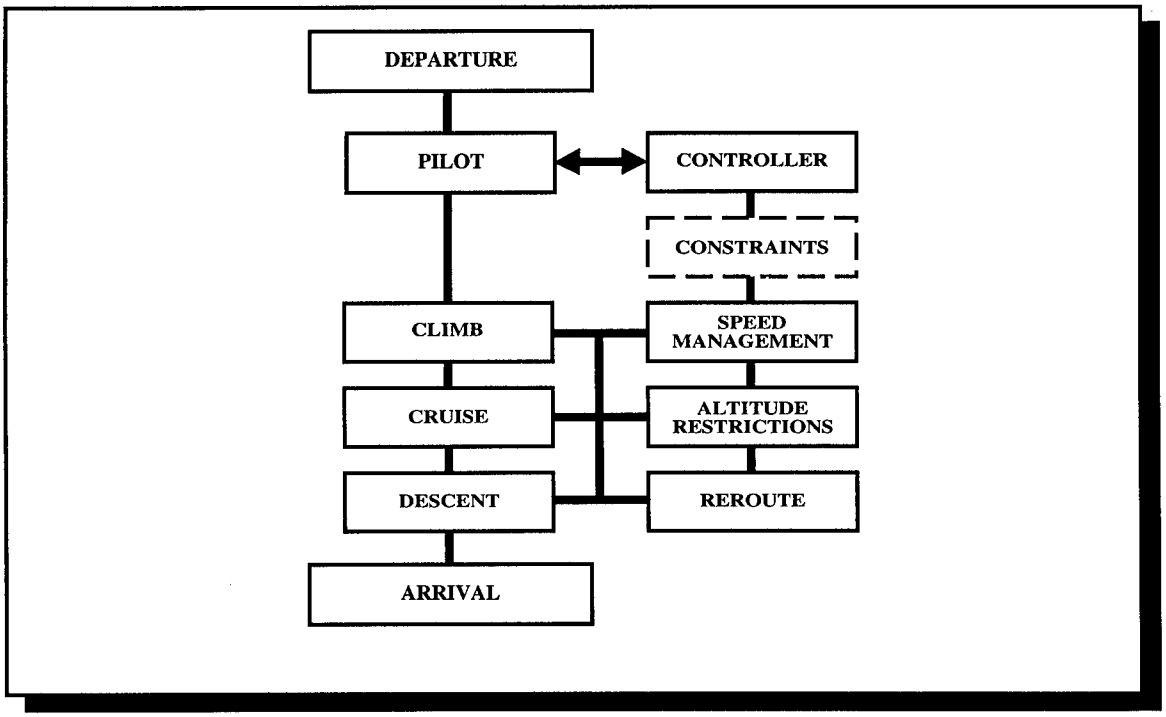

Figure 1-2-8. Movement Control (Airborne Phase)

Controllers issue instructions; pilots acknowledge and respond. Pilots request changes or information; controllers either grant or deny the request, based on the operational situation. Most aircraft operating in controlled airspace have a radar transponder which provides data about the aircraft such as its position, and altitude. Transponder equipped aircraft are identified by a discrete radar code.

As in the airport environment, the process of controlling airborne traffic is facilitated with high levels of automation. This includes quality display technology, aircraft surveillance and tracking, weather tracking and forecasting, and reliable communications. In addition, automated switching of voice channels makes voice communications between the air and the ground and between ground facilities and ATC positions highly efficient.

ATC instructions, traffic advisories and weather information are transmitted over voice channels. However, local airport traffic area information, weather, and pilot reports may be transmitted to aircraft on digital communication networks. The increased use of digital communications such as PDC and data link reduces radio frequency congestion.

As aircraft near destinations, weather tracking and forecasting increase the level of safety and reliability of the system and information delivered to the pilot and controller. Improvements in the detection of frontal activity, wind shear and microbursts allow pilots and controllers to respond more quickly and to efficiently manage changes in traffic flows resulting from weather.

Terminal Operations (Departure Phase)

Operationally, an aircraft enters the airborne phase upon departure. During a normal, unrestricted flight, the pilot proceeds according to clearance, through a series of handoffs from one controller to another, through the climb, cruise, and descent portions of the flight.

After departure, control is transferred to departure controllers using radar tracking and display equipment at the TRACON, to the point where they are handed off to an en route controller at the ARTCC or an adjacent TRACON whose airspace they are about to enter.

Aircraft departing from non-towered airports within a terminal area contact the TRACON and await a clearance to depart. Aircraft entering the system from a non-towered airport outside the terminal area make contact directly with an ARTCC either on the ground or airborne. If direct communication with the TRACON or ARTCC is not possible, then the clearance may be requested from and relayed through the nearest AFSS/FSS.

Aircraft are directed through air traffic control sectors—portions of controlled airspace—up to their requested altitude and en route to their destination. They proceed through the sectors on airways--air routes that have been established to facilitate orderly control of cruising traffic—or on random routes requested by the pilot. They continue in the cruise segment of their flight to a point where their flight profile calls for descent to begin.

Aircraft descend through the airspace, are transferred from high to low sectors in the ARTCC to arrival controllers in the TRACON, and on to local controllers in the tower. Pilots follow

ATC instructions while stepping down through altitudes, being queued into landing order by a team of controllers who make decisions based on any number of local conditions and parameters.

Aircraft arriving at non-towered airports receive en route guidance from ATC until they are cleared to begin their approach to the airport. This may be a clearance for an instrument approach, or the pilot may report that the airport is in sight and he wishes to cancel his flight plan and complete the flight under VFR.

Normally, aircraft fly these procedures unconstrained and with little variance from the flight plan. There are conditions, however, from which variation may occur, and controllers have three principal tools to handle changing conditions: 1) speed management, 2) altitude restriction; and 3) reroutes. It is the responsibility of ATC to establish and maintain separation of IFR aircraft.

Speed management is one tool used by ATC as a method of achieving desired spacing between aircraft. Aircraft departing from various airports in a region may be cleared to the same fixes, navaids, or vectored to intercept the same airways. ATC may slow an aircraft down or speed it up, in accordance with its performance capability, to ensure that it makes its way to the intended point at the proper time to achieve the desired airborne spacing.

Altitude assignment is another type of separation variable. Air traffic control assigns altitudes to IFR aircraft based on traffic volume, the types of aircraft in the airspace, weather conditions, and a number of other reasons. It is primarily a tool for achieving proper vertical separation between aircraft and allows as many aircraft as possible to fly at their optimum altitude for efficiency. However, safe separation is always the primary consideration in air traffic control.

Route assignment is the third type of separation variable. Controllers may issue a change in the flight plan by assigning a new route, or they may vector an aircraft—that is, direct an aircraft off of its cleared flight route. A totally new route may be assigned or the aircraft may be vectored to join its original route. These techniques may be utilized to avoid weather, other traffic, or for the purpose of managing traffic flow. Rerouting and radar vectoring can be viable alternatives to speed management as a method of achieving spacing, making space for additional aircraft in the airspace, or slowing down the overall traffic flow to a point where aircraft leave the airway to begin heading toward their destination airport.

The above are examples of why aircraft may be subject to variation in their flight plan or clearance. There can be a number of reasons why such variations may occur, and often more than one applies. The list of elements that place constraints on nominal operations include considerations for: weather, wake turbulence, icing, airspace and airport configuration, traffic flow management, preferential routings, special use airspace, vectoring, separation standards, and communications/navigation/surveillance aid outages, aircraft performance considerations, scheduling data accuracy, staffing, sectorization, and air traffic volume. Air traffic controllers consider all of these constraints to flight operations in an ever-changing environment. The operational situation is constantly evolving, requiring controllers to continually re-evaluate traffic and make decisions to ensure an efficient flow of aircraft in the system.

En Route Operations

En route ATC operations are split into various types of high and low altitude sectors. Generally, a sector controller is responsible for preplanning activities and aircraft separation through the use of flight progress strips and interphone communications. There is also a radar controller in each sector responsible for radar separation, using a plan view display (PVD) and air ground communications.

High altitude sectors, generally above 24,000 feet, handle departure traffic climbing to a cruise altitude, overflying other en route traffic in level flight, and traffic descending to lower altitudes in preparation for arrival. Low altitude sectors normally have a mixture of aircraft types which fly below 24,000 feet. In this stratum there is a mixture of through flights, slower speed arrival and departure traffic, and higher performance aircraft transitioning to and from the high altitude sectors.

As the pilot transitions into the enroute high altitude stratum, the aircraft's altitude is verified by the pilot and the digital display on the PVD. At this point the flight continues crossing numerous sector and center boundaries. Prior to entry into another area of control jurisdiction, or sector, the next radio frequency is issued to the pilot. At that time, the pilot changes frequency and establishes communication with the next controller by identifying the aircraft flight number, altitude, and any special instructions issued by the previous controller.

Prior to an aircraft's entry into another area of jurisdiction, a procedure is initiated whereby an alphanumeric data tag will flash on the receiving controller's PVD. The receiving controller initiates an action which indicates to the transferring controller that the flight is recognized and accepted prior to entering the receiving controller's airspace. This is termed a "hand-off". When the transferring controller no longer requires verbal communication with the aircraft that has been "handed-off," the frequency change will take place. The receiving controller, however, may not alter the speed, route, or altitude of the flight, without prior coordination, until the aircraft has crossed into his/her area of jurisdiction. The hand-off procedure between sectors or from one center to another is no different. Handoffs are made prior to an aircraft's crossing of a sector (or center) boundary. ATC sectors receive flight progress strips well in advance. Therefore, when an aircraft is being handed off from another sector, the receiving controller can easily reference all flight data regarding that aircraft. As the flight approaches its destination, controllers begin an assessment of when the aircraft should begin its descent.

Transitioning from sector to sector during the descent is handled in the same fashion as the climb phase. The pilot reports the aircraft identification, present altitude and assigned altitude each time there is a handoff to a different controller. Prior to reaching the TRACON boundaries, ARTCC controllers establish inbound flows of aircraft over specified arrival fixes. During times of heavy volume, it is the responsibility of ARTCC controllers to sequence aircraft to cross specific fixes at specific times. This process is called metering. The objective is to set up adequate spacing as the aircraft approach the airport to maximize runway capacity. In order to effect proper spacing and to move each arrival through the arrival fix at the proper time, it may be necessary to instruct an aircraft to reduce or increase speed, vector an aircraft thorough a series of turns, or even have an aircraft enter a holding pattern.

Terminal Operations (Arrival Phase)

As the aircraft nears a terminal area, it is handed off to the TRACON radar arrival controller. When the handoff is accepted, the pilot is instructed to contact the TRACON arrival controller. When reporting on the frequency of the arrival controller, the pilot calls out the aircraft identification, current altitude, and the altitude to which the aircraft is cleared. The controller verifies the altitude based on a comparison of the pilot's reported altitude and the alphanumeric readout on the controller's display. The aircraft is then sequenced to join the arrival flow with other aircraft which entered the TRACON airspace from different fixes. It then transitions to a prescribed STAR flies the published procedure to the runway and subsequently is cleared for an approach. This segment of flight is often referred to as the final approach course.

When an aircraft begins its final approach, the arrival controller clears the aircraft for that approach and transfers communications and control to a local controller in the airport control tower.

The pilot makes contact with the local controller, announcing the aircraft identification, and position. The local controller acknowledges the pilot's communications, ensures that the runway is clear, provides wind conditions and other necessary advisories, and clears the aircraft to land. The local controller may request or issue turnoff instructions, either before or after the aircraft lands and then transfers communication to ground control.

The process for descending to non-towered airports is basically the same, with the aircraft being guided down through the airspace in the same manner. If the non-towered airport is located within the terminal radar facility jurisdiction and a published instrument approach exists, the aircraft is controlled and issued an approach clearance in the same manner as outlined above. The pilot may, however, report the airport in sight, and cancel the IFR flight plan. If the aircraft is bound for an airport without radio or radar coverage, radar service is terminated, usually when the aircraft is issued the approach clearance. The pilot cancels the IFR segment of flight by remote radio communications or telephone with the appropriate ATC facility.

If the aircraft is descending through terminal airspace, but is bound for an airport outside the terminal radar coverage area, ATC announces the point at which radar service is terminated. The pilot decides if a landing is possible given the weather conditions, or if a re-route is to be made to an alternate airport within radar coverage.

E. Surface Movement (Arrival Phase)

Movement about the surface in the landing phase of flight is virtually the same as in the departure phase (see Figure 1-2-9 for details of this phase). Technically, surface movement in the arrival phase of flight begins when an aircraft's wheels touch the runway. The pilot receives a clearance to land from the local controller in the air traffic control tower, or announces intentions on approach to an uncontrolled airport. In operations at airports with numerous taxiway intersections along the active runway, the pilot receives instructions on where to turn off the active runway.

Towered Airports

At most larger airports the process of surface movement is complex, and takes many factors into consideration (Figure 1-2-10). The aircraft in this scenario is rolling down the active runway, slowing to a speed that allows a smooth, safe turn onto a taxiway.

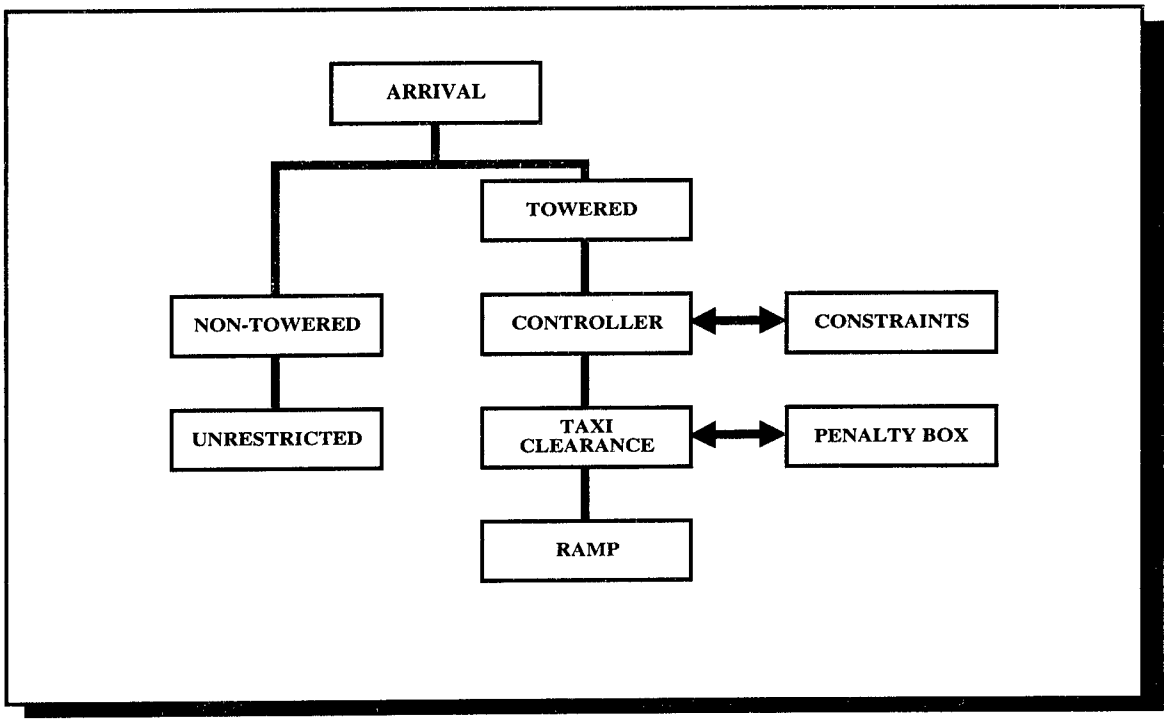

Figure 1-2-9. Surface Movement (Arrival Phase) Movement Clearances

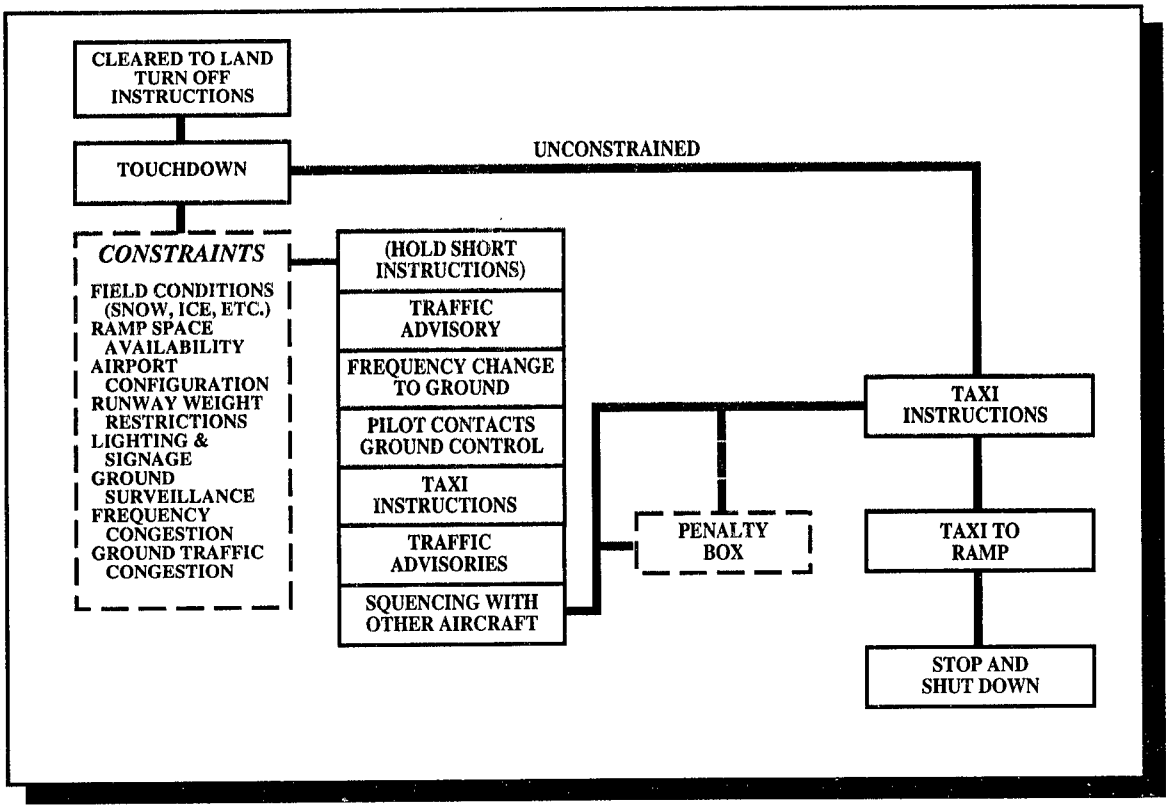

Figure 1-2-10. Surface Movement (Arrival Phase) Movement Control

As the ground and local controllers survey the field and give instructions to the airplanes moving about the airport, they consider a number of constraining factors in making correct decisions. As the aircraft prepares to turn off the active runway, the local controller provides any necessary hold short instructions and traffic advisories as to other traffic moving in the vicinity, and instructs the pilot to change to another radio frequency, on which a ground controller is directing surface movements about the airport.

Pilots change to the appropriate radio frequency, make contact with the ground controller, and await instructions. The ground controller provides the pilot with traffic advisories of other aircraft moving in the vicinity, and then directs the movement of the aircraft into sequence with the other aircraft heading toward a gate or parking area.

There are a number of constraints on the movement of aircraft about the airport. Field conditions can change in moments. Weather is the most common determinant of field conditions. Controllers are aware of snow accumulations, water and ice on runways, gusting winds, visibility, and a number of other factors.

Gate/ramp space availability is a factor in giving taxi instructions to pilots. If there is no place for an aircraft to park, the controller directs aircraft to a holding area out of the way of other traffic, until there is a parking place at the gate.

Controllers have a thorough knowledge of the airport's configuration, not only as it relates to the standard, unchanging configuration—where certain airlines park, where an aircraft on an international arrival goes to clear customs and inspections, where and when converging runways can affect operations—but also changing factors, such as the closure of a turn-off or taxiway.

Ground surveillance can be a constraint to normal operations. While technology in surface detection radar is improving rapidly, not every airport is equipped with surface radar, and restricted visibility due to rain, fog, smog, or haze can adversely affect operations and airport capacity. Runway incursions on the airport surface may occur when low visibility or adverse weather conditions exist.

Frequency congestion is a growing problem. The number of aircraft operating in the system, especially during peak periods, places a severe strain on communications between pilots and controllers, and many aircraft await instructions and advisories from the tower.

Demand for space on the airport surface is growing. As a result, ground traffic congestion is a major constraint to surface operations. A look at the ramp and parking areas of a large airport in a busy period demonstrates clearly the importance of accurate control and coordination among all who operate in the airport environment.

Non-Towered Airports

At non-towered airports, the pilot lands and clears the active runway as quickly as possible within the limits of safe operation of the aircraft, taxis to a parking position, and shuts down the aircraft. Since surface movement on arrival is unrestricted, it is the pilot's responsibility to

use caution at all times and to maintain a safe distance from all other vehicles. Pilots are expected to announce their position and intentions at every critical point along the way. Once the pilot's intentions have been made clear, it is incumbent upon the pilot to do precisely what is announced. This enables other aircraft moving about the surface to depend on the information they receive on their radio.

ATC SYSTEM METHODOLOGY

NOTE: *Level Three is a more in-depth look at the ATC system, and further explores its technical details of how the system functions. The level views individual systems and describes how they are interrelated. Therefore, the first three levels of each year (1995, 2000, 2005, etc.) are created in parallel to provide the most comprehensive explanation of how ATC functions.*

Air traffic control is a highly complex process. In all phases of air traffic control, the key elements of input, process and output depend on close coordination among many sources and individuals, all working toward the same goal—the safe, orderly and expeditious movement of aircraft through the system. The process involves the consideration of weather factors, the current state of the facilities and systems that make up the NAS, traffic demand, coordination with the U.S. military establishment, and the current situation as it evolves tactically.

This section of the document discusses the methodology of ATC, looking at each of the primary categories of control activity as outlined in the previous section: preflight activities, the clearance process, control of aircraft as they move about the surface, and aircraft control in the airborne phase.

A. PREFLIGHT ACTIVITIES

The preflight process begins long before the first requests come in to the FAA. It is actually an ongoing activity of the FAA and the NWS to maintain current and forecast weather information for aircraft as they prepare for departure. The FAA also maintains dynamic databases of aeronautical information.

Every day, long before the early morning activity on the east coast, a team of Traffic Management Specialists (TMSs) in the FAA's Air Traffic Control System Command Center (ATCSCC) develop a traffic management action plan for the day's scheduled activity. This plan is based on airline schedules, filed flight plans, scheduled military activity, weather, and aeronautical information regarding the status of facilities and equipment of the NAS. This strategic plan is designed to prevent demand on the NAS from exceeding its capacity. For example, a severe weather condition at any one of the nation's major airports can drastically change that airport's capacity, as well as the procedures used by pilots and air traffic controllers. Since no two weather phenomena are alike, each day a unique strategy is developed for minimizing delays.

When it is determined that a projected constraint exists in the NAS and that demand exceeds capacity, the action plan developed utilizes one or a combination of several traffic management procedures. This may result, for example, in an aircraft being issued an Expected Departure Clearance Time (EDCT) or being given an alternate route assignment. If demand exceeds the projected capacity of an airport, the TMS may assign EDCTs based on scheduling information and availability of arrival slots, or capacity, at the destination airport. Demand, therefore, is affected in varying degrees and the number of aircraft arriving at the destination is controlled. However, since restricting conditions are often subject to rapid change, many aircraft are

released unrestricted to ensure availability at the destination relative to projected and actual capacity at the time of arrival. Although the majority of delays are taken on the ground, flights often proceed unrestricted, or incur limited airborne holding.

TMSs also coordinate with other air traffic facilities to develop alternate routes around severe weather in the enroute environment. Such routes reduce the distance aircraft fly to circumnavigate severe weather and standardize the flow of traffic, reducing controller workload. The purpose of these and other traffic management procedures is to minimize the time aircraft spend flying in holding patterns or around areas of severe weather, and to manage controller workload.

At a number of the nation's largest airports served by carriers with relatively constant schedules, automated pre-departure clearances (PDCs) are being formulated and disseminated to the airlines. The PDC process is designed to build into the system a constant that can alleviate a measure of the workload on controllers who formulate and issue clearances to IFR aircraft. These clearances are already in the computers, and form the baseline against which the rest of the day's activity is compared and scheduled.

At the same time, airline dispatch offices, military BASOPS, commercial vendors, and AFSSs/FSSs are gathering weather data and maps from the National Weather Service (NWS) and other sources to prepare forecasts and weather briefings for pilots. In the AFSSs/FSSs, preflight briefers are gathering the data they use to inform pilots of the meteorological, aeronautical and traffic management information needed to make their trips. Preflight briefers get information from a broad range of sources including the NWS; DOD; pilots reporting on weather and turbulence experienced in flight; airport management, who provide details of specific activities at the airport that may have an effect on operations; fixed base operators, who report conditions at smaller airports that do not have any on-site weather services; other positions at the AFSS/FSS (EFAS, Inflight, Weather Observer, Flight Data); the ATCSCC, whose specialists send advisories concerning traffic management programs and procedures; and aeronautical data from FAA NOTAM documents; and the NAS computers. Preflight specialists receive a complete pre-duty briefing. This data collection and analysis is updated continuously; a round-the-clock activity.

There are several automated systems that are part of the preflight process, some of which are unique to particular facilities, and others that are common. In the IFR ATC environment, weather data from NWS and other sources is routed to the FAA through the National Airspace Data Interchange Network (NADIN I/II). NADIN I/II is the central data switch through which all information bound for the FAA passes for dissemination to the proper facility. NADIN I is the switching interface that has been in use for several years to route information to/from the Weather Message Switching Center/Replacement (WMSC/R) and Host computers. This switching system also communicates with other users of weather products outside of the FAA. NADIN II is an upgraded switching system that achieves increased throughput capacity, automatic alternate route switching control, and service availability through the use of advanced packet switching technology and a highly connected network architecture. The NADIN II Packet Switched Network (PSN) consists of two control centers, 26 regional packet switching nodes, and many more strategically-placed message concentrators that code and decode information into and from packets. There are over 2,000 users (airlines, DUATS, private compa-

nies, military, etc.) connected to the WMSC/R through NADIN I/II. Many users do not have the advanced equipment that is required to communicate with the WMSC/R through NADIN II; therefore, they are still connected through NADIN I. NADIN I/II interfaces with the Host Computers and the Central Weather Service Units (CWSU) in the ARTCCs, and with the Flight Service Data Processing Systems (FSDPS) (located at each ARTCC), the main processing systems that combine aeronautical and meteorological data as part of the Flight Service Automation System (FSAS). Through the NADIN I/II switches, the FSDPSs connect the 61 Automated Flight Service Stations. This system is the principal interface for AFSS-generated flight plans prior to entry into the Host computers. The FSAS includes two Aviation Weather Processors (AWP)--central computers that collect weather data from a variety of sources--and is served by the WMSC/R, which disseminates the weather information to the AFSSs. FSSs, those that are not fully automated, utilize Leased Service A&B (LABS) computers that connect with the WMSC/R through NADIN I.

When a pilot requests a preflight briefing from the AFSS/FSS, the briefer provides the appropriate briefing (as detailed in Section II-A above). Based on that information, a pilot makes a go or no-go decision, a VFR or IFR decision, and a file or not-file decision. If the pilot decides to file, the flight service station specialist enters the data into the system. The specialist reviews the flight plan for accuracy and forwards it to the appropriate destination: the Host Computer in the ARTCC if the flight plan is IFR, or the inflight position if the flight plan is VFR. In an AFSS, this distribution is accomplished automatically through the Model 1 Full Capacity (M1FC) system. At an FSS, the addressing of the flight plan is accomplished manually and the data is entered into the LABS computer for transmission. The briefer also informs the pilot of any traffic management procedures in effect for either the departure or the destination airport.

International flights have additional preflight activities that are dependent upon which oceanic ARTCC will control the flight. Pilots crossing the Atlantic will review and select the fixed route available for the time period they plan to fly. Daily route information is provided to airline operations, flight planning services and flight service stations by ATCSCC advisory messages. Those aircraft not traveling along fixed oceanic routes will develop minimum time track routing to their destination. Final oceanic routings will be taken care of in the enroute phase of flight. Pacific flight routings and pre-planning are managed through the Track Generation and Track Advisory portions of the Dynamic Ocean Track System (DOTS). Daily DOTS generated flexible and fixed oceanic route information is transmitted to aircraft operators by the controlling ARTCC. Electronic non-verbal communication is used to coordinate priority route selections of each aircraft based on proposed departure time with the ARTCC responsible for Pacific operations. The ARTCC subsequently advises each operator of the most likely route that it can expect for each flight. International flight plans are more detailed and require coding in the International Civil Aviation Organization (ICAO) format. These flight plans should be filed several hours in advance to insure proper processing into the system. International weather briefings also require prior notice to the AFSS/FSS so that the necessary documentation can be obtained and consolidated for the pilot. Documentation and briefing requirements for International flights are outlined in the applicable FARs.

B. THE CLEARANCE PROCESS

The clearance process as it relates to air traffic control is the focal point for systems operations. The surface movement and airborne phases of the ATC system would never occur without the formulation, issuance, and receipt of clearances. The formulation of data usually originates in the AFSSs/FSSs, and with the help of flight service specialists and several automated systems the clearance process begins to unfold. Flight plans are also filed through airline Operations offices, military Base Operations offices, and through DUATS or other contract flight planning service companies.

The primary data relay for clearance information is the National Airspace Data Interchange Network (NADIN I/II). The primary NADIN I/II sites are located in Atlanta, Georgia, and Salt Lake City, Utah, with connection nodes located at each ARTCC. NADIN II interfaces with the Model 1 Full Capacity version of the FSDPS, the principal interface system for AFSS-generated flight plans. LABS systems located at the FSSs connect through NADIN I. All flight plan information concerning air traffic clearances is routed through NADIN I/II, which in turn assesses the data and transmits the information to the appropriate address via direct interface with the Host Computers in the ARTCCs.

The ARTCC Host Computers are directly interfaced with Interfacility Flow Control Network (IFCN) computers located at the FAAs Volpe National Transportation System Center (TSC) in Cambridge Massachusetts. The IFCN computers, used by the ATCSCC and other traffic management units, receive flight plan data from the Host Computers and update a database of scheduled flights. If traffic management procedures are in effect for the destination airport, a controlled departure time is assigned to each flight plan via this interface.

Thirty minutes prior to the proposed departure time, the Host Computers generate a flight progress strip and send it to the ATC facility responsible for issuing the clearance. This includes air traffic control towers, and appropriate sectors when the departure airport falls under the jurisdiction of an enroute controller. The actual process of issuing the clearance can begin when flight data formulation and processing is completed.

Terminal Clearance Process

The majority of clearances issued to aircraft in the terminal environment originate from the Clearance Delivery position (CD). The process begins with the receipt of a computer-generated flight progress strip processed by the Host Computer in the ARTCC. The flight progress strip contains clearance items pertinent to that aircraft, including aircraft identification, clearance limit, departure procedure or standard instrument departure (SID), route of flight, altitude, transponder code, frequency information, and any other special information deemed necessary. The strip is routed to the Flight Data Input/Output (FDIO) located at the CD position. Strips received by the CD position are for aircraft that will operate under Instrument Flight Rules (IFR). Upon request for a clearance by a pilot, the CD position issues the clearance, and routes the flight progress strip to the appropriate ATC position that will handle the first movement of the aircraft.

Additional clearances issued by the CD position include Tower Enroute Control Service (TECS), Special VFR (SVFR), and VFR-on-top. The tower enroute clearance is utilized to control IFR enroute traffic that will operate entirely within delegated airspace between two or more adjacent approach control facilities. The advantage of the TECS is to expedite traffic and reduce control and pilot communications requirements in a high density area. The TECS data is transmitted via the Host Computer to the FDIO and is processed in the same manner as IFR clearances. SVFR and VFR-on-top clearances are occasionally requested by pilots on the ground. The CD position obtains clearance from the tower cab Flight Data (FD) position or formulates the clearance based on the pilot's request. Once issued, the CD ensures that the flight plan data for SVFR, and VFR-on-top clearances are received and recorded accurately for processing by the tower cab flight data position.

Very often the radio channels used for clearance delivery become extremely congested. This is attributed to a number of factors. One factor is that the clustering of departures at certain times of the day causes a large number of clearances to be given in a relatively short period of time. Another is the random, sometimes uncontrolled nature of communications on the CD frequency. This is due mainly to the fact that pilots are initiating requests at a high rate and are competing with each other for air time. On most other ATC frequencies, communications are usually initiated by the controller, resulting in better frequency utilization.

These factors, and the continued growth in air traffic, were the basis for the development and implementation of the PDC system. Clearances, based upon departure times and runway slot availability, are queued into an ATC database, and are accessed on request by pilots via an on-board communications system or an automated terminal in an operations office. Clearances are delivered automatically, without controller intervention. The Clearance Delivery controller still issues clearances verbally to aircraft not equipped with digital communications equipment, and tracks and monitors the flow of information to all aircraft preparing to enter the system. The number of facilities equipped with PDC has expanded to include most of the nation's busiest airports, producing more efficient operations. The PDC process virtually eliminates the need for verbal communications with participating aircraft and reduces the amount of frequency congestion, especially during peak traffic periods.

The Clearance Delivery position located in the TRACON is responsible for issuing IFR clearances and obtaining approval for the release of IFR aircraft at satellite airports--airports located within terminal control airspace, but without a tower or only a VFR tower. The CD controller issues clearances from flight plan information processed by the FDIO, and delivers departure strips to the appropriate radar sector.

Additional clearances generated at the TRACON are initiated by the radar controller. There are numerous types of clearance requests made by aircraft while airborne. These include aircraft with an IFR flight plan originating from a satellite airport, departing VFR and requesting a clearance in the air. Occasionally a VFR aircraft makes radio contact with the radar controller requesting an IFR airfile. VFR, VFR-on-top, and Special VFR clearances are just a few of the requests a radar controller may receive while on position. The techniques may vary but the process for issuing a clearance is the same. The radar controller first establishes radio communications. Then radar identification, or position verification with non-radar aircraft, is attempted. Once this is accomplished, a clearance is issued based on data the controller re-

ceives from the pilot. The controller ensures that the flight plan data is properly received, recorded, and processed. When radio communication cannot be established between the controlling facility and the pilot, a void-time clearance may be relayed through the appropriate AFSS/FSS either via telephone or radio.

International flights across the Pacific receive their clearance to and through oceanic airspace at the departure airport. Atlantic traffic will receive their oceanic clearance during the airborne phase, just prior the entering oceanic airspace.

Enroute Clearance Process

Enroute clearances are issued from two positions, the Radar Associate (RA), and the Radar (R) Position. Enroute flight plan data is processed by the host computer and transmitted to the Flight Data Input/Output (FDIO), which generates flight progress strips at the appropriate sector. These strips are reviewed by the RA for possible conflicts, and used for coordination purposes with other ATC sectors and facilities. Strips generated for departures directly into enroute airspace are used by the RA to issue clearances in the enroute environment. If a pilot is unable to contact the controller from the aircraft, he or she initiates a phone call or radio contact with the appropriate AFSS/FSS requesting an IFR clearance to the destination. The flight service specialist contacts the ARTCC RA controller via voice switching system. When the AFSS/FSS specialist reaches the appropriate sector, the RA controller issues the clearance using the standard format including a clearance void time. This prevents the airport and the surrounding airspace from being unusable for extended periods of time because of expected departures. The clearance is then relayed verbatim by the AFSS/FSS specialist to the pilot, verifying accurate readback.

Additionally, the RA is responsible for issuing clearances to VFR towers. The process is similar to the one described above, except that the VFR tower initiates the call to the RA position. Once the clearance is issued by the RA position, no other instructions are given unless the RA determines that a possible traffic conflict exists. In this instance a hold-for-release time is issued in conjunction with the clearance. When all traffic conflicts are resolved, the RA contacts the VFR tower and cancels the hold. The RA controller coordinates all clearances of this nature with the radar controller.

The remaining clearances in the enroute environment are issued to airborne aircraft. These duties are designated to the Radar (R) controller. VFR, IFR/airfiles, and VFR-on-top are issued in the same manner as by the terminal radar position. First, radio communication is established. Then an attempt to identify or verify position of non-radar aircraft is executed prior to the issuance of the clearance. The R controller ensures that the flight plan data is received and recorded. Once this is accomplished the R controller forwards the data to the RA controller for processing. After the clearances are issued and verification of receipt is accomplished, the process of movement control begins.

C. SURFACE MOVEMENT (DEPARTURE PHASE)

Controlling the movement of aircraft traffic on the ground is a highly complex task that depends on coordination of numerous inputs and decisions, and prompt communication among all

the various participants. Air traffic controllers make decisions based on information provided to them from three basic sources: data generated by computers and radars; information received on the radio, the telephone, and from others in the tower; and the airport environment seen visually from the windows of the ATC Tower.

The responsibility for controlling departing traffic on the ground lies primarily in the hands of two controllers or teams of controllers—ground and local controllers. Each has different responsibilities and actions to take, but their success depends on close coordination.

Tower controllers analyze a myriad of information to determine the priority of their duties. The information comes from a variety of sources. Visual or verbal input comes from observing the movement area and coordinating activities with other tower cab positions, the Terminal Traffic Management Unit (TTMU), and from the Area Supervisor (AS). Voice communications input comes from pilots in aircraft awaiting instructions, other positions in the tower, airline dispatchers, ground service personnel, and a variety of other sources including flight service stations.

Tower controllers receive data from several automated systems, including both traffic observing and weather systems. For tracking aircraft movement, controllers at busier airports have access to an automated tower display (DBRITE) system connected to the primary terminal computer system, the Airport Radar Terminal System (ARTS). The ARTS computer processes radar data received by the Airport Surveillance Radar (ASR- 7, 8, and 9) and secondary surveillance beacon systems that communicate with aircraft transponders, and displays them as targets with alphanumeric identification tags on the tower displays. Many airports also have Airport Surface Detection Equipment (ASDE) radars, which survey and display movement about the airport surface. In addition, tower controllers receive data from the NAS Host computers in the form of flight progress strips, which detail all the pertinent information about each IFR flight.

Tower personnel have weather data at their disposal from several sources, including the airport surveillance radars, which process and display weather phenomena directly on the DBRITE display, the Automated Weather Display System (AWDS), and the Low Level Wind Shear Alert System (LLWAS). In addition, the Runway Visual Range (RVR) system provides automated data regarding visibility on the runways.

Field status information is provided by several systems that display information to the tower, including field and approach lighting panels that indicate the status of the lighting systems on the surface, coordination lights that assist in the movement of traffic, and a NAVAIDS panel that displays the status of the various navigation systems in the area.

Using this data, controllers project and plan traffic flows about the airport surface based on traffic management considerations, pilot requests, facility procedures, weather and field conditions, and aircraft performance. They obtain, review, amend and mark the flight strips to keep the information on the strips up-to-date; ensure that the information about aircraft movement is disseminated to pilots, ground vehicle operators and other tower cab positions; issue traffic and weather information and current airport conditions; issue ground movement instructions and ensure that pilots have received current airport, weather, and departure information

(ground controller); issue takeoff clearance and transition instructions in the airport traffic area or control zone (local controller); record the information concerning aircraft movement; and forward flight data to the next facility via interphone and on the computers.

There are two other positions that contribute to the movement of aircraft about the airport, the flight data position and the gate hold position. The flight data position primarily relays flight plan and airport information to other tower positions, working closely with clearance delivery for coordination. The flight data controller analyzes information to determine the priority of duties; reviews, amends and marks flight strips as necessary; monitors and operates the NAVAID panel, Automated Terminal Information System (ATIS), and Flight Data Input/Output (FDIO); and ensures that the other tower controllers get any information that may affect operations.

The gate hold position analyzes traffic management requirements and implements gate holding procedures; records call up times (the time a pilot calls ready to push back); and maintains the sequence of departures based on the call-up times or flow control requirements. The gate hold controller is responsible for informing pilots when departure delays exceed or are expected to exceed 15 minutes. The gate hold controller delivers aircraft to the ground controller in an orderly flow to minimize congestion on the movement area. Pilots monitor the gate hold radio frequency for engine start-up advisories, changes in delay status, or new proposed start-up times.

D. AIRBORNE PHASE

The airborne phase involves three separate sets of activities, terminal, enroute and flight service operations. These areas are different both in function and in the equipment and systems used to facilitate the activities of controllers.

Terminal Operations

Control in the terminal area actually begins long before an aircraft enters terminal airspace. A flight progress strip is generated at the TRACON by the Host Computer, and a data block appears on a radar screen at the appropriate radar position. The radar positions design and configuration are flexible, and can be set up in various ways, depending on how a position is to be used, and whether it is for departure, arrival, or satellite operations. Departure positions primarily deliver departing aircraft from one or more airports to adjacent air traffic control facilities or out of terminal airspace. Arrival positions primarily sequence aircraft delivered from adjacent sectors or VFR pop-up aircraft to the destination airport. Satellite positions normally provide arrival and departure service for secondary or military airports within the terminal area. Generally, these aircraft are incorporated into the primary airport flow of traffic.

Each radar position is assigned a defined segment of airspace, with appropriate maps on the display for the position. The level of service and separation applied to individual aircraft is dependent on a number of factors, including pilot requests, flight plan and aircraft types, and weather.

Controllers manage flight progress strips, scanning the strips, analyzing the information, transferring strips when necessary, making necessary progress markings on the flight strips, and filing them in a bay for easy access. The controller(s) correlates the flight progress strip information with radar display information.

Controllers analyze traffic factors such as volume, aircraft type and performance, pilot requests, weather, equipment status and Traffic Management considerations, and develop an action plan to manage the traffic under control at that position. Part of the responsibility for the activity is to continuously evaluate the effectiveness of the action plan and make corrections if necessary.

Controllers receive input from various sources, voice and data communications, and automated messages and weather from the computers. Contact with the aircraft is established when the pilot reports his/her position to the controller. In addition to the pilot request, the controller is receiving information inputs to help make decisions. Again, there are voice and automated data inputs. The voice inputs include PIREPS by radio from other aircraft; coordination from the towers, other TRACON positions, and adjacent ATC facilities; the TTMU; and the AS. Voice communications are controlled and routed by the Interfacility Communication Switching System (ICSS), in the same manner as communications to the tower.

Data inputs include both aeronautical data and weather. The controllers radar display shows aircraft data blocks based on data received by ASR equipment, beacon information received from aircraft transponders, and information entered by the controller. The data is processed by the terminal computers (ARTS). Terminal radar controllers also receive data/weather inputs from the Runway Visual Range (RVR), Aviation Weather Display System (AWDS), Terminal Doppler Weather Radar (TDWR), Aircraft Surface Display Equipment (ASDE), and the Low Level Wind Advisory System (LLWAS).

Enroute Operations

Air traffic control in the enroute area is performed in a similar fashion to the terminal area. Each sector in the ARTCC is a distinct segment of airspace, within which a radar controller's primary responsibility is to maintain separation. Depending on the projected traffic volume through a sector, the radar controller may receive assistance from additional personnel assigned to the sector. In addition to the radar position, there may be a radar associate controller and a radar coordinator. It should be noted, however, that the functions of the positions are interchangeable and do not always imply separate positions. As the volume of traffic increases, the team of controllers at a sector gets larger, to relieve the radar controller of tasks that may distract attention from the display.

As an aircraft enters a sector, the pilot makes contact with the radar controller monitoring and controlling the sector. In advance of a flight entering the sector, the radar controller receives a flight progress strip, and the information on the strip is correlated with that presented on the display. As aircraft make their way through a sector, the controller passes necessary information to the pilots and monitors their progress.

The radar controller receives input from various sources in order to plan and accomplish the task of separating aircraft. The inputs come in the form of voice and automated data. The voice data includes radio transmissions of pilot requests for information or advisories, PIREPS on events encountered in the air such as weather or turbulence, significant meteorological events (SIGMETS), and coordination from other radar and non-radar positions in the ARTCC and from adjacent ATC facilities. In addition, the controller receives advisories and instructions from the Traffic Management Unit in the Center.

The automated input to the controller includes the information presented on a digital radar screen known as a plan view display, or PVD. The PVD presents information to the controller about the sector being controlled. The PVD displays a map of the sector, including any necessary notations that affect the movement of traffic, such as airways and airway intersections, areas of restricted airspace, etc. The screen shows a data block for each aircraft operating within the sector, including a notation of altitude, airspeed, aircraft identification, and a discrete four-digit identification number assigned to the flight by air traffic control. The information presented on the PVD is processed by the ATC Host computer, based on inputs from the Traffic Management computers, the daily airline schedules, aircraft beacon transponders, the Air Route Surveillance Radars (ARSR), and military operations units. In addition, the PVD displays the status of all flights in the sector in table form.

The enroute sector controllers track the progress of aircraft on flight progress strips, similar to those used in the terminal area. The flight progress strips are generated in advance of a flight's entry into a sector, and are amended as necessary as aircraft make their way across the sector.

Weather data is another form of automated input received by the Center. Each ARTCCs equipment includes a Center Weather Service Unit (CWSU) operated by National Weather Service meteorologists. These personnel receive up-to-date weather reports from the NWS, satellite weather observations, and reports from other weather observing sources, and present information to controllers about changing weather conditions that may affect operations. The CWSU meteorologists constantly revise their forecasts to present the clearest possible picture of current and short-term forecast weather events. This is a critical function in the center, as the movement of a weather front through an area can affect vast numbers of operations.

The sector controller or controllers receive input from the Area Supervisor in Charge, who coordinates the activities of the controllers, the meteorologists, the Traffic Management Unit, and other ATC facilities, and presents needed information to controllers.

The Radar Associate (RA) also provides input to the radar controller, maintaining watch over the operations by tracking the progress of aircraft through the flight progress strips. The person in this position reviews the flight strips for possible conflicts, and advises the radar controller that an action needs to be taken. In addition, the RA controller receives and reviews information relating to departures that transition into enroute airspace directly from airports not located within terminal airspace. This information is received from Flight Service, and is recorded and entered into the system so that the aircraft may be tracked by the Host Computer and the radar controllers. The RA ensures that all flight strips are accurate and in the proper place, so that the radar controller's information is available when necessary.

The radar controller uses all this information to analyze the evolving traffic situation in the sector and issue control instructions, safety alerts, traffic and weather advisories and information to pilots. In addition, the R controller updates the Host Computer and the Enhanced Direct Access Radar Channel (EDARC) backup system, based on actions taken at the sector. This position is also responsible for coordinating with other positions in the Center and in adjacent facilities, and advising the area supervisor of pertinent information affecting the sector or adjacent sectors or facilities.

Finally, the radar controller is responsible to initiate the handoff of aircraft from one sector to another. This is done both manually and through the computers. From an operational standpoint, the boundaries between ARTCCs are no different from those between sectors. The transition is handled in a similar fashion, with handoffs accomplished the same way.

International flights across the Atlantic are issued their oceanic clearance to their destination by the R controller in the last domestic ARTCC prior to entering oceanic airspace. Oceanic controllers utilize flight progress strips to maintain a mental picture of traffic. Some Atlantic and Pacific area controllers use graphic depictions of aircraft position on the Oceanic Display and Planning System (ODAPS) displays. All altitude and route changes are relayed via a third party, Aeronautical Radio Incorporated (ARINC) on high frequency (HF) long range radios.

Flight Service Operations

Aircraft flying under Visual Flight Rules may operate without the separation services of air traffic control. The Flight Service System is in place to provide in-flight services to pilots operating VFR - not under the control of ATC. This involves serveral functions within the AFSS/FSS.

The inflight function delivers information and/or services to airborne aircraft as requested or as required when adverse weather conditions exist; relays air traffic control clearances to airborne VFR aircraft and to aircraft on the ground departing from non-controlled airports; maintains an awareness of the operational status of navigation aids in the station's flight plan area and reports abnormalities or outages to pilots when they occur; solicits pilot reports from aircraft operating in the area and passes the information on to other pilots and to ATC; performs unscheduled significant weather broadcasts; and provides emergency services on a priority basis, when necessary.

The inflight position receives input from pilots, airport management, ARTCCs and air traffic control towers, adjacent facilities, and specialists on other positions in the FSS. These include preflight, flight data, broadcast, flight watch, and NOTAM positions.

Requests for information from an inflight specialist are received via two-way radio communications. The request may vary from information regarding a single location, such as a NAVAID or an airport, to an entire weather update. Inflight weather briefings contain weather advisory information pertaining to an area within 150 miles of the requesting aircraft.

Requests are handled on a first-come, first-served basis, with the exception of emergencies and search and rescue missions. Pilot reports may be solicited when conditions require, or when

current conditions are not as forecast. Local airport advisory services may be provided for non-towered airports and airports with part-time towers.

Detailed real-time weather briefings are provided to enroute aircraft by the AFSS Flight Watch (FW) position. The person at this position is responsible for obtaining a complete briefing prior to coming on line at the position, becoming familiar with the most current information from the National Weather Service and meteorological charts, all current NOTAMS, and active pilot reports. In addition, the flight watch specialist may obtain a briefing from the Center Weather Service Unit at the area ARTCC. During the course of the shift, the FW specialist is constantly updating weather information through hourly weather reports and PIREPS obtained from aircraft contacted. FW is primarily concerned with enroute weather. The kind of information FW provides includes current and forecast weather for intended and alternate airports of landing, and route and destination changes to avoid areas of weather that constitute a threat to safe operations.

The air traffic control system also provides emergency assistance to VFR operators when the need arises. Pilots occasionally lose track of where they are, and a system is in place to help them locate their position and complete their flight. Using Direction Finder (DF) receivers on the ground (where available), VORs, Radio Beacons, and the airborne radio communications system, AFSS/FSS air traffic controllers can identify an aircraft's position even when it is out of radar coverage. The AFSS/FSS controller then assists the pilot in establishing his/her position and provides guidance to the desired destination. Position fixing of a lost aircraft may involve the use of more than one NAVAID to provide a cross-fix, or the use of time and distance procedures from a single NAVAID.

When an aircraft is overdue at its destination according to its filed flight plan, or when one is reported missing, the Flight Service system initiates a process to determine if the flight was completed or if the aircraft is in trouble. Search and rescue activities are initiated if attempts to locate the aircraft are unable to determine that the flight was completed safely. The Search and Rescue (SAR) process involves contact with all airports along the filed route of flight where the aircraft may have landed, as well as all ATC facilities along the route that may have had radio communication with the aircraft. The search may expand to involve pilots from the Civil Air Patrol (CAP) to conduct an air search for the aircraft. Information from the Flight Plan is utilized to contact anyone who may have knowledge of the aircraft's present location. SAR is utilized to locate a missing aircraft, not a missing person. Once the aircraft is located, SAR is cancelled, regardless of whether the pilot is found.

All aircraft are required to carry an Emergency Locator Transmitter (ELT), which activates in a crash landing and transmits a steady signal on assigned emergency frequencies. Frequencies used by ELTs are monitored by AFSS/FSS specialists. When an emergency signal is heard outside of the designated ELT signal testing period designated by the FAA, ELT search procedures are initiated. This search may involve ATC personnel, Airway Facilities maintenance personnel, FBOs, airborne aircraft in the area of the signal, and CAP search aircraft.

ATC CONTROLLER POSITIONS: FUNCTIONAL DESCRIPTIONS

NOTE: *Level Four offers a description of each air traffic control function, including Flight Service and Traffic Management functions. It describes positions, their inputs, process, and their outputs, and the systems used by the personnel who operate the position during that particular decade.*

TERMINAL FACILITIES

TOWER

Area Supervisor (AS)

The tower cab AS is responsible for overall tower cab operation. This includes management and direction of tower cab personnel, and observing, scanning and projecting the needs of the constantly changing airport operation.

INPUTS:
- Visual observation of tower cab operations
- Flight progress strips
- Status information area
- Coordination from tower cab positions
- Systems displays (see below)
- TRACON Area Supervisor (AS)
- Area Manager (AM)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/ weather conditions, staffing and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination to pilots information concerning vehicle conditions that may affect operations
- Coordinate with tower cab positions, TTMU, TRACON AS and AM
- Ensure tower cab operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine tower cab positions
- Initiate action as input changes

SYSTEMS:
- ICSS, DBRITE, RVR, ARTS, Information Display System (IDS), NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour ZULU (Z-time, or Greenwich Mean Time) clock, ASDE, AWDS, crash phone system

TOWER

Cab Coordinator (CC)

The CC is primarily responsible for observing and scanning the active runways and airport traffic area/control zone to assist the LC. CC will coordinate for the LC and ensure procedures and flows are adhered to in the rapidly changing airport environment.

INPUTS:
- Receive requests for air traffic movement
- Visual observation of runways, taxiways, traffic pattern and airport traffic area/ control zone
- Flight progress strips
- Status information area
- Coordination from other tower cab and TRACON positions
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Observe local control (LC) operations and coordinate for the LC
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, separation standards, pilot requests, facility procedures, field/weather conditions and aircraft performance.
- Review flight progress strips
- Ensure dissemination of information to pilots, vehicle operators, other cab positions, and the supervisor, of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Coordinate for the LC with other tower cab and TRACON positions
- Scan airport operations and assist LC with duties
- Report airport conditions
- Forward flight progress strips
- Initiate action as input changes

SYSTEMS:
- ICSS, DBRITE, light guns, RVR, ARTS, IDS, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour Z-time clock, ASDE, AWDS, crash phone system

TOWER

Local Control (LC)

The LC is primarily responsible for handling arriving and departing traffic at the airport. The area of responsibility includes the active runways and airport traffic area/control zone. It is a rapidly changing environment requiring constant evaluation of input and modification to existing plans. The LC position interfaces mainly with Ground Control (GC) and TRACON positions.

INPUTS:
- Receive request for air traffic movement
- Visual Observation of Runways, taxiways, traffic pattern and airport traffic area/ control zone
- Radios
- Flight progress strips
- Status information area
- Coordination from other tower cab and TRACON positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan ATC service based upon traffic flows, traffic management, separation standards, pilot requests, facility procedures, field and weather conditions, and aircraft performance
- Obtain, review, amend and mark flight progress strips
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and AS of conditions that may affect operations.
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Issue arrival, departure, airport traffic area/control zone transition instructions
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab and TRACON positions
- Forward flight progress strips
- Disseminate to pilots, vehicle operators, other tower cab positions and AS information that may affect airport operations
- Record arrival/departure transition information
- Initiate action as input changes

SYSTEMS:
- ICSS, radios, DBRITE, light guns, RVR, ARTS, IDS, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour Z-time clock, ASDE, AWDS, crash phone system, DASI, Wind instruments

TOWER

Ground Control (GC)

The GC is primarily responsible for directing aircraft to and from the runway. Additional duties include directing other aircraft/vehicular movement on the airport movement area and disseminating information to support operations (e.g. traffic, weather, equipment status, delays/ flow etc,). It is a dynamic environment in which the GC must adjust traffic flows and evaluate new information.

INPUTS:
- Receive request for ground movement
- Visual observation of movement area
- Radios
- Flight progress strip
- Status information area
- Coordination from other tower cab positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, pilot requests, facility procedures, field/weather conditions and aircraft performance
- Obtain, review, amend and mark flight progress strips
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and the AS of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Issue ground movement instructions
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab positions
- Forward flight progress strips
- Issue/ensure pilot has received current airport, weather and departure information
- Record ground movement and other significant information
- Initiate action as input changes

SYSTEMS:
- ICSS, radios, DBRITE, light guns, RVR, ARTS, IDS, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour Z-time clock, ASDE, AWDS, crash phone system

TOWER

GATE HOLD (GH)

The GH position is intended to inform pilots when departure delays exceed or are anticipated to exceed 15 minutes. GH delivers aircraft to the ground controller in an orderly flow to minimize congestion on the movement area. Pilots monitor the frequency for engine start-up advisories or new proposed start times if the delay changes.

INPUTS:
- Requests for engine start time
- Visual observation of movement area
- Radios
- Flight progress strips
- Status information area
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)

PROCESS:
- Analyze gate hold (GH) and traffic management requirements and implement gate hold procedures
- Record time of initial call-up on flight progress strips
- Maintain sequence for departure using initial call-up time, unless modified by flow control restrictions

OUTPUTS:
- Issue pilot engine start times and subsequent revisions if delays change

SYSTEMS:
- ICSS, radios, 24-hour Z-time clock, ASDE, IDS

TOWER/TRACON

CLEARANCE DELIVERY (CD)

The CD position primarily issues departure clearances to pilots. The clearance is delivered to the pilot on the radio or via ARINC Communications Addressing and Reporting System (ACARS). Additionally, weather, route, delay and other significant information may be relayed to pilots.

INPUTS:
- Requests for departure clearance
- Radios
- Flight progress strips
- Status information area
- Coordination from other tower/TRACON cab positions
- ARINC Communications Addressing and Reporting System (ACARS)
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:

- Upon receipt of flight plan/VFR departure information, ensure all required clearance items are received and recorded
- Forward clearance information to Flight Data (FD) for processing
- Obtain clearance from FD or formulate a clearance (e.g., IFR, SVFR, VFR-on- top, or other VFR departure)
- Apply strip marking procedures
- Place strips in designated area
- Periodically review strips for currency

OUTPUTS:
- Issue clearance to pilots and deliver information to Ground Control (GC) or Gate Hold (GH), if applicable
- Coordinate information with other tower cab positions

SYSTEMS:
- ICSS, radios, ARTS, IDS, ACARS, AWDS, 24-hour Z-time clock

TOWER/TRACON

FLIGHT DATA (FD)

The FD position primarily relays flight plan and airport information to other tower cab positions. FD closely interfaces with Clearance Delivery (CD) as a coordinator.

INPUTS:
- Receive weather information
- Flight progress strips
- Status information area
- Flight Data Input/Output (FDIO)
- Automated Weather Information System (AWIS)
- Automated Weather Display System (AWDS)
- National Weather Service (NWS)
- Notices to Airmen (NOTAMs)
- Coordination with other tower/TRACON positions, Flight Service Station (FSS), and Air Route Traffic Control Center (ARTCC)
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Review, amend and mark flight progress strips
- Ensure dissemination of information that may affect operations to other positions
- Monitor and operate NAVAID panel, Automated Terminal Information System (ATIS), and FDIO

OUTPUT:
- Disseminate flight plan information, flight progress strip amendments, weather and traffic management information, and airport conditions
- Update status information area
- Record ATIS

SYSTEMS:
- ICSS, FDIO, AWIS, ATIS, ARTS, IDS, AWDS, 24-hour Z-time clock

TRACON

AREA MANAGER (AM)

The Area Manager has the responsibility for the entire facility's shift operation. By projecting, planning, coordinating and strategizing with shift supervisors, the Area Manager facilitates the use of available resources to meet the demands of air traffic.

INPUTS:
- TRACON Area Supervisor
- Tower Area Supervisor
- Automation Specialist
- Terminal Traffic Management Unit (TTMU))
- Enroute Area Manager
- Airport operators
- Facility Staff officers
- Airway Facility technicians
- National Weather Service
- Flight Service Stations

PROCESS:
- Administrate shift operations
- Project and plan shift staffing, runway openings and closures, equipment outages

OUTPUTS:
- Ensure information dissemination to TRACON/Tower Area Supervisors
- Ensure adequate supervisory staffing
- Coordinate with enroute AM and TMS on airport conditions with NAS impact.
- Record facility operations per FAA Order 7210.3J
- Document equipment outages/restorations

Systems:
- ARTS, ICSS, LLWAS, IDS, Aircraft Situation Display (ASD), RVR, Digital Altimeter Setting Indicator (DASI), ASR, ILS, FDIO, Center ARTS Radar Processing (CENRAP).

TRACON

AREA SUPERVISOR (AS)

The TRACON AS is responsible for overall TRACON operations. Through planning, monitoring and evaluating operations, the AS will use available resources to accommodate traffic demands. It is a constantly changing environment where anticipating and communicating needs are as important as current operations.

INPUTS:
- TRACON operations
- Flight progress strips
- Status information area
- Coordination from the TRACON positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)
- Area Manager (AM)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/ weather conditions, staffing, and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination of information concerning conditions that may affect operations to TRACON positions, TTMU, tower cab AS and AM
- Coordinate with TRACON positions, tower cab AS, TTMU and AM
- Ensure TRACON operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine TRACON positions
- Initiate action as input changes

SYSTEMS:
- ICSS, ARTS, LLWAS, 24-hour Z-time clock, AWDS, crash phone system, IDS, Aircraft Situational Display (ASD), Meteorologist Weather Processor (MWP) or Remote Radar Weather Display System (RRWDS)

TRACON

RADAR POSITION (R)

The Radar Control position is designed according to the desired function--arrival, departure, and satellite. The controller responsible for each sector has defined airspace and can use a variety of techniques to accomplish the assigned tasks (e.g., vectoring, speed control. sequencing, altitude, lateral, diverging, and visual separation). The level of service and separation applied to the individual aircraft is dependent upon numerous factors including the pilot's request, type of flight plan, type of aircraft, and weather.

Aircraft are generally routed via published or facility-established routes. When established routes are unavailable or unusable, aircraft are directed into current traffic flows to avoid conflicts, adverse weather, obstructions and terrain. Occasionally due to unusual circumstances aircraft may be issued holding instructions. The TRACON environment is rapidly changing as input changes (e.g., aircraft, weather, pilot requests, flow control). The Radar Controller must continually evaluate current operations, conditions, and the effectiveness of the action plan. As new input is received, the controller must be flexible, and rapidly incorporate the information into the action plan.

The arrival position(s) primarily sequences aircraft delivered from adjacent sectors or VFR "pop-up" aircraft to the destination airport. Service may be provided to more than one runway at one or more airports.

The departure position(s) primarily delivers departing aircraft from one or more airports to adjacent ATC facilities or out of controlled airspace, in accordance with established procedures.

The satellite position(s) normally provides arrival and departure service for secondary or military airports. Generally these aircraft are incorporated into the primary airport flow of traffic.

INPUTS:

- Pilot requests
- Pilot reports (PIREPS)
- Radar display
- Manual and automated handoffs
- Radios
- Flight progress strips
- Status information area
- Coordination from tower cab, other TRACON positions and adjacent ATC facilities
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:

- Prepare and monitor Radar position equipment for settings and optimum performance
- Correlate flight progress strips and Radar display information
- Manage flight progress strips: scan, analyze, transfer and file
- Mark flight progress strips as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft types and performance characteristics, requests) and evaluate additional factors (e.g.,weather, equipment status, flow control) and develop an action plan
- Continuously evaluate the effectiveness of the plan and adjust as necessary

OUTPUTS:

- Issue control instructions, safety alerts, advisories and information
- Initiate control instructions and ensure separation
- Initiate manual and automated handoffs
- Disseminate weather information
- Make entries into ARTS computer system
- Coordinate with tower cab, other TRACON positions and adjacent ATC facilities

SYSTEMS:

- ICSS, RVR, ARTS, LLWAS, 24-hour Z-time clock, AWDS, IDS
- DEDS, FDAD, FMAD, RADS

TRACON

RADAR ASSOCIATE (HANDOFF) POSITION (RA)

The position of Radar Associate (RA), also referred to as the handoff or radar data position, is designed to assist the Radar controller in performing sector functions including ensuring aircraft separation, initiating control instructions, and providing the highest level of service to the user. Most sector tasks can be accomplished by the RA, thereby allowing the Radar controller to focus on the efficient flow and separation of aircraft.

INPUTS:
- Radar display
- Manual and automated handoffs
- Radios
- Flight progress strips
- Status information area
- Coordination from tower cab, other TRACON positions and adjacent ATC facilities
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor

PROCESS:
- Correlate flight progress strips and Radar display information
- Scan, analyze, transfer and file flight progress strips
- Mark flight progress strips as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type and performance characteristics, requests) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the R controller's action plan

OUTPUTS:
- Ensure separation of aircraft
- Ensure adherence to procedures and flow restrictions
- Assist R controller in implementing action plan
- Initiate manual and automated handoffs
- Make entries into ARTS computer system
- Coordinate with tower cab, other TRACON positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- ICSS, RVR, ARTS, LLWAS, 24-hour clock, AWDS, IDS

TRACON

ASSISTANT MANAGER FOR AUTOMATION (AMA)

The Terminal AMA is responsible for the software maintenance program while working for the FAA Technical Center (FAATC) System Support Facility (SSF). The AMA works closely with the facility Automation Specialist (AUS), AS, AM, and adjacent facilities. The AMA provides briefings to facility management on the current status, problems, and planned changes to the automation system.

INPUTS:
- Area Managers (AM)
- Area Supervisors (AS)
- Automation Specialists (AUS)
- Facility staff specialist
- Air Traffic Control Specialists (ATCS)
- Technicians
- Agency directives
- FAA Technical Center (FAATC)
- Flight progress strips

PROCESS:
- Project and plan system modifications
- Analyze effectiveness of plan
- Determine priorities
- Ensure compliance with national and regional policies

OUTPUTS:
- Make adjustments for changes (NCPs, local modifications, etc.)
- Ensure adequate system operation for users and adjacent facilities
- Coordinate operational changes that impact automation

SYSTEMS:
- ARTS, AWDS, IDS, Critical Data Recording (CDR)

TRACON

AUTOMATION SPECIALIST (AUS)

The terminal AUS has limited responsibility for software maintenance. The ANS assists the AMA and FAATC in the identification of site-specific software problems, collection of support data, submission of the problem description and data to the FAATC for resolution, and receiving new software versions from the FAATC.

INPUTS:
- Assistant Manager for Automation (AMA)
- Area Managers (AM)
- Area Supervisors (AS)
- Facility staff specialist
- Air Traffic Control Specialists (ATCS)
- Technicians
- Agency directives
- FAA Technical Center (FAATC)
- Computer printouts and specifications
- Flight progress strips

PROCESS:
- Analyze information and determine priorities
- Project and plan computer system and system support
- Review and evaluate proposed changes and corrections to system
- Evaluate effectiveness of plan

OUTPUTS:
- Coordinate operations
- Provide briefings to facilities management
- Ensure testing of modifications based on operational need
- Initiate action as input changes
- Develop program modifications and implementation procedures
- Coordinate with FAATC approved and suggested changes
- Maintain records and statistical data on the performance of the system

SYSTEMS:
- ARTS, AWDS, IDS, Critical Data Recording (CDR)

ARTCC

AREA MANAGER (AM)

The ARTCC AM is responsible for the overall ARTCC operations. Through planning, monitoring and evaluating operations, the AM uses available resources to update and accommodate traffic demands. It is a constantly changing environment where anticipating and communicating needs are as important as current operations.

INPUTS:
- Observe ARTCC operations
- Center Weather Service Unit
- Adjacent facilities
- Air Traffic Control System Command Center (ATCSCC)
- Facility Traffic Management Unit (TMU)
- Area Supervisors
- Assistant Air Traffic Manager (AATM)
- Operational Error Detection Program (OEDP)
- Military Operations Specialist (MOS)
- Manager, NAS Operations (NOM)
- DSC, AUS

PROCESS:
- Analyze information to determine priority of duties
- Project and plan: traffic flows, traffic management, facility procedures, weather conditions, staffing and position configurations
- Analyze, evaluate and update information as it is received to ensure effectiveness of the operation
- Monitor OEDP

OUTPUTS:
- Ensure dissemination of information from ARTCC positions, TMU, AS, and ATM that may affect operations
- Coordinate with the adjacent ARTCCs, AS, TMU, and ATM
- Ensure ARTCC operations are in accordance with procedures, current flows and weather conditions
- Ensure all areas are adequately staffed
- Initiate action as conditions and operations change

SYSTEMS:
- 300 system, Host Computer (HCS), 24-hour Z-time clock, Automated Weather Display System (AWDS), Aircraft Situational Display (ASD), Meteorologist Weather Processor (MWP) or Remote RADAR Weather Display System (RRWDS), Automated Voice Network (AUTOVON), VSCS.

ARTCC

AREA SUPERVISOR (AS)

The Area Supervisor is responsible for the operation of his/her area of specialization. There are typically four to six areas in each ARTCC. This responsibility includes observing, scanning and projecting the needs of a particular area and providing for those needs.

INPUTS:
- Observation of sector operations
- Flight progress strips
- Status information area
- Coordination from other AS positions
- Coordination with other facilities
- Traffic Management Unit (TMU)
- Center Weather Service Unit (CWSU)
- Area Manager in Charge (AMIC)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, enroute/ airport weather conditions, staffing and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination to appropriate positions, TMU, and AM of information concerning conditions that may affect operations.
- Coordinate with the sector positions, other AS, TMU, and AM
- Ensure sector operations are in accordance with procedures, current traffic flows, and weather conditions
- Ensure adequate staffing
- Combine/decombine sector positions as need dictates
- Initiate action as input changes

SYSTEMS:
- Host Computer System (HCS), Enhanced Direct Access Radar Channel (EDARC), Air Route Surveillance Radar (ARSR), Air-to-ground/Interphone Communication System, Aircraft Situation Display (ASD), 300 system, VSCS

ARTCC

RADAR POSITION (R)

The Radar position is in direct communication with the aircraft and has the responsibility of managing overall sector operations, including aircraft separation and traffic flows. The R controller assists the Radar Associate (RA) position with manual handoffs and coordination when needed.

INPUTS:
- Pilot requests, PIREPS and SIGMETS
- Radar display
- Manual and automated handoffs
- Radios
- Flight progress strips
- Status information area
- Coordination from other radar positions, non-radar positions, and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor in Charge (ASIC)

PROCESS:
- Prepare and monitor Radar position equipment for settings and optimum performance
- Correlate flight progress strips and Radar display information
- Manage flight progress strips: scan, analyze, transfer and file
- Mark flight progress strips as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type, aircraft performance, requests) and evaluate additional factors (e.g., weather, equipment status, traffic management initiatives) and develop an action plan

OUTPUTS:
- Issue control instructions, safety alerts, advisories and information to pilots
- Initiate control instructions and ensure safe and orderly traffic flow
- Initiate manual and automated handoffs
- Disseminate weather information
- Make computer (HCS/EDARC) entries
- Coordinate with other positions and adjacent ATC facilities
- Advise AS of pertinent information affecting area of primary responsibility or information affecting other areas in the ARTCC

SYSTEMS:
- HCS, EDARC, ARSR, 24-hour Z-time clock, digital plan view display (PVD), 300 system, Mode C Intruder, VSCS

ARTCC

RADAR ASSOCIATE CONTROLLER (RA)

The Radar Associate Controller, also known as the D-side or Manual controller, is responsible for providing assistance to the Radar position (R) as necessary to ensure continued smooth operation of the sector. The RA accepts or initiates manual and automated handoffs, manages flight progress strips for the sector, and informs the R controller of all actions taken.

INPUTS:
- Requests for departure clearance
- Manual and automated handoffs
- Radios
- Flight progress strips
- Status information area
- Coordination from other controller positions
- Traffic Management Unit (TMU)
- Area Supervisor in Charge (ASIC)

PROCESS:
- Review flight progress strips for possible conflicts and advise Radar controller
- Upon receipt of flight plan/VFR departure information, ensure all required clearance items are received and recorded
- Obtain clearance from tower or formulate a clearance (e.g., IFR, SVFR, VFR-on-top, or other VFR departure)
- Mark flight progress strips as necessary
- Ensure the accuracy of flight progress strips and place in the designated area

OUTPUTS:
- Issue clearance and deliver information to appropriate ATC facility, if applicable
- Coordinate information with other control positions
- Coordinate with TMU and/or AS
- Make computer (HCS/EDARC) entries

SYSTEMS:
- HCS, EDARC, 24-hour Z-time clock, 300 system, VSCS

ARTCC

RADAR COORDINATOR (RC)

The Radar Coordinator, also known as the Coordinator, Tracker, or Handoff controller, is responsible for performing inter- and intra-facility coordination on traffic actions, and accomplishes any other functions that will assist the Radar team in meeting situational objectives. The RC advises the Radar Associate (RA) of any action taken.

INPUTS:
- Radar display
- Manual and automated handoffs
- Radios
- Flight progress strips
- Status information area
- Coordination from other radar and/or manual positions and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor in Charge (ASIC)

PROCESS:
- Correlate flight progress strips and radar display information
- Scan, analyze, transfer, and update flight progress strips
- Mark flight progress strips as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type, aircraft performance, requests) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the Radar controller's action plan

OUTPUTS:
- Ensure safe and orderly traffic flow
- Ensure adherence to procedures and traffic management initiatives
- Assist Radar controller in implementing action plan
- Initiate manual and automated handoffs
- Make computer (HCS/EDARC) entries
- Coordinate with other radar and non-radar positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- HCS, EDARC, 24-hour Z-time clock, 300 system

ARTCC

ASSISTANT MANAGER FOR AUTOMATION (AMA)

The Center AMA provides air traffic management oversight to ensure the adequacy of the NAS enroute automation system, its effectiveness, efficiency, reliability, functionality, and suitability for the safe and expeditious movement of aircraft.

INPUTS:
- Area Managers (AM)
- Area Supervisors (AS)
- Data System Coordinator (DSC)
- Facility staff specialists
- Air Traffic Control Specialists (ATCS)
- Technicians
- Manager, NAS Operations (NOM)
- Agency directives
- Computer printouts
- FAA Technical Center (FAATC)
- Contractors
- Flight progress strips

PROCESS:
- Project and plan system modifications
- Analyze effectiveness of plan
- Determine Priorities
- Ensure compliance with national and regional policies

OUTPUTS:
- Make adjustments or changes (NCPs, local modifications, etc.)
- Ensure adequate system operation for users and adjacent facilities
- Coordinate operations
- Provide direction to contractors and evaluate their activities
- Provide direction to DSC
- Staff studies of computer-related requirements

SYSTEMS:
- HCS, EDARC, status panels, 24-hour Z-time clock, 300 system, Traffic Management computer system, Display Channel Complex (DCC), Computer Display Channel (CDC), Plan View Display (PVD), Computer Readout Device (CRD)

ARTCC

DATA SYSTEM COORDINATOR (DSC)

The DSC provides Air Traffic expertise to ensure the adequacy of the NAS enroute automation system, its effectiveness, reliability, functionality, and suitability for the safe and expeditious movement of aircraft.

INPUTS:
- Assistant Manager for Automation (AMA)
- Area Managers (AM)
- Area Supervisors (AS)
- Facility staff specialists
- Air Traffic Control Specialists (ATCS)
- Technicians
- Agency Directives
- FAA Technical Center (FAATC)
- Computer printouts and specifications
- Manager, NAS Operations (NOM)
- Contractors
- Flight progress strips
- Other DSCs

PROCESS:
- Analyze information and determine priorities
- Project and plan computer system and system support
- Review and evaluate proposed changes and corrections to system
- Evaluate effectiveness of plan

OUTPUTS:
- Coordinate operations
- Provide briefings to facility management
- Ensure dissemination of computer information to system users
- Assessment of computer operation
- Adjustment of computer system to provide adequate system to users
- Initiate action as input changes
- Staff studies of computer-related requirements
- Evaluation of contractor-related activities

SYSTEMS:
- HCS, EDARC, status panels, 24-hour Z-time clock, typewriter and/or PC, Traffic Management computer system, DCC, CDC, PVD, CRD, Quick-Action Keyboard (QAK), 300 system

AUTOMATED FLIGHT SERVICE STATION (AFSS)

PREFLIGHT (PF)

The Preflight (PF) position is the primary position providing weather and aeronautical information and flight plan filing services to pilots prior to flight, and is staffed with certified pilot weather briefers. Briefers are expected to be familiar with current and forecast conditions while on duty. They are required to maintain comprehensive knowledge of the topographical and physical characteristics of the facility's area of responsibility. Information is provided either by telephone or face-to-face. The services are available to all users of the National Airspace System, however general aviation is the predominant user.

Preflight briefers receive a pre-duty briefing, and then continually update operational data during the tour of duty. Weather information is interpreted, translated, and summarized by the briefer, rather than read verbatim. All information and service is provided in accordance with procedural handbooks, agency and facility directives, and best professional judgement for situations not otherwise specifically addressed.

INPUTS:
- Pilots
- NWS
- National Flight Data Center/U.S. NOTAM Office (NFDC/USNOF)
- Other Facility Positions
- Adjacent control facilities
- Airport management/fixed base operators
- FSAS, M1FC, LABS
- Charts and printed aeronautical information

PROCESS:
- Receive, analyze and respond to pilot requests for service
- Copy flight plan information
- Correctly format and transmit flight plan data

OUTPUTS:
- Preflight weather briefings
- Flight plans to ARTCCs or In Flight (IF) position
- Record of briefing via aircraft identification or pilot name

SYSTEMS:
- ICSS, FSDPS, M1FC, LABS, weather graphics, 24-hour Z-time clock, RRWDS, GOES

AUTOMATED FLIGHT SERVICE STATION (AFSS)

INFLIGHT (IF)

The Inflight position provides air/ground communication with aircraft. Communication may be of a routine or an emergency nature. The position is staffed with certified pilot weather briefers. Briefers are expected to be familiar with current and forecast weather conditions while they are on duty. They are also required to maintain detailed current knowledge of the topographical and other physical features of the facility's area of responsibility. Routine services provided at the IF position include pilot weather briefings, position reporting, inflight weather advisories, flight plan filing, activation, revision, and closure. Emergency services are provided in the form of orientation of lost aircraft.

INPUTS:
- Pilots
- NWS
- NFDC
- FSAS, M1FC, LABS
- Other facility positions
- Adjacent control facilities
- Airport management/fixed base operators

PROCESS:
- Establish priority of duties
- Receive, analyze, and respond to pilot requests for service via two-way radio
- Copy flight plan information
- Format and transmit flight plan data
- Determine appropriate course of action in emergency situations

OUTPUTS:
- Emergency services to aircraft in flight
- Inflight weather briefings
- PIREPS
- Flight plans to ARTCCs or ATCTs
- Aircraft information to FD position
- Relay of control information and clearances
- Record of briefing with aircraft identification or pilot name
- Notification of NAVAID malfunctions
- Unscheduled broadcasts
- Local airport information and advisories

SYSTEMS:
- ICSS, FSDPS, M1FC, LABS, weather graphics, Direction Finder (DF), GOES, RRWDS, 24-hour Z-time clock

AUTOMATED FLIGHT SERVICE STATION (AFSS)

FLIGHT WATCH (FW)

The Flight Watch position is a specialized air/ground position within the FSS/AFSS facility. Service is provided between 6:00 a.m.. and 10:00 p.m. on unique VHF radio frequencies (122.0 nationwide between 6,000 and 17,000 ft. MSL). Discrete frequencies are used for high altitude service. The service provided is entitled Enroute Flight Advisory Service (EFAS). EFAS service is limited to "near-real-time" weather information, and is specifically intended for aircraft in the enroute phase of flight. A primary function of EFAS is the solicitation and exchange of pilot weather reports (PIREPS) among aircraft. EFAS specialists are pilot weather briefers who have received additional specialized training and certification in the use and interpretation of weather radar and weather satellite data.

All information and service provided is in accordance with procedural handbooks, FAA orders, and facility directives.

INPUTS:
- Self briefings
- Pilots
- FSAS, M1FC, LABS
- NWS (reports, charts, etc.)
- Other facility positions
- Adjacent control facilities

PROCESS:
- Receive, analyze and respond to pilot requests for enroute weather information
- Solicit reports from pilots (PIREPS) concerning enroute conditions
- Compare PIREPS to NWS forecasts and advisories of hazardous conditions to validate the accuracy of the forecast information
- Provide to pilots the most current information available, tailored to a specific altitude and route of flight
- Refer requests for services other than EFAS to the In Flight (IF) position

OUTPUTS:
- Enroute flight advisories
- PIREPS
- Record of aircraft contacted via aircraft identification
- Relay of reported conditions (PIREPS) to CWSU and NWS forecasters

SYSTEMS:
- ICSS, discrete frequency outlets, FSDPS, M1FC, LABS, weather graphics, GOES, RRWDS, 24-hour Z-time clock

AUTOMATED FLIGHT SERVICE STATION (AFSS)

BROADCAST (BC)

The Broadcast (BC) position is responsible for recording a number of messages concerning current and forecast weather, NOTAMS, and other significant operational information. These messages are accessible to pilots via phone, and in some cases, radio.

All information is broadcast in accordance with procedural handbooks, FAA orders, and facility directives.

INPUTS:
- National Weather Service (NWS) scheduled and unscheduled surface observations, forecasts and amendments, and weather advisories
- PIREPs
- FSAS, M1FC, LABS
- NOTAMs
- Other facility positions
- Adjacent control facilities

PROCESS:
- Specialist assembles and edits specified weather reports and aeronautical information for various types of broadcasts in accordance with broadcast timetables
- Update broadcast recordings continually, on a scheduled or unscheduled basis, to include most current information
- Update recordings on an unscheduled basis upon receipt of significant new information such as special weather observations and newly issued or revised weather advisory data

OUTPUTS:
- Scheduled Weather Broadcast (SWB) (Alaska only)
- Weather advisories (SIGMET, AIRMET, Center Weather Advisory)
- Recorded messages:
  Transcribed Weather Broadcast (TWEB)
  Pilot Automatic Telephone Weather Answering Services (PATWAS)
  Telephone Information Briefing Service (TIBS)
  Hazardous In-flight Weather Advisory Service (HIWAS)

SYSTEMS:
- ICSS, FSDPS, LABS, M1FC, weather graphics, RRWDS, GOES, Comex equipment, dedicated telephone service, recording equipment, 24-hour Z-time clock

AUTOMATED FLIGHT SERVICE STATION (AFSS)

WEATHER OBSERVER (WO)

The weather observer position is responsible for taking surface observations on a scheduled basis. A basic weather watch is maintained, with "record" observations taken every hour, and "special" observations taken when criteria dictates. Observations are made using a combination of visual techniques, instrument readings, and calculations. Weather observations are not taken at every FSS/AFSS location, or always by FSS/AFSS personnel at those FSS/AFSS locations that have weather observers. Weather observers are trained and certified by the National Weather Service.

INPUTS:
- Personal observation of clouds, precipitation, visibility and obstructions
- Instrument and indicator readouts of temperature, wind speed and direction and barometric pressure
- Calculations of dew point, sea level pressure and density altitude

PROCESS:
- Certified observers begin the observation of conditions so as to complete in time for scheduled transmission to WMSC/R
- Maintain basic weather watch
- Complete all elements of record observation in a timely manner
- Format required elements and transmit in a timely manner
- Initiate special observations when criteria so dictate

OUTPUT:
- Surface Analysis (SA), Record Special (RS), and Special (SP) observations
- Climatological data
- Certified record of observations

SYSTEMS:
- LABS, Visibility chart and designated markers, temperature measuring devices, pressure indicator devices, DASI, wind instruments, local communications links, Input/Output (I/O) Devices, FSAS (M1FC), NADIN, ICSS, 24-hour Z-time clock

AUTOMATED FLIGHT SERVICE STATION (AFSS)

NOTAM (NO)

This position is the facility focal point for the collection, analysis and dissemination of NOTAMs. Position specialists accept and document information from all sources including other facility positions, airways facilities personnel, airport managers and operations offices, and other users. Duties include correctly formatting and transmitting data that meets handbook criteria, and maintaining the accuracy and currency of the facility files of local and FDC NOTAMs. The specialist at this position is responsible for the classification, accuracy, format, and cancellation of NOTAM information. Search and Rescue procedures may also be initiated from this position.

INPUTS:
- Other facility positions
- Adjacent control facilities
- Airways facilities personnel
- Airport management
- NAVAID monitor equipment (or at FD)

PROCESS:
- Classify and format information received from several sources according to criteria defined in handbooks (7930.2)
- Distribute data meeting NOTAM criteria to appropriate receptors
- Search and Rescue initiation (or at FD)

OUTPUT:
- Local NOTAMS,
- National NOTAMS (via U.S. NOTAM System)
- NOTAM cancellations
- Dissemination of FDC NOTAMS to adjacent control facilities
- Permanent changes to NFDC for publication
- SAR information

SYSTEMS:
- FSAS (FSDPS, M1FC), ICSS, USNS, RMM (or at FD), 24-hour Z-time clock

AUTOMATED FLIGHT SERVICE STATION (AFSS)

FLIGHT DATA (FD)

Flight Data is an internal/external communication position within the FSS/AFSS. It is the focal point for messages such as flight plans, flight movement and notification data, and administrative message traffic. Search and Rescue (SAR) activities may be initiated from this position on aircraft that become overdue (or at NO).

INPUTS:
- Other FSS/AFSS positions
- Flight plans
- Flight plan activation/cancellation
- Search and Rescue (SAR) initiation (or at NO)
- Other FSS/AFSS facilities
- Requests for arrival information
- SAR data (or at NO)
- Administrative messages

PROCESS:
- Receive IFR flight plans and other movement messages from other positions.
- Properly format flight plans and other pertinent data for transmission
- Initiate and respond to SA messages in a timely manner based on established criteria and procedures
- Perform SAR duties as required (or at NO)
- Format and transmit administrative messages
- Transcribe information from "Fast File" recordings

OUTPUTS:
- SAR information to other facilities/positions
- Flight plan closure/cancellation data to ATC facilities
- Relay of administrative traffic
- Transmit flight plans, flight movement/notification messages and administrative message traffic

SYSTEMS:
- FSAS (M1FC), ICSS, LABS, USNS, Fast Files

AUTOMATED FLIGHT SERVICE STATION (AFSS)

AREA SUPERVISOR (AS)

The FSS/AFSS area supervisor is responsible for overall facility operations during an assigned shift. Duties include ensuring adequate staffing for the operational situation, monitoring of all operational positions, ensuring that all functions are performed in accordance with various directives, and making timely notification in the event of equipment malfunctions.

INPUTS:
- Visual observation of positions
- Notification by specialists of unusual situations
- Coordination with other facilities
- Off-loading or accepting transferred traffic
- RCC, Regional Headquarters, BASOPS, FSDPS
- Airway Facilities personnel
- Facility Manager

PROCESS:
- Continually analyze operational situation and assign duties in accordance with priority of duties
- Monitor TMIS to maintain balance of traffic/workload between AFSSs in the same Region
- Maintain awareness of weather/staffing situation that may require:
  - Off-loading traffic
  - Utilizing back-up generator power
  - Additional staffing/reassignment of personnel
- Coordinating with Airway Facility personnel for maintenance of equipment

OUTPUT:
- Operational direction and guidance as needed
- Management of available resources
- Transfer traffic to other AFSSs

SYSTEMS:
- FSAS (M1FC), LABS, GOES, RRWDS, WMSC/R, NADIN, BASOPS, FSDPS, weather graphics system, ICSS, NAVAID monitor systems, Traffic Management Information System (TMIS), ICSS, 24-hour Z-time clock

AUTOMATED FLIGHT SERVICE STATION (AFSS)

ASSISTANT MANAGER FOR AUTOMATION (AMA)

The Flight Service AMA is responsible for managing the operation of the FSDPS staff and host computer that serves 2-6 AFSS sites. The AMA monitors the application software and provides periodic system analysis to ensure operational acceptability. The AMA maintains a close liaison with regional and national offices. The AMA supervises a staff of 6-8 people. This position requires close coordination with several operational facilities including AFSS site users, WMSC, AWP, FAATC, and NADIN.

INPUTS:
- Area Managers (AM)
- Area Supervisors (AS)
- Automation Specialists (AUS)
- Facility staff specialists
- Air Traffic Control Specialists (ATCS)
- Technicians
- Agency directives
- FAA Technical Center (FAATC)
- Computer printouts
- Aviation Weather Processor (AWP) managers

PROCESS:
- Project and plan system modifications
- Analyze effectiveness of plan
- Determine priorities
- Ensure compliance with national and regional policies
- Maintain system operational security
- Ensure recurrent training

OUTPUTS:
- Make adjustments for changes (NCPs, local modifications, etc.)
- Ensure adequate system operation for users and adjacent facilities
- Coordinate operations
- Certify accident and incident packages for AFSS sites

SYSTEMS:
- M1FC, FSDPS, Data Scope Monitors, NADIN, LABS, WMSC/R, AWP, ICSS

AUTOMATED FLIGHT SERVICE STATION (AFSS)

AUTOMATION SPECIALIST (AUS)

The Flight Service AUS is responsible for maintaining the operation of an FSDPS host computer that serves between 2-6 sites; monitors the application software and provides periodic system analysis to ensure operational acceptability; resolves problems with the FSDPS system software and hardware; coordinates closely with Area Supervisors in the AWP, WMSC, NADIN, and AFSS facilities; verifies the accuracy of data base and software versions; installs new revisions; maintains data base integrity; and performs system restarts and performance monitoring.

INPUTS:
- Assistant Manager for Automation (AMA)
- Area Managers (AM)
- Area Supervisors (AS)
- Facility staff specialists
- Air Traffic Control Specialists (ATCS)
- Technicians
- Agency directives
- FAA Technical Center (FAATC)
- Computer printouts and specifications
- Aviation Weather Processor (AWP) supervisor
- NADIN interface
- WMSC/R interface

PROCESS:
- Analyze information and determine priorities
- Project and plan computer system and system support
- Review and evaluate effectiveness of plan
- Maintain computer operation
- Implement new software and data base versions
- Reconfigure failed system components
- Archive historical data for 2-6 AFSS sites
- Perform system analysis for problem detection
- Perform system diagnostics

OUTPUTS:
- Coordinate operations
- Provide briefings to facility management
- Initiate program technical reports
- Prepare accident and incident packages for AFSS sites
- Develop program enhancements for national software
- Coordinate changes in software and/or database with servicing facilities

SYSTEMS:
- M1FC, FSDPS, Coded Time Source (CTS), data scope monitors, interface and coordination with NADIN, WMSC/R, LABS, AWP, ICSS

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO) -- ATCSCC

NTMOs gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives.

INPUTS:

- Official Airline Guide (OAG)
- Host flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (MWP, CFWSU)
- Air Traffic Control facility personnel
- ARTCC and Terminal traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- National Flight Data Center (NFDC)

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO) continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- Aircraft Situation Display (ASD), Specialist workstations, ETMS processor, PDPs, long-line and commercial telephone, 24-hour Z-time clock, Dynamic Ocean Track System (DOTS), Meteorologist Weather Processor (MWP), printed planning charts, large screen displays, Special Use Airspace Management System (SAMS), High Altitude Route System (HARS), Automated Voice Airport Reservation System (AVARS).

TRAFFIC MANAGEMENT

NATIONAL OPERATIONS MANAGER (NOM) - ATCSCC

National operations managers gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives.

INPUTS:

- Official Airline Guide (OAG)
- Host Flight Plan Data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (MWP, CFWSU)
- Air Traffic Control facility personnel
- ARTCC and Tower/TRACON traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS)
- National Flight Data Center (NFDC)
- International ATC systems

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

NATIONAL OPERATIONS MANAGER (NOM) - ATCSCC continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- ASD, ETMS, DOTS, MWP, HARS, AVARS specialists' workstations, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (TMS) -- ATCSCC

TMSs/NOMs gather all the pertinent information relative to current and projected future operations, and develop tentative TM plans to balance demand with capacity; initiate and implement TM plans with other facilities/TMUs, supervisors and control specialists and the ATCSCC; maintain awareness of capacity reductions throughout the NAS; document delay information; evaluate effectiveness of TM initiatives and make necessary adjustments.

TMSs disseminate TM initiative information to users and TMUs via ATCSCC advisories and records delay information. NOMs coordinate the efforts of TMSs into a coordinated NAS Traffic Management Plan.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- Host flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Arrival Acceptance Rate (AAR)
- Weather data (FT, SA, CFWSU)
- Coordination with other ATC facilities
- ATCSCC Operations Center
- Central Altitude Reservation Function (CARF) users (airlines, military, general aviation)

PROCESS:
- Use inputs to gather information for airports and enroute sectors within the NAS to assess their current and forecasted capacities
- Develop and implement Traffic Management initiatives necessary to balance demand with capacity
- Limit restrictions to increase capacity of the NAS through close coordination of individual enroute and terminal Traffic Management initiatives
- Generate transcontinental routes for use between specified city pairs

OUTPUTS:
- Traffic Management Initiatives:
  - A. Mile/minutes in-trail restrictions
    Local ground delay programs
    Arrival spacing (ASP)
  - B. Arrival fix balancing
  - C. Flight reroutes
  - D. Traffic stops
  - E. Transcontinental routes
  - F. Exemptions from TM initiatives

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (TMS) continued

- Coordination with:
  - A. National Traffic Management Offices (NTMOs) and TMSs/TMCs to implement traffic management initiatives and flight reroutes
  - B. Traffic Management Units (TMU)/TMCs to maintain awareness of current and anticipated conditions
  - C. Users, to inform them of local/national TM initiatives and advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- Aircraft Situation Display (ASD), ETMS processor, PDPs, long-line and commercial telephone, 24-hour Z-time clock, Dynamic Ocean Track System (DOTS), Meteorological Weather Processor (MWP), printed planning charts, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (STMC) -- Enroute

STMCs are responsible for assessing the capacity and demand for airspace and airports within their facility's area of responsibility; developing and administering traffic management initiatives including arrival and departure metering, enroute spacing, ground delays, and severe weather avoidance routes; providing intra- and inter-center coordination on military aircraft missions and airspace usage; disseminating weather information to center personnel and to other air traffic facilities in their area of responsibility; and assigning work within the Traffic Management Unit to ensure the most effective use of resources.

INPUTS:
- Official Airline Guide (OAG)
- Host flight plan data
- Enroute radar
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (MWP, CWSU)
- Air Traffic Control facility personnel
- Enroute Terminal traffic management personnel
- Air Traffic Control System Command Center (ATCSCC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- National Flight Data Center (NFDC)

PROCESS:
- Use inputs to gather information about the status of the airspace and airports within the Center's boundaries. Considerations include weather, system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS, weather, traffic management initiatives, and military airspace and mission requirements to personnel within the facility, air traffic facilities with adjacent airspace, and the ATCSCC
- Establish priorities and assign work to TMCs to achieve maximum efficiency and utilization of operations personnel
- Monitor and evaluate traffic management initiatives to ensure effectiveness.

OUTPUTS:
- Develops, implements, monitors and analyzes traffic management initiatives specific to the facility's area of responsibility

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (STMC) continued

- Utilizes available resources to ensure balanced traffic flows and the maximum utilization of airspace
- Balances and meters traffic into airports in the Center's area of responsibility
- Manages airport departure flows to meet enroute restrictions
- Implements traffic management initiatives requested by adjacent facilities and the ATCSCC
- Coordinates weather, traffic management, and other information pertaining to the efficient operation of the NAS to concerned personnel

SYSTEMS:

- Enroute radar and Host computer through PVDs and KVDTs; Aircraft Situation Display (ASD); specialist's workstation; ETMS processor; interphone, dedicated long-line, and commercial telephones; 24-hour
  Z-time clock; walkie-talkie; Meteorologist Weather Processor (MWP); printed planning charts; Special Use Airspace Management System (SAMS); Dynamic Ocean Track System (DOTS).

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) -- TOWER

Tower TMCs gather all necessary information and develop tentative TM plans to balance demand with capacity; negotiate tentative TM plans with terminal/enroute TMC/TMUs, supervisors, control specialists, and the ATCSCC; maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives and make necessary adjustments; disseminate TM initiatives to supervisory/control personnel, approach controllers, and parent TMU; and forward delay information to parent TMU.

INPUTS:
- DBRITE terminal Radar
- Host flight plan data
- Engineered Performance Standards (EPS)
- Weather data (FT, SA, CWSU)
- Traffic Management Unit (TMU) -- ARTCC
- Air Traffic Control System Command Center (ATCSCC)
- Users (Airlines, Military, General Aviation)
- Aircraft movement (visual)
- Airport manager

PROCESS:
- Gather information about terminal/enroute sectors
- Assess current and forecasted capacities at the airport and develop or recommend Traffic Management (TM) initiatives necessary to balance demand with capacity and meet terminal and enroute sector requirements

OUTPUTS:
- Traffic Management Initiatives (strategic/tactical):
  - A. Final spacing
  - B. Flight reroutes
  - C. Traffic stops
- Coordination with:
  - A. SATCs/ATCSs (internal) to implement traffic management initiatives and flight reroutes
  - B. Traffic Management Unit (TMU)/TMCs with parent terminal facilities to maintain awareness of current and anticipated conditions.
  - C. ATCSCC to advise of current and anticipated airport delays and airspace/ airport conditions

SYSTEMS:
- Flight Data Input/Output (FDIO), interphone, long-line and commercial telephone, 24-hour Z-time clock

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) -- TRACON

TMCs gather all necessary information and develop tentative TM plans to balance demand with capacity; negotiate tentative TM plans with other terminal facilities, parent TMU, supervisors, control specialists and the ATCSCC; maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives and make necessary adjustments; disseminate TM initiatives to supervisory/control personnel, towers, approach controls, and other TMUs via the ATCSCC; and forward delay information to the ATCSCC.

INPUTS:
- Host flight plan data
- Terminal Radar
- Engineered Performance Standards (EPS)
- Weather data (FT, SA, CWSU)
- ATCs and SATCs (towers/ARTCCs)
- Air Traffic Control System Command Center (ATCSCC)
- Users (airlines, military, general aviation)

PROCESS:
- Gather information for airports and terminal sectors within their airspace to assess current and forecasted capacities
- Develop or recommend Traffic Management (TM) initiatives necessary to balance the demand with the capacity.

OUTPUTS:
- Traffic Management initiatives (strategic/tactical)
  A. Mile/minutes in-trail restrictions, arrival spacing
  B. Arrival fix balancing
  C. Flight reroutes
  D. Traffic Stops
- Coordination with:
  A. SATCs/ATCSs (internal) to implement traffic management initiatives and flight reroutes
  B. Parent Traffic Management Units (TMU)/TMCs, adjacent/ other terminal facilities to maintain awareness of current and anticipated conditions
  C. ATCSCC to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:
- Aircraft Situation Display (ASD), Terminal Radar/ARTS, Flight Data Input/ Output (FDIO), interphone, long-line and commercial telephone, 24-hour Z-time clock

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) -- Enroute

TMCs gather all necessary information and develop tentative TM plans to balance demand with capacity; and negotiate tentative TM plans with other facilities and TMUs, supervisors, control specialists and the ATCSCC. They maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives; and make necessary adjustments to disseminate TM initiatives to supervisory and control personnel. This includes towers, approach control facilities, and other TMUs via the ATCSCC. TMCs also forward delay information to the ATCSCC.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- Host Flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Weather data (FT, SA, CWSU)
- ATCSs and SATCSs, (towers, TRACONs, ARTCCs)
- Users (airlines, military, general aviation)

PROCESS:
- Gather information for airports and enroute sectors within their ARTCC to assess current and forecasted demand and capacities
- Develop or recommend Traffic Management (TM) initiatives necessary to balance the demand with the capacity

OUTPUTS:
- Traffic Management initiatives (strategic and tactical)
  - A. Mile and minutes in-trail restrictions, local ground delay programs, arrival spacing
  - B. Arrival fix balancing
  - C. Flight reroutes
  - D. Traffic Stops
- Coordination with:
  - A. SATCSs and ATCSs (internal) to implement traffic management initiatives and flight reroutes
  - B. Traffic Management Units (TMU/TMCs in adjacent ARTCCs and terminal facilities to maintain awareness of current and anticipated conditions
  - C. ATCSCC to request national TM initiatives and advise of current and anticipated delays and airspace and airport conditions

SYSTEMS:
- Host PVD and KVDT, Aircraft Situational Display (ASD), Flight Data Input/ Output (FDIO), interphone, long-line and commercial telephone, 24-hour Z-time clock, Dynamic Ocean Track System (DOTS), MWP, walkie-talkie.

ATC TECHNOLOGY AND SUPPORT INTERFACES

ATC AUTOMATION

AUTOMATED RADAR TERMINAL SYSTEM (ARTS IIA)

The ARTS IIA is a single processor system that operates in conjunction with the Air Traffic Control Radar Beacon System (ATCRBS) and generates a data block to be correlated with the actual radar target. Aircraft must be equipped with a beacon transponder that transmits a four-digit code, which is converted by the ARTS IIA computer into alphanumeric information to be displayed on the Radar Alphanumeric Display System (RADS) or DBRITE Alphanumeric Subsystem (BANS). Data is continuously updated by the operational program to show real-time position. If the aircraft is equipped with Mode C, altitude information is also displayed and updated. The system is normally interfaced with at least one ARTCC Host Computer and one or more adjacent ARTS sites for transfer of information. ARTS IIA is used in air traffic control for low- to medium-density airports. It will be enhanced in 1996, becoming ARTS IIE, a microprocessor-based system.

INPUTS:
- Aircraft transponder/ATCBI
- Airport Surveillance Radars (ASR)
- Controller keyboard/Positional Entry Module (PEM)
- Automation Specialist (AUS)
- Technicians

PROCESS:
- Receive beacon code from aircraft
- Analyze code and process data
- Direct code to specified area of operational program
- Determine priorities
- Update data continuously
- Transfer data to display

OUTPUTS:
- Display processed code on Radar Alphanumeric Display system (RADS) or DBRITE Alphanumeric Subsystem (BANS)
- Correlate radar target with beacon code data block
- Keyboard and switch inputs may be used to modify display
- Provide aural warning if aircraft are too close to other aircraft (Mode C Intruder) or terrain (Minimum Safe Altitude Warning (MSAW)
- Transfer date to adjacent ARTS sites or ARTCCs

INTERFACED SYSTEMS:

- Airport Surveillance Radar (ASR), Host Computer, other ARTS, video mappers, operational program, Radar Alphanumeric Display System (RADS), DBRITE Alphanumeric Subsystem (BANS), telephone lines, microwave links.

ATC AUTOMATION

AUTOMATED TERMINAL RADAR SYSTEM (ARTS IIIA)

The ARTS IIIA is a multiprocessor system that operates in conjunction with the Air Traffic Control Radar Beacon System (ATCRBS) and generates a data block to be correlated with the actual radar target. Aircraft equipped with a beacon transponder transmit a four-digit code that is converted by the ARTS IIIA computer into an alphanumeric data block. This data is displayed on the RADS or BANS, and is continuously updated, or tracked, by the operational program to show real-time position. If the aircraft is equipped with Mode C, altitude information is also displayed and updated. Aircraft not transponder-equipped may have a track started manually if the appropriate configuration of processors are operating. One processor may be used by the Automation specialist (AUS) or technician for running off-line programs while the operational program continues to function. During this time, it is not possible to track non-transponder-equipped aircraft, track capacity is reduced, and the Conflict Alert (CA) and Minimum Safe Altitude Warning (MSAW) functions are disabled. The system is normally interfaced with at least one ARTCC, and one or more adjacent ARTS sites for transfer of information. ARTS IIIA is used in air traffic control for medium- to high-density airports.

INPUTS:
- Aircraft transponders/ATCBI
- Airport Surveillance Radar (ASR)
- Controller keyboard/track ball
- Automation Specialist (AUS)
- Technicians

PROCESS:
- Receive beacon code or radar return from aircraft
- Analyze code and process data
- Direct code to specified area of operational program
- Track aircraft not equipped with transponder when at least two processors are operational
- Determine priorities
- Update data continuously
- Transfer data to display

OUTPUTS:
- Display processed data on DEDS or BANS
- Correlate radar target or beacon code with data block
- Provide aural warning if aircraft are too close to other aircraft (Mode C Intruder) or terrain (Minimum Safe Altitude Warning)
- Keyboard and switch inputs may be used to modify display
- Transfer data to adjacent ARTS sites or ARTCCs

INTERFACED SYSTEMS:
- Airport Surveillance Radar (ASR), Host Computer, other ARTS systems, video mappers, Data Entry and Display System (DEDS), BANS, telephone lines, microwave links.

ATC AUTOMATION

AUTOMATED TERMINAL RADAR SYSTEM (ARTS IIIE)

The ARTS IIIE system is a terminal ATC system that further consolidates the operations associated with increased traffic in the airspace of the nation's busiest airports. The ARTS IIIE is similar to the ARTS IIIA system, but displays data on the Full Digital ARTS Displays (FDAD), to show real-time position. If the aircraft is equipped with Mode C, altitude information is also displayed and updated. Automatic track initiation is available for aircraft not transponder-equipped.

Five levels of operating capability maximize automation support during periods of equipment outage or off-line use by an automation specialist (AUS) or technician:

- Normal (full system available)
- Fail-safe (redundant hardware used to maintain full operational capability)
- Fail-soft (reduced system capability)
- Backup (direct tracking to display capabilities)
- Broadband (radar analog video display only)

The system is normally interfaced with at least one ARTCC and one or more adjacent ARTS sites for transfer of information. The ARTS IIIE system is used in air traffic control for high density airports.

INPUTS:
- Aircraft transponders/ATCBI
- Airport Surveillance Radar (ASR)
- Controller keyboard/track ball
- Automation Specialist (AUS)
- Technicians

PROCESS:
- Receive beacon code or radar return from aircraft
- Analyze code and process data
- Direct code to specified area of operational program
- Track aircraft not equipped with transponder
- Determine priorities
- Update data continuously
- Transfer data to display

ATC AUTOMATION

AUTOMATED TERMINAL RADAR SYSTEM (ARTS IIIE) continued

OUTPUTS:

- Display precessed data on FDAD, DEDS, or Local BANS processors
- Correlate radar target or beacon code with data block
- Provide aural warning if aircraft are too close to other aircraft (Conflict Alert) or terrain (Minimum Safe Altitude Warning)
- Keyboard and switch inputs may be used to modify display
- Transfer data to adjacent ARTS sites or ARTCCs

ATC AUTOMATION

CONVERGING RUNWAY DISPLAY AID (CRDA)

The Converging Runway Display Aid (CRDA) is a software enhancement for the ARTS IIIA designed to assist the terminal radar controller establish precise separation between aircraft approaching different runways that converge, through a procedure called Dependent Converging Instrument Approaches (DCIAs), which are based on standards already in existence. It is expected that instrument flight rules (IFR) staggered approaches can be conducted to Category I/II minima with probable capacity improvements using CRDA.

The CRDA function projects the image of a real aircraft flying an approach to runway A on the display of the approach to runway B, so that the distance of the real aircraft from a given reference point equals the distance of the Ghost Data Block (GDB) from another given reference point. The real aircraft reference point and the GDB reference point may be identical, e.g., the intersection of runways A and B, or they may be different, e.g., the thresholds of runways A and B. This character will display the ground speed of the actual aircraft relative to the ghost target.

Controllers may be able to use this "ghosting aid" in VFR conditions to achieve an increased departure rate. Through precise simultaneous arrivals to converging runways (tieing), departing aircraft could possibly depart at more precise slot times.

Airspace may be more effectively used by segregating aircraft of different characteristics or weight classifications to land on a desired runway. Similarly, slower aircraft may be landed on a preferred runway, allowing a more effective use of final approaches.

The ultimate goal of CRDA is an FAA effort to reduce controller workload, assist controllers in maintaining prescribed separation, and, where applicable, to increase capacity.

INPUTS:
- Aircraft transponder/ATCBI
- Controller keyboard/Positional Entry Module (PEM)
- Automation Specialist (AUS)
- Technicians

PROCESS:
- Analyze code and process data
- Direct code to specified area of operational program
- Update data continuously
- Transfer data to display

ATC AUTOMATION

CONVERGING RUNWAY DISPLAY AID (CRDA) continued

OUTPUTS:

- Display processed code on Data Entry and Display System (DEDS) or BRITE Alphanumeric Subsystem (BANS)

INTERFACED SYSTEMS:

- ARTS IIIA computer system, operational program, DEDS, BRITE Alphanumeric Subsystem (BANS).

ATC AUTOMATION

DIGITAL BRITE RADAR INDICATOR TOWER EQUIPMENT (DBRITE)

The DBRITE provides the tower controller with a clear, precise, and comprehensive presentation of the aircraft in his/her assigned sector. The system operates with the ARTS IIA, ARTS IIIA, ARTS IIIE, EARTS, PIDP, and TPX-42 automated terminal systems to provide alphanumeric information. A direct connection with the airport surveillance radar system (ASR) provides a digitally-controlled plan position indicator (PPI) video presentation, including weather information. A built-in digital map capability allows up to five maps for presentation in any combination.

INPUTS:
- Airport Surveillance Radars (ASR)
- Controller keyboard/Position Entry Module (PEM)
- Automated Radar Terminal System (ARTS)

PROCESS:
- Combines PPI and automation/synthetic data
- Generates video display
- Provides digital map

OUTPUTS:
- Displays data in tower sunlight conditions
- Control panel may be used to modify display
- Aural warning for Conflict Alert and terrain.

INTERFACED SYSTEMS:
- Airport Surveillance Radar (ASR), Automated Radar Terminal System (ARTS), video mappers, telephone lines, fiber optic or microwave links, tower cab displays

ATC AUTOMATION

DYNAMIC OCEAN TRACK SYSTEM (DOTS)

DOTS provides the ATC Traffic Management Unit (TMU) specialist with the following capabilities: a Track Generation function uses forecast aviation weather, user operation, and site-specific ATC flow requirements to compute a structured system of routes that allows the most efficient use of oceanic airspace; A Traffic Display function accepts data from various aircraft flight data sources as it monitors and projects aircraft progress entering and proceeding through oceanic airspace; a Track Advisory function identifies airspace availability based on actual and planned airspace usage.

INPUTS:
- DOTS functional specifications developed by the Oceanic Systems Requirements Team
- Apollo computer used to prototype DOTS functions
- ARINC line directly to the DOTS computers to provide flight plan information and weather data
- DOTS sends traffic advisory service to users
- Display provides visual reference of a flight's location to the TMU specialist and the control room supervisors

PROCESS:
- Uses high resolution graphics
- Uses Bracknel weather
- Distribution of tracks generated reflect separation standards and changing wind patterns

OUTPUTS:
- Generates tracks twice a day and provides an overlay of the tracks for controller charts
- Displays traffic based on reported positions and flight plan information
- Generates track advisory information based on availability of optimum routing and altitudes

INTERFACED SYSTEMS:
- TMS display channel computers, ARINC lines, Contractor-developed software, TMS interface, HOST

ATC AUTOMATION

ENHANCED DIRECT ACCESS RADAR CHANNEL (EDARC)

The Enhanced Direct Access Radar Channel (EDARC), is a dual processor display system. The DARC system uses a single disk drive, 2.5 Mb capacity, in each processor which contains the DARC software program. DARC has three modes of operation providing backup radar display when the Host computer or the Computer Display Channel (CDC) is not in service. Three modes of operation are available known as DARC only, Level "A" and Level "B". In a DARC only mode the DARC hardware/software accomplishes all radar data processing providing display to controllers in the form of data tags identical to Host/CDC display. In Level "A" mode DARC provides radar processing and display while Host provides flight data processing. Level "A" is a one way interface with Host sending information to DARC, DARC does not respond. While utilizing DARC only or Level "A" automated handoff capability is maintained intra-facility only. In Level "B" mode Host continues radar processing sending information to DARC that would normally be sent to CDC for display. Level "B" is the preferred mode of operation in that an outage of CDC has little if any effect on controller workload. When Level "B" is operational automated interfacility handoff capability is maintained.

INPUTS:
- Radar data
- Weather information from Weather Message Switching Center (WMSC)
- Host
- Controller keyboard
- Data Systems Specialist
- Technicians

PROCESS:
- Receive radar data
- Process radar data and display on controller's Plan View Display (PVD)
- Update data continuously
- Display data sent from Host

OUTPUTS:
- Display radar data on PVD
- Correlate radar target with Data Block
- Respond to Inputs/Request from Host
- Send transfer request to Host

SYSTEMS:
- Long range radar (ARSR), Host, Radar Controller input keyboards, Weather Message Switching Center (WMSC)

ATC AUTOMATION

ENHANCED TRAFFIC MANAGEMENT SYSTEM (ETMS)

ETMS is a national network of computers consisting of a central computer complex located in Cambridge, MA, connected via satellite to remote sites. Remote computer sites are located in the Traffic Management Units (TMUs at each ARTCC and at selected TRACONs). The ETMS generates a national picture every three minutes of all air traffic being tracked by the 20 CONUS ARTCCs. In addition, the ETMS is used in tactical planning by providing a projection of air traffic for the current time plus eight hours.

INPUTS:
- ARTCC Host computer flight movement messages
- ARINC oceanic position reports
- National Ocean Service (NOS) data
- National Oceanographic and Atmospheric Administration (NOAA) data
- National Flight Data Center (NFDC) data
- Official Airline Guide (OAG) data

PROCESS:
- Receive map data from above sources
- Generate background maps
- Receive real-time flight movement and ARINC data
- Generate national flight movement database and graphic depiction
- Generate prediction of next eight hours

OUTPUTS:
- Aircraft Situation Display (ASD)
- Monitor Alert (MA)

SYSTEMS:
- TMS display channel computer systems, Leased satellite system, Interfacility Communications Network (IFCN)

ATC AUTOMATION

ENROUTE AUTOMATED RADAR TERMINAL SYSTEM (EARTS) and Micro-EARTS

The EARTS is a multiprocessor system capable of simultaneously tracking target data from short range and long range radars and providing a mosaic presentation to the air traffic controller on the Plan View Display (PVD). It is presently used in four air traffic control facilities — San Juan CERAP, Nellis AFB, Honolulu CERAP and Anchorage Center.

The Common Digitizer (CD) receives radar and beacon video from the radar system, detects and isolates radar and beacon targets, and transmits the target reports in digital form to the Data Processing Subsystem (DPS). Using this data, the DPS performs real-time tracking of all aircraft within a sensor area. The DPS provides output to the Interface Buffer Adapter Generator (IBAGs), which control and refresh the dynamic display of the alphanumeric data (A/N) on the PVD's. Each PVD accepts the data from the DPS via the IBAGs and displays controlled aircraft A/N identity, altitude (if mode C equipped), and ground speed information, tabular data and aircraft single symbology association in either a sensor-oriented (where only one sensor provides the radar data displayed to the controller) or mosaic presentation (where more than one sensor supplies the radar data).

A Reconfiguration Fault Detection Unit (RFDU) allows the processor and memory modules in the DPS to be automatically or manually reconfigured. The RFDU also monitors system errors and can generate a scatter interrupt to all processors when an error is detected. Depending on the source of the error, the RFDU can automatically lock out the offending memory or processor from communication with the rest of the system.

The EARTS provides monitoring functions for potential conflict between all mode C equipped aircraft and between mode C equipped associated aircraft and terrain.

Micro-EARTS, the microprocessor-based En Route Automated Radar Tracking System, combines both en route and terminal air traffic control, providing multi-sensor mosaic derived situation displays of air traffic data received from long and short range radars and terminal air traffic control from single sensor radar data. Micro-EARTS has five major subsystems:

- Radar Interface Subsystem (RIS)
- Data Processing Subsystem (DPS)
- System Monitor Console (SMC)
- Communications Interface Subsystem (CIS)
- Controller Display Subsystem (CDS)

These subsystems are interconnected by a dual Ethernet local area network (LAN). Radar data received by the RIS is sent to the DPS for operational processing for conflict alert, minimum safe altitude warning, mode-C intruder and tracking functions. The data is then sent to the CDS for display. The CIS receives/sends flight data to remote displays, provides interfacility communications with adjacent NAS facilities, and receives GPS clock data for system timing. The SMC monitors the LAN status, provides alarm messages received from the operational program, and directs overall system control messages.

ATC AUTOMATION

ENROUTE AUTOMATED RADAR TERMINAL SYSTEM (EARTS) and Micro-EARTS continued

The Radar Interface Subsystem consists of dual/redundant radar interface processors (RIPs) with interfaces to synchronous serial RS-232/RS-422 Common Digitizer, ARSR-3/4, AN/FPS-117, and ASR-9 data. The Data Processor Subsystem consists of dual/redundant data processors, continuous critical data recorders, and uninterrupted power supplies (UPS). While one of the data processors is in the active mode, the other is in a "hot" standby mode. In the unlikely event of a failure of one of the operational data processors in the DPS, the second operational data processor will automatically restore the system. The UPS provides system operation in the event of a commercial of critical bus power failure.

Micro-EARTS is coded in ANSI C language software on Commercial Off-The-Shelf (COTS) hardware. The operational program is transportable with an open system design architecture. The system operates on various UNIX-based platforms such as IBM, DEC and Hewlett Packard.

Micro-EARTS utilizes User Datagram Protocol/Internet Protocol (UDP/IP) for LAN message transmission including message validation.

INPUTS:
- Aircraft with transponder
- Aircraft without transponder
- Controller keyboard/trackball
- Automation Specialist
- Technicians

PROCESS:
- Receive radar and beacon reply from aircraft
- Analyze code and process data
- Direct code to specified area of operational program
- Track aircraft not equipped with transponder
- Determine priorities
- Update data continuously

OUTPUTS:
- Transfer data to IBAG or Remote Brite
- Alphanumeric Subsystem (BANS)
- IBAG processes data and is sent to PVD
- Data may be presented in a Mosaic or Sensor-only format
- Provide aural and visual warning if aircraft are to close to other aircraft (Conflict Alert) or terrain (Minimum Safe Altitude Warning)
- Keyboard and switch inputs may be used to modify display
- Transfer data to adjacent ARTS sites or Air Route Traffic Control Centers (ARTCC)

ATC AUTOMATION

ENROUTE AUTOMATED RADAR TERMINAL SYSTEM (EARTS) and Micro-EARTS continued

SYSTEMS:

- Multiprocessor Executive Control
- Radar Input Processing
- Track Processing
- Controller Keyboard Processing
- Display Output Processing
- Interfacility Data Transfer
- Bulk Store Flight Plan Processing
- Console Data Terminal Input Processing
- Off-line Programs
- System Recovery
- Continuous Data Recording (CDR)
- EARTS Target Generator
- Real-Time Quality Control
- On-line Certification Diagnostics
- Minimum Safe Altitude Warning
- Conflict Alert
- HOST, ARTS IIA and ARTS IIIA
- PVD and BANS
- Medium Speed Printers
- Telephone lines, satellite and microwave links

ATC AUTOMATION

FLIGHT DATA INPUT/OUTPUT (FDIO)

The FDIO system receives and transmits flight plan data between the Air Traffic Control Tower (ATCT) and the Air Route Traffic Control Center (ARTCC). The Host computer located at the ARTCC processes data on arrival, departure, and overflight aircraft. After this data is processed, it is sent to FDIO printers to be printed on flight strips in the ATCT and ARTCC. The Host Computer determines to which ATCT or ARTCC sector specific flight data information is sent.

INPUTS:
- ATCT and ARTCC flight data operators
- Host Computer

PROCESS:
- Receive flight plan data information from Host Computer
- Transmit flight plan data to Host computer

OUTPUTS:
- Flight plan data on arrival, departure, and overflight aircraft

SYSTEMS:
- Host Computer, telephone lines, airline computers

ATC AUTOMATION

FLIGHT SERVICE AUTOMATION SYSTEM (FSAS)

The M1FC FSAS is a four-processor system located at a Flight Service Data Processing (FSDPS) site. The FSDPS operates in conjunction with the FSAS Aviation Weather Processor (AWP) and operational positions at the Automated Flight Service Stations (AFSS). The FSDPS can receive, process, store, format, display, and distribute a wide variety of meteorological, flight movement, and aviation data at geographically distributed AFSS sites. The software updates, modifies, or cancels the data on a continuous basis.

INPUTS:
- Air Traffic Control Specialists (ATCS)
- Automation Specialists (AUS)
- Technicians

PROCESS:
- Receive, categorize, store, retrieve and display meteorological data
- Receive, categorize, compute parameters, store, and retrieve flight movement data
- Receive, categorize, store, and retrieve other aviation data
- Calculate, build, and check flight plan route
- Retrieve and transfer weather for calculated route

OUTPUTS:
- Transmit meteorological data to other NAS facilities through AWP
- Transmit flight movement data to other NAS facilities through National Airspace Data Interchange Network (NADIN)
- Transmit other aviation data to other NAS facilities through AWP and NADIN
- Display flight plan information
- Display weather information
- Keyboard inputs may modify display for further processing

INTERFACED SYSTEMS:
- Weather Message Switching Center (WMSC), NADIN, Host Computer, other FSDPS, telephone lines, microwave links

ATC AUTOMATION

HOST COMPUTER SYSTEM (HCS)

The HOST Central Computer Complex system, IBM System/370-series 3083 BX1 Processor, offers greater processing speed, more internal memory, greater on-line storage and more input/output capacity than the 9020 computer system which was replaced. Safety, capacity, productivity, and economy determines the higher levels of automation. The HCS can be described as being composed of four parts: (1) software, (2) hardware, (3) firmware, and (4) interfaces. This new system employs two independent processing systems and adequate peripheral devices to fulfill the redundancy requirements. One processor acts as the primary processor performing all the air traffic control processing functions while the other processor acts as independent backup monitor system (standby mode) ready to take over if an unrecoverable error occurs. All channel devices are connected to redundant paths to the groups of peripherals. The Host Computer System (HCS) National Airspace System (NAS) processor is configured to have no single point of failure. There are two 3278 Keyboard Video Display Terminals (KVDT) at the computer operator position in the HCS room used as System Consoles (one for each processor). The Direct Access Storage (DAS) Subsystem has greatly increased storage capacity and has 10 gigabytes of disk storage. The 3880 Storage Control Unit contains two Storage Directors which support data transfers through independent data paths at a rate of 3.0 megabytes per second. The 3083 complex has a processing rate of 7.3 MIPS (million instructions per second) with 16 channels and 16 megabytes of storage.

INPUTS:

- Radar Data Acquisition and Tracking (RDAT)
- Traffic Management System (TMS)
- Weather information from Weather Message Switching Center (WMSC)
- Controller keyboard
- Data Systems Coordinator
- Technicians
- Programmers

PROCESS:

- Receive radar data from ARSR
- Process radar data and display on controller's Plan View Display (PVD)
- Update data continuously
- Communicates with TMS
- Provides operational data for IFR traffic
- Primary source for ensuring separation during En Route Flight phase
- Flight Plan Posting Strips analysis allow Procedural Separation for aircraft outside radar coverage

ATC AUTOMATION

HOST COMPUTER SYSTEM (HCS) continued

OUTPUTS:

- Display radar data on PVD
- Correlate radar target with Data Block
- Provide Sector Flight Plan Strips
- Respond to Inputs/Request from other System Interfaces

SYSTEMS:

- ARSR, WMSC, Direct Access Radar Channel (DARC), TMS, NADIN

ATC AUTOMATION

LEASED A & B SERVICE (LABS)

The ARTCC/FSS computer utilizes a GS-200 microprocessor to provide the user interface to Leased Service A and B (LABS). Currently Service A is disseminated from the Weather Message Switching Center (WMSC), and Service B from the National Airspace Data Interchange Network (NADIN) I. Two NADIN I switches provide exchange of Service B aircraft movements/flight plans and administrative messages. GS-200 computers are located at all ARTCCs and selected FSSs. The LABS can receive, process, store, format, display, and distribute a wide variety of flight movement, meteorological and NOTAM data. Software provides updates, modifications, or cancellations to the data on a continuous basis.

INPUTS:
- Air Traffic Control Specialists (ATCS)
- Flight Data Control Specialists (FDCS)
- Flight Service Stations (FSS)
- National Weather Service (NWS)
- Salt Lake City and Atlanta Switching Center
- Commercial Federal Systems (end-to-end service)
- Military Base Operations (BASOPs)
- Communications Command Center (CCC)

PROCESS:
- Receive, categorize, sort, retrieve, and display meteorological and NOTAM data
- Receive, store, and input aircraft movement and flight plan messages
- Receive, store, and input various administrative messages

OUTPUTS:
- Transmits meteorological and NOTAM data to other NAS facilities through WMSC
- Transmits flight movement data to other NAS facilities through NADIN
- Transmit administrative messages through NADIN
- Display flight plan information
- Display meteorological and NOTAM information
- Keyboard inputs may modify display for further processing

INTERFACED SYSTEMS:
- NADIN, Weather Message Switching Center (WMSC), Consolidated Notam System (CNS), Flight Service Automated Systems (FSAS), various local and remote workstations, interface provided through various sources such as telephone lines, microwave and satellite links

ATC AUTOMATION

MODE C INTRUDER (MCI)

The Mode C Intruder function of ARTS III systems provides conflict alert reporting of potentially hazardous situations involving associated and unassociated tracks, where both aircraft are reporting Mode C. MCI maintains the function of providing inter-sensor conflict alerting for an associated track pair. Intra-sensor MCI alerts are provided between an associated-unassociated track pair. The automatic alerts provided will consist of:

(a) Displayed alerts (active data blocks and tabular sets)
(b) Aural alerts
(c) Printouts of alerts
(d) Recorded alert data

INPUTS:
- Aircraft transponders
- Surveillance Radar (ASR/ARSR)
- Controller keyboard/track ball
- Automation Specialist (AUS)
- Technicians

PROCESS:
- Receive beacon code or radar return from aircraft
- Analyze code and process data
- Direct code to specified area of operational program
- Track aircraft not equipped with transponder when at least two processors are operational
- Determine priorities
- Update data continuously
- Transfer date to display

OUTPUTS:
- Display processed data on RADS, BANS, DEDS, or PVD
- Correlate radar target or beacon code with data block
- Provide aural warning if aircraft are too close to other aircraft (Conflict Alert) or terrain (Minimum Safe Altitude Warning)
- Keyboard and switch inputs may be used to modify display
- Transfer data to adjacent ARTS sites or ARTCCs

INTERFACED SYSTEMS:
- Airport Surveillance Radar (ASR), Host Computer, other ARTS systems, video mappers, operational program, RADS, BANS, DEDS, PVD, telephone lines, microwave links.

ATC AUTOMATION

OCEANIC DISPLAY AND PLANNING SYSTEM (ODAPS)

ODAPS is a flight data processing and display system designed to provide automation functions in support of oceanic air traffic control. The system is currently in use at the Oakland and New York ARTCCs. ODAPS provides important improvements for the oceanic air traffic controller such as computer-generated flight progress strips, traffic situation display, conformance checking and automated communications with adjacent facilities. An added feature is conflict probe, which detects potential conflicts of separation and provides the controller ample time to rectify the situation.

INPUTS:
- Adjacent ARTCCs
- NADIN
- Aeronautical Radio, Inc. (ARINC)
- AFTN
- Service A (Weather)
- Service B (Flight plan data)
- Automation Specialist (AUS)
- FDIO and Plan View Display (PVD) keyboard
- Facility technicians

PROCESS:
- Receives aircraft progress reports through ARINC
- Analyze, validate, and process data
- Receive interfacility or international flight plan data

OUTPUTS:
- Produces flight strips
- Displays data block information on PVD
- Produces conflict probe tabular list
- Produces overdue aircraft list
- Displays interpolated position of aircraft on PVD
- Transfers flight plan data to adjacent facilities

INTERFACED SYSTEMS:
- Host Computer at local ARTCC, FDIO system, NADIN, display system (IBAG AND PVD), NORAD (DoD air defense system)

ATC AUTOMATION

OFFSHORE FLIGHT DATA PROCESSING SYSTEM (OFDPS)

OFDPS is a flight data processing system serving the Hawaiian oceanic flight information region. The system uses redundant mainframe hardware and software based on NAS enroute processing to receive, validate, process, and output military, commercial and general aviation flight plan data for air traffic controllers located at the Honolulu Combined Enroute Radar Approach Control (CERAP) and five local air traffic control towers. The OFDPS prints flight strips for the CERAP and the remote towers. The flight plan data base is updated continuously through interfaces with the local Enroute Automated Radar Tracking System (EARTS) and the ODAPS at the Oakland ARTCC.

INPUTS:
- FDIO replacement alphanumeric keyboard
- ODAPS at Oakland ARTCC
- EARTS at Honolulu CERAP
- NADIN
- System support keyboards
- Bulk-stored flight plan data

PROCESS:
- Receive originating flight plan data
- Receive in-transit or arriving flight plan data
- Validate data and reformat for output or generate error message
- Prepare output for appropriate interface or controller sector
- Monitor system and interface operation for health; log status; activate redundant systems or data

OUTPUTS:
- Flight strips at controller sectors and remote towers
- Outbound flight plan data to Oakland ARTCC
- Local flight plan data to EARTS
- System operational status message to System Engineer (SE), Computer Operator (CO) and Automation Specialist (AUS) positions

INTERFACED SYSTEMS:
- EARTS for local flight plan data, ODAPS for arriving, departing and in-transit Pacific Ocean traffic, NADIN IA

ATC AUTOMATION

PRE-DEPARTURE CLEARANCE (PDC)

PDC is a PC-based interim air traffic control (ATC) system that automates the delivery of flight plan clearances for participating airlines. PDC captures the departure flight plan data of participating airlines via a passive tap on the flight data input/output (FDIO) line. This line interfaces the Host Computer System (HCS) and the tower flight strip printer (FSP). The data is presented to the controller on the terminal display (CRT) in the form of a tabular list of aircraft identities (ACIDs) and a flight plan display area containing the departure flight plan clearance of the select ACID.

INPUTS:
- ARTCC Host Computer

PROCESS:
- Capture flight plan data from FDIO line

OUTPUTS:
- Display flight plan to the flight data operator
- Send flight plan data to airline computer
- Airline computer directs flight plan data to aircraft

SYSTEMS:
- FAA ARTCC Host Computers, ARINC Flight Data Network, Airline computers.

NAVIGATION

LORAN C

Loran C is a radionavigation system that provides signal coverage over the 48 states and the southern half of Alaska. The navigation service possible with Loran-C signals is adequate for the enroute, terminal, and approach phases of flight under instrument flight rules. A receiver measures the time of arrival of signals from three or more transmitting stations, and from these values computes aircraft position and guidance information. For use of Loran-C for nonprecision instrument approaches, additional calibration data is required. The FAA operates signal data monitors, which are the source of the calibration values published with approach procedures. The FAA monitors are interfaced with the VOR maintenance monitoring and with a data collection system at the FAA Aeronautical Center.

INPUTS:
- Loran-C transmitters
- Signal data monitors
- VOR maintenance monitoring
- Technicians

PROCESS:
- Receive Loran-C signals
- Compute navigation solutions
- Apply correction values for approaches
- Complete intended flight procedure

OUTPUTS:
- Data for use with approach procedures
- Airport measurement of signals
- Approach procedures

SYSTEMS:
- VOR maintenance system, Loran-C Data System, Loran Site Evaluation System

NAVIGATION

RUNWAY VISUAL RANGE (RVR)

The RVR system generates instrumentally-measured RVR information provided to pilots prior to takeoff and landing. The information represents the horizontal distance a pilot can see down an instrument runway.

INPUTS:
- Visibility sensor
- Ambient Light Sensor (ALS)
- Runway Light Intensity Monitor (RLIM)
- Sensor Interface Electronics (SIE)

PROCESS:
- The Atmospheric scatter coefficient, ambient light level, and runway edge and centerline light setting levels are measured by the visibility sensor, ALS, and RLIM, respectively
- All sensor output signals are acquired by SIEs, and then digitized, processed, formatted, and transmitted as a single data stream to a Data Processing Unit (DPU)
- The DPU accepts and reduces data, implements algorithms, and continuously distributes the RVR product (RVR visibility data, runway light intensity levels, and trend information) to controller displays and external interfaces

OUTPUTS:
- The controller displays receive incoming serial data streams from the DPU, perform error checks, format and display RVR visibility values, trend information, and runway light setting levels for controller-selected runways. The displays issue both aural and visual alarms when an RVR value decreases below preset alarm limits, or when a failure occurs
- A system console (SC) consisting of a display, microprocessor, and keyboard is used by a qualified maintenance technician to monitor the system status and output, reconfigure, and initialize the system

INTERFACED SYSTEMS:
- External coded time source, external users (National Weather Service, airlines), Remote Maintenance Monitoring System, Maintenance Data Terminal, future applications (TCCC).

SURVEILLANCE

AUTOMATIC DEPENDENT SURVEILLANCE (ADS)

Automatic Dependent Surveillance is a function for use by air traffic services in which aircraft automatically transmit, via a data link, information derived from on-board navigation systems. The data includes three dimensional position and time. An ADS-based ATC system includes the capability to exchange messages between the pilot and the controller via data link and by voice for emergency and non-routine communications. Position data is most beneficial in non-radar airspace where little or no direct pilot/controller communication is presently available.

INPUTS:
- On-board navigation systems

PROCESS:
- Make determination of exact position in the airspace
- Make selectable interval position reports via satellite communications

OUTPUTS:
- ADS surveillance capability Two-way pilot-controller data link communication Improved Human Computer Interface (HCI) for message composition and transmission

INTERFACED SYSTEMS:
- ODAPS with ADS capability, avionics with ADS function, satellites to relay transmissions between aircraft and ground/earth stations, ground/earth stations to communicate messages between ATC facilities and the satellites.

SURVEILLANCE

AIRPORT SURFACE DETECTION EQUIPMENT (ASDE-3)

The ASDE-3 system is a high-resolution ground mapping radar system that presents controllers with a precise picture of airport ground traffic at all times, even when visibility is severely curtailed. It can be used in all weather conditions to determine that aircraft are not on the correct runway or taxiway, and that the active runways are not obstructed. It helps ensure effective monitoring of all ground traffic.

INPUTS:
- Self-contained radar system (T/R, processor, and displays)
- Controller keyboards
- Air Traffic Control Specialist
- Technicians

PROCESS:
- System processes radar returns for display

OUTPUTS:
- Primary radar targets displayed on ASDE indicators
- Performance data for Maintenance Processor Subsystem (MPS)

INTERFACED SYSTEMS:
- None

SURVEILLANCE

AIRPORT SURVEILLANCE RADAR (ASR)

ASR consists of several generations of airport surveillance radars currently in use. The latest, ASR-9, is a state- of-the art solid-state radar system. It provides extremely accurate aircraft positional information within a 60 nautical-mile range. The ASR-9's moving target indicator ensures that all aircraft within its range are detected and continuously displayed. The ASR-9 as a separate weather channel that generates up to six levels of weather, any two of which can be selected by controllers simultaneously.

Through the use of redundant solid-state electronic components, the ASR-9 achieves an availability of 99.98 percent, or less than four hours of down time per year. It incorporates remote maintenance monitoring technology that continuously monitors radar status, performance parameters, engine generator and site security.

INPUTS:
- Reflected aircraft returns
- Reflected weather returns
- Aircraft transponders
- Air Traffic Control Radar Beacon System (ATCRBS)
- Internal diagnostic adjustment signals

PROCESS:
- Analyze and process aircraft radar and beacon data
- Analyze and process six levels of weather data
- Correlate radar and beacon data
- Process and eliminate ground clutter

OUTPUTS:
- Display radar and beacon data to controller (direction and altitude)
- Display weather information to controller (direction, coverage and intensity level)

INTERFACED SYSTEMS:
- ARTS (IIA, IIIA, IIIE), Mode C Intruder, Mode S, LLWAS, RMMS, DBRITE, MSAW

SURVEILLANCE

AIR ROUTE SURVEILLANCE RADAR (ARSR)

Surveillance of the airspace is provided by two types of radar: primary radar and the radar beacon system, sometimes known as secondary radar, or beacon system. The beacon system receives reply signals transmitted from aircraft transponders. These signals are processed to show aircraft's real-time position. On aircraft equipped with altitude encoders, the transponder automatically transmits altitude information.
The beacon system is presently the main source of surveillance for air traffic control.

INPUTS:
- Air Traffic Control Radar Beacon System (ATCRBS)
- Aircraft transponder

PROCESS:
- Ground-based beacon interrogator
- Receive beacon code from aircraft
- Analyze code and process data

OUTPUTS:
- Display position of aircraft
- Display aircraft's altitude

INTERFACED SYSTEMS:
- Host Computer, Enroute Automated Radar Tracking System (EARTS), transponders

SURVEILLANCE

NEXT GENERATION WEATHER RADAR (NEXRAD)

The National NEXRAD program is a tri-agency program created to develop and implement a national network of advanced Doppler weather surveillance radars (WSR-88D). Sponsors and level of support are: DOC, 60%, DOD, 20%, and DOT, 20%. The DOT and DOC systems are maintained and operated by the National Weather Service (NWS).

The FAA has its own off-shore NEXRAD program that will consist of 13 to 15 systems in Alaska, Hawaii and Puerto Rico. These systems will be solely owned and maintained by the FAA, but operated by the NWS.

A NEXRAD unit consists of three subsystems, the radar acquisition subsystem (RDA), the radar product generator subsystem (RPG), and the principal user processor subsystem (PUP).

INPUTS:
- Radar Signal
- Technicians
- Meteorologists/Keyboard entries

PROCESS:
- RDA receives the radar signal, converts the radar signal to a data base for reflectivity, velocity and spectrum width.
- RPG composes data into 43 NEXRAD products for reflectivity, velocity, and special use.
- PUP displays NEXRAD products.

OUTPUTS:
- NEXRAD products to PUP and external users.

INTERFACED SYSTEMS:
- NWS Family of Services.
- Weather and Radar Processor (WARP).
- Distribution ports.

SURVEILLANCE

PRECISION RUNWAY MONITOR (PRM)

The PRM is designed to apply an improved radar to alleviate delays created during instrument weather conditions. The PRM provides the radar and associated procedures for controllers and pilots to yield runway acceptance and departure rates that more closely approximate those in visual weather conditions. The PRM system consists of an improved monopulse antenna system that provides high azimuth and range accuracy and higher data rates than terminal ASR system radars, a processing system that monitors all approaches, and generates controller alerts when aircraft appear to be blundering.

INPUTS:
- Aircraft transponder
- ARTS III equipment
- Controller keyboards
- Controllers and technicians

PROCESS:
- Receive beacon code from aircraft
- Transmit data to display via passive ARTS III interface
- Update aircraft position every one second

OUTPUTS:
- High resolution indicators display ARTS III data on CRT displays
- Provides visual and aural alarms to final monitors

INTERFACED SYSTEMS:
- Passive ARTS III interface, two-way ARTS III interface, visual and audio recording and playback equipment, telephone lines, ICSS and other related communications systems.

SURVEILLANCE

TERMINAL DOPPLER WEATHER RADAR(TDWR)

Terminal Doppler Weather Radar (TDWR) is C-band pencil beam radar that detects low level wind shear and microbursts. The radar, located ten to twelve miles from the airport, provides optimum coverage to the primary runways. The primary areas of protection are three miles from the approach end of the runway, one half mile each side of the centerline, and two miles from the departure end one half mile each side of the centerline, plus the entire length of the runway one half mile each side of centerline. When a wind shear or micro-burst is detected within these areas, a warning message is displayed to the tower controller, who relays the information to the aircraft.

INPUTS:
- Severe Weather

PROCESS:
- Searches severe weather areas
- Analyzes weather returns
- Processes weather returns
- Locates wind shear or micro-burst

OUTPUTS:
- Wind shear and micro-burst warnings

SYSTEMS:
- Low Level Wind Shear Alert System (LLWAS), ARTS

SURVEILLANCE

VERY HIGH FREQUENCY DIRECTION FINDER SYSTEM (VHF/DF)

The 10121 VHF DF system provides the specialist the capability to graphically display an aircraft position within an automated flight service stations (AFSS) flight plan area. The aircraft's bearing is determined using pilot transmissions as detected by strategically placed antennae. This bearing data is transmitted to a computer-displayed map which allows the operator to determine aircraft position and provide guidance to an airport. Each AFSS DF system will be capable of interconnecting with and controlling a maximum of 24 DF antennae. The AFSS site equipment consists of the Remote Maintenance Monitor and Control (RMMC) Subsystem and the Informational and Display Unit (IDCU) Subsystem. A subsystem at the antenna site receives, and transmits the bearing and status data to the RMMC. Bearing-related information is routed by the RMMC System to the IDCU where the data is displayed and used for aircraft guidance purposes. The system data base contains airport, NAVAID, obstruction and landmark data.

INPUTS:
- Signals from the DF antennas
- Commands from the RMMC and IDCU
- Pilot voice transmissions
- Status/alarm data from the RMMC
- Operator input

OUTPUTS:
- Computed bearings
- Pilot voice transmissions
- Status/alarm/diagnostic data
- Aircraft status data
- Map displays
- Commands to the IDCU System
- Polling inquiries to the DF antenna and components
- System status data to the IDCU screen and printer

PROCESS:
- Receive aircraft transmission
- Demodulate signal and digitize readings
- Determine digitized bearing and aircraft position
- Maintain and update data continuously

INTERFACED SYSTEMS:
- Telephone lines, antenna array which includes 9964 and 5530 series DF antennae and the 10121 antenna

SUPPORT INTERFACES

AUTOMATED SURFACE OBSERVING SYSTEM (ASOS)

The ASOS is a 24-hour, real-time weather data collection and display system. The ASOS is installed at sites ranging from remote, unattended airports to sites with air traffic control towers located on the airport. These systems collect, analyze, and broadcast data automatically with no operator involvement. Using a computer-generated voice, ASOS provides weather reports directly to pilots by air-to-ground radio. These voice reports can also be accessed by telephone from any location. An operator terminal/display can be provided to indicate up-to-the-minute weather data if required.

INPUTS:
- Meteorological sensors:
  - wind speed/direction
  - temperature
  - dew point
  - barometric pressure
  - sky condition
  - visibility
  - Present weather
- Operator terminal

PROCESS:
- Sensors detect weather and provide information to data collection platform (DCP)
- Reformat and consolidate data
- Transmit data to system processor
- Apply algorithms to data
- Formulate observation
- Transfer to displays, voice synthesizer, and national weather network

OUTPUTS:
- Display processed data on video displays
- Store archived data in memory
- Generate voice for air-to-ground radio telephone access
- Provide data to national weather network

INTERFACED SYSTEMS:
- AWOS Data Acquisition System (ADAS), GS200 Runway Visual Range (RVR), Tower Control Computer Complex (TCCC), Airport Terminal Information Service (ATIS)

SUPPORT INTERFACES

AUTOMATED WEATHER OBSERVING SYSTEM (AWOS)

The AWOS is a 24-hour, real-time weather data collection and display system. The AWOS is primarily located for use at unattended or remote sites, however, there are 20 U.S. AWOS installations at flight service stations (FSS), and towered airport locations. AWOS collects, analyzes, and broadcasts data automatically with no operator involvement. Using a computer-generated voice recording, AWOS provides weather reports directly to pilots via radio. These voice reports can also be accessed by telephone from any location. An operator terminal/display can be provided to indicate up-to-the-minute weather date if required.

INPUTS:

- Meteorological sensors:
  - wind speed/direction
  - temperature
  - dew point
  - barometric pressure
  - sky condition
  - visibility
- Operator terminal

PROCESS:

- Sensors detect weather and provide information to data collection platform (DCP)
- Reformat and consolidate data
- Transmit data to system processor
- Apply algorithms to data
- Format observation

OUTPUTS:

- Transfer processed data to displays, voice synthesizer, and national telecommunications network
- Store archived data in memory
- Generate voice message for radio and telephone access

INTERFACED SYSTEMS:

- AWOS Data Acquisition System (ADAS), GS200 Runway Visual Range (RVR), Tower Control Computer Complex (TCCC), Automated Terminal Information System (ATIS)

SUPPORT INTERFACES

AWOS DATA ACQUISITION SYSTEM (ADAS)

The Automated Weather Observing System (AWOS) obtains aviation-critical weather data through the use of automated sensors. It will process the data for dissemination to pilots. The ADAS collects and concentrates weather messages from AWOSs and ASOSs for internal distribution within the ARTCCs and national distribution via the Weather Message Switching Center Replacement (WMSCR). The systems within the ARTCC will be connected to the ADAS. ADAS will be located in each of the ARTCCs, CERAPs, the FAA Technical Center, and the FAA Academy.

INPUTS:
- AWOS/ASOS surface observations

PROCESS:
- Decode and check incoming data
- Generate additional parameters
- Prepare output data products and messages

OUTPUTS:
- Disseminate both periodic and event-driven weather messages to RWPs, DLPs, and national weather network
- Store archived data in memory

INTERFACED SYSTEMS:
- WMSCR, NADIN II, Central Weather Processor (CWP), Datalink Processor (DLP), Maintenance Processor Subsystem (MPS), Local Communications Network (LCN), AWOS, ASOS, Weather and Radar Processor (WARP), and Coded Time Source (CTS)

SUPPORT INTERFACES

DIRECT USER ACCESS TERMINAL (DUATS)

DUATS is an FAA-funded service that allows pilots to access preflight weather and aeronautical information and to file flight plans through the se of personal computers. It is designed to eliminate the need for pilots to contact flight service stations for this information and service. Initially, the service is being provided by two commercial vendors, with no direct cost to the pilot. The vendors bill the FAA for each transaction with pilots.

The initial implementation of DUATS was restricted to civil pilots operating within the 48 conterminous states. Because of their unique mission requirements, military operations were excluded.

INPUTS:
- NWS
- NFDC
- Pilot requests for meteorological data
- Pilot requests for aeronautical data
- Pilot enters flight plan data

PROCESS:
- System stores data received from various sources
- Systems provides menus of services and data for pilot
- Contractor personnel correct flight plan input errors
- Correct flight plans are transmitted to appropriate air traffic facility
- Historical data is retained for search and rescue purposes

OUTPUTS:
- System displays requested data
- System acknowledges receipt of flight plan information
- Record of transaction is compiled for billing purposes

SYSTEMS:
- WMSC, NADIN, USNS/CNSP, Host Computer, vendor-developed software, communications facilities

SUPPORT INTERFACES

HAZARDOUS INFLIGHT WEATHER ADVISORY SERVICE (HIWAS)

The HIWAS is designed to provide airborne pilots with a continuous broadcast of hazardous weather information conditions within 150 miles of the communications outlet. Information approved for broadcast on HIWAS includes Convective Sigmets, Sigmets, AIRMETs, Center Weather Advisories, Severe Weather Warning Alerts, Urgent Pilot Reports, and hazardous portions of the Area Forecast.

INPUTS:
- FSS Specialists
- ICSS equipment

PROCESS:
- Records voice messages from specialists on digital media
- Converts digital messages to analog signal

OUTPUTS:
- Continuous voice broadcast

INTERFACED SYSTEMS:
- Telephone lines, ICSS, and radio transmitters at VOR and VORTAC sites.

SUPPORT INTERFACES

METEOROLOGICAL WEATHER PROCESSOR (MWP-1)

The MWP-1 is an interim, leased weather information system deployed at the ARTCCs and the Air Traffic Control System Command Center (ATCSCC). The MWP workstation is located in the Center Weather Service Unit (CWSU) within each ARTCC. The ATCSCC has two systems located in the Central Flow Weather Service Unit (CFWSU). Associated Briefing Terminals are located in the ARTCC Traffic Management Units (TMU), and in each area of specialization. Also, Traffic Management Specialists (TMS) have briefing terminals at their workstations. The current MWP-1 lease expires in FY 1995. The requirements for MWP-2 are being developed.

INPUTS:
- Weather data
- Meteorologist-entered data
- Satellite transmissions

PROCESS:
- Receives, stores and disseminates weather data from the satellite link
- Meteorologist creates weather products for area of responsibility

OUTPUTS:
- Meteorologist-created products
- Weather data

INTERFACED SYSTEMS:
- National Weather Service family of services

SUPPORT INTERFACES

WEATHER MESSAGE SWITCHING CENTER REPLACEMENT (WMSCR)

The WMSCR replaces the Weather Message Switching Center (WMSC) with state-of-the-art equipment and technology to perform all current alphanumeric weather data handling functions of the WMSC in addition to the storage of NOTAMs. Further, the system accommodates graphic data and functions as the primary FAA gateway to the National Weather Service Telecommunications Gateway (NWSTG), which is the source of NWS products for the NAS.

INPUTS:
- Graphic Weather Display System
- National Meteorological Center (NMC)
- National Severe Storm Forecast Center (NSSFC)
- Military weather data
- Aviation Weather Processor (AWP)
- Consolidated NOTAM System Processor (CNSP)
- NADIN II
- Operator/technician

PROCESS:
- Receives aeronautical information and weather
- Processes and stores data
- Transmits data

OUTPUTS:
- Alphanumeric/graphic weather products
- NOTAMs

INTERFACED SYSTEMS:
- Data communications circuits, Aviation Weather Processor (AWP), Consolidated NOTAM system, NADIN II, Remote Maintenance Monitoring System (RMMS)

SUPPORT INTERFACES

RADIO CONTROL EQUIPMENT (RCE)

The RCE program is intended to replace existing aged vacuum tube and early solid-state tone control equipment with modern solid-state and digital equipment. The equipment to be procured will be currently manufactured items, available from commercial sources. Little or no development or custom engineering will be required. The RCE program will replace equipment in all air/ground communication environments including: ARTCC/RCAG, TRACON/RCF and AFSS/RCO.

INPUTS:
- Controller-initiated voice communication to aircraft
- Pilot initiated voice communication to controller

PROCESS:
- Controller voice signal processed and sent to communication outlet via telephone circuits
- Pilot voice signal received and forwarded to controller via telephone circuits
- Full-duplex

OUTPUTS:
- Voice transmission to aircraft
- Voice transmission to controller

INTERFACED SYSTEMS:
- Remote communication outlets (transmitter/receiver facilities), RCE control unit, telephone circuits.

SUPPORT INTERFACES

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER (ATCSCC)

The ATCSCC is a traffic management facility staffed by ATC controllers with specialized traffic management training, and by National Weather Service personnel. The ATCSCC manages the flow of traffic throughout the NAS to achieve the optimum use of the navigable airspace and to minimize the effect of delays on the user without allowing demand to exceed capacity. The ATCSCC is responsible, on a system-wide basis, for coordinating and approving all major inter-facility traffic management restrictions and for coordinating non- standard routings around areas of severe weather. The following functions are also housed within the ATCSCC: Central Altitude Reservation Function (CARF), responsible for planning, coordinating and approving special user requirements using altitude reservations (see CARF below); Airport Reservation Office (ARO), responsible for approving IFR flights at designated high density traffic airports (JFK, LGA, ORD, and DCA) during specified hours; and the ATC Contingency Command Post, a facility that enables the FAA to manage the ATC system when significant portions of the system's capabilities have been lost or are threatened.

AERONAUTICAL RADIO INCORPORATED (ARINC)

ARINC is a not-for-profit, airline industry-owned and operated company providing voice and data communications services worldwide. Many airlines use ARINC's data communications for filing flight plans. ARINC also operates air/ground voice and data networks that airline companies use to communicate with airborne flights. Many aircraft flying in oceanic airspace receive air traffic control clearances and relay position reports via ARINC.

AVIATION WEATHER PROCESSOR (AWP)

The AWP, collocated at the two NADI sites, are automated switches that provide operational databases of weather information used at the twenty Flight Service Data Processor Systems (FSDPS), which support the network of Automated Flight Service Stations.

CENTER WEATHER SERVICE UNIT (CWSU)

CWSUs are National Weather Service (NWS) units located within each of the 20 domestic ARTCCs to provide on-the-spot operational weather data unique to the individual center's area of responsibility. A similar unit, the Central Flow Weather Service Unit (CFWSU), is located at the Air Traffic Control System Command Center (ATCSCC) in Washington D.C., and provides information of a national scope in support of their mission.

CENTRAL ALTITUDE RESERVATION FUNCTION (CARF)

CARF is the primary liaison between the military and civil air traffic control organizations. It supports the National Airspace System by planning and coordinating air traffic clearances for military air exercises, mass movements of military aircraft, and other special user requirements. CARF also obtains clearances for special military movements that traverse or terminate in a foreign country, and resolves conflicts within and between military reservation movements.

CENTRAL FLOW WEATHER SERVICE UNIT (CFWSU)

CFWSU is located in the Air Traffic Control System Command Center (ATCSCC), staffed 24 hours a day by National Weather Service meteorologists under contract to the FAA. Its primary purpose is to provide aviation weather information and forecasts for use in Traffic Management planning. It also serves as a back-up source of weather information to other ATC facilities. Its sources of weather data include the Meteorological Weather Processor (MWP), and the automated weather graphics networks.

DEPARTMENT OF DEFENSE (DOD)

DOD is a source of information on military air traffic facilities and functions that have direct impact on civil ATC operations, such as special use airspace, military exercises, range use, etc. In some locations, DOD are the exclusive providers of ATC services to the National Airspace System.

FAA AERONAUTICAL CENTER (FAAAC)

The FAAAC, located in Oklahoma City, OK, provides two major support functions: The FAA Logistics Center is the supply and repair center for critical air traffic system equipment; and the FAA Academy provides initial screening and training of Air Traffic control and automation specialists. Training is provided through the use of computer-driven simulators, laboratories and classrooms.

FAA TECHNICAL CENTER (FAATC)

The FAATC. located near Atlantic City, NJ, provides technical support the ATC system in areas such as software development and trouble-shooting, ATC simulation, and facility mockups. The FAATC is a primary source of air traffic-related R,E&D activities.

FLIGHT STANDARDS (FS)

Flight Standards organizations support the air traffic operation by development and certification of standard instrument approach and departure procedures, flight inspection and documentation of the various components of the system, such as navigation aids and airways.

NATIONAL AIRSPACE DATA INTERCHANGE NETWORK (NADIN)

NADIN, redundant facilities in Atlanta and Salt Lake City, provides automated interchange of operational (such as flight plan and aircraft movement) data and administrative message between air traffic facilities.

NATIONAL FLIGHT DATA CENTER (NFDC)

NFDC, located in Washington, D.C., is the central air traffic focal point for aeronautical information. It receives input from field offices of Flight Standards, airports, and air traffic; validates the data; and passes it on to the National Oceanographic and Atmospheric Administration (NOAA) for inclusion in publications and charts. NFDC also generates FDC NOTAMS for distribution in the U.S.N.S.

NATIONAL MAINTENANCE COORDINATION CENTER (NMCC)

NMCC is the Airway Facilities (AF) counterpart of the Air Traffic Control System Command Center (ATCSCC). It is collocated with the ATCSCC in Washington, D.C., and supports the National Airspace System (NAS) by providing national coordination of facility restoration activities. Such activities may be the result of facility outages, accidents, disasters, or other issues critical to the safe and efficient movement of air traffic. The NMCC keeps the ATCSCC advised as the status of equipment and facilities within the NAS.

NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

NOAA, a service of the Department of Commerce, provides support of air traffic operations in the forms of navigational and reference charts and publications. Another key product is video maps used in ATC radar systems.

NATIONAL WEATHER SERVICE (NWS)

NWS, a service of the Department of Commerce, provides support of air traffic operations in the form of weather reports, forecasts, and advisories. NWS personnel also certify FAA weather observers and provide direct staff support in the Central Flow Weather Service Unit (CFWSU) and the Center Weather Service Unit (CWSU).

SYSTEM SUPPORT FACILITY (SSF)

The SSF is a separate facility or staff established within another facility, which provides support to other air traffic control facilities in the form of air traffic automation data systems expertise and program (software) modifications.

TRAFFIC MANAGEMENT UNIT (TMU)

TMUs are located in each ARTCC and in the larger terminal air traffic facilities. They are staffed by specially trained air traffic controllers who manage and balance air traffic flows within their areas of responsibility in accordance with national direction and terminal capabilities. Additionally, ARTCC TMUs are staffed with weather coordinators who provide an interface between NWS personnel in the ARTCC CWSU and air traffic personnel.

VOLPE NATIONAL TRANSPORTATION SYSTEMS CENTER (TSC)

TSC, located in Cambridge, MA, is responsible for system development, hardware configuration, and software support for the Enhanced Traffic Management System (ETMS), the operational system used to manage the flow of traffic in a manner that will reduce congestion and delays. TSC's overall objective with ETMS is to maintain and upgrade the traffic management hardware and software to meet current and future traffic management requirements.

UNITED STATES NOTAM OFFICE FACILITY (USNOF)

A section of the NFDC, the USNOF is a central collection and distribution point for all NOTAM information used by operational air traffic facilities. It receives domestic NOTAM input from flight service stations, international NOTAMS from the NOTAM offices of other countries, and information from other parts of the NFDC. Operations of the USNOF are supported by the Consolidated NOTAM System Processor (CNSP).

ATC FLIGHT SCENARIOS

Note: *These Scenarios describe commercial, general aviation, military, rotorcraft, and other selected types of flight operations, detailing the actions taken by controllers and by pilots. Like all sections, they can be tracked through the publication's "outyear" sections to allow comprehensive knowledge of changes to the system.*

COMMERCIAL CARRIER (DOMESTIC SERVICE) FROM/TO AIRPORTS WITH A CONTROL TOWER

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Pilot in command obtains briefing from aircraft dispatcher, who authorizes flight.	
2. Verify IFR flight plan and notify changes to air traffic as required.	
3. Contacts ground control/clearance delivery prior to engine start.	
	4. Issues engine start time, taxi or clearance information, departure control frequency,and beacon code.
5. After receiving clearance, contacts ground control for taxi clearance if not previously provided.	
	6. Issues taxi instructions.
7. Acknowledges and follows taxi instructions.	
8. Contacts local control for clearance to take off.	
	9. Issues departure information and takeoff clearance.
	10. After takeoff, instructs pilot to contact departure controller (TRACON).
11. Flies specific departure route, climbing to assigned altitude, and contacts departure control as directed.	
	12. Provides air traffic control service from point of handoff to enroute controller (ARTCC).

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	13. Transfers radio communications and control responsibility to enroute controller and instructs pilot to contact the next facility, by name, on a specified frequency. Repeated as required from sector to sector.
14. Contacts enroute controller and reports altitude.	15. Confirms radar contact and issues control instructions as required.
16. Adheres to assigned airways, routes, and altitudes.	
	17. When aircraft is nearing destination, a clearance time is specified — including route, altitude information, and instructions on further communications.
	18. Transfers radio communications and control responsibility to approach controller (TRACON).
	19. Instructs pilot to contact approach control on a specific frequency.
20. Contacts approach controller, confirms position and altitude, and advised of any approach requirements or requests.	
	21. Clears aircraft for approach, issues special instructions/radar vectors where appropriate. Instructs pilot to contact tower.
22. Follows specific approach procedures and contacts tower when instructed.	
	23. Acknowledges initial contact and issues landing instructions or clearance.
	24. Instructs aircraft when to turn off runway and contact ground control.
25. Exits runway without delay. Change to ground control frequency when instructed by tower.	
	26. Ground control issues specific instructions to direct pilot to gate area.

Note: Flight crew and air traffic control actions are subject to traffic management action or initiatives, which are taken in response to air traffic demand (and in excess of capacity) to direct aircraft to avoid severe weather. The Air Traffic Control System Command Center (ATCSCC) transmits advisories to airline dispatch offices concerning the status of the national management initiatives. These initiatives in response to excess demand frequently utilize delay departure times to smooth the flow of traffic and to avoid costly airborne holding. Initiatives designed for severe weather avoidance usually result in a non-standard route of flight. Flight planning by the dispatcher and crew take into account possible ground delays and non-standard routings.

TRAFFIC MANAGEMENT AIR CARRIER FLIGHT FROM ATLANTA (ATL) TO CHICAGO O'HARE (ORD)

Early in the morning, traffic management specialists (TMS) at the Air Traffic Control Systems Command Center (ATCSCC) receive a weather briefing from National Weather Service (NWS) personnel located at the Central Flow Weather Service Unit (CFWSU). They are told that weather at Chicago's O'Hare International (ORD) will experience low ceilings, reduced visibility and rain showers. Also, thunderstorm activity is expected to occur along a cold front extending from southwest Tennessee to northeast Georgia. The thunderstorms are predicted to be most numerous in the area north of Atlanta, GA.

At the same time, traffic management specialists in the Chicago and Atlanta Air Route Traffic Control Center Traffic Management Units (ARTCC TMUs) are receiving similar briefings from NWS personnel located in the Center Weather Service Units (CWSU) at their facilities. The TMS' and supervisors at all three facilities are beginning to consider the impact that this adverse weather will have upon air traffic operations, and what actions will be required to mitigate that impact.

Later in the morning, the National Traffic Management Officer (NTMO) at the ATCSCC conducts one of two daily telephone conference (TELCON) briefings with Traffic Management personnel from each of the ARTCCs and the larger airport air traffic facilities, and representatives of the major airline dispatch offices. The briefing begins with a summary of the known and expected constraints on the National Airspace System (NAS) such as adverse weather, airport construction activity, and other factors, and evolves into a discussion of probable results or traffic management actions that may be required. During this briefing, the airline dispatch offices are made aware that traffic management actions, or initiatives, may be required for aircraft flying to ORD and for aircraft flying on routes that normally traverse the area where thunderstorms are predicted to exist.

Specialists at the Atlanta ARTCC TMU have decided to plan for possible reroutes around severe weather if thunderstorms close normal routes. They coordinate this information with the ATL approach control (TRACON) and tower (ATCT), and with the Severe Weather and National Route Management (NRM) specialist at the ATCSCC. The NRM specialist sends a message to the airline dispatch offices advising that flights to ATL, or through the area north of Atlanta can expect to be rerouted around areas of severe weather.

Meanwhile, the TMS responsible for the central portion of the country is considering the situation at ORD. This will require increased spacing between aircraft, which will reduce the arrival capacity of the airport. In addition, the rain will leave runways wet, thus reducing braking traction. So, instead of being able to land aircraft on three runways at the same time, only two runways will be available for arrivals. Given these conditions, the specialist calculates the airport's arrival capacity.

The Specialists then accesses a computer database that stores records of all regularly scheduled flights to determine the number of aircraft scheduled to arrive at ORD will exceed the

available capacity. If nothing is done to manage this situation, the result will be aircraft stacked in holding patterns over the airport waiting their turn to land. This would significantly increase controller workload, waste fuel and reduce equitable access to the airspace for other aircraft.

The ATCSCC central area specialist, having determined that a problem exists, decides to conduct a conference call with the Chicago ARTCC TMU and the ORD TRACON TMU, to determine a course of action. Another check is made with the meteorologists at the CFWSU and the Chicago CWSU, and they agree that there will be low ceilings and rain all day at ORD. Specialists at ORD TRACON confirm that they will only be able to land on two runways. All concerned facilities agree that the projected arrival capacity will be 65 aircraft per hour. A check of the flight schedule data base shows that the hourly demand will indeed exceed the 65 aircraft arrival rate. A national traffic management initiative is agreed to by all to regulate the traffic flow to ORD in such a manner to achieve a 65 aircraft per hour arrival rate and provide a reservoir of aircraft at or near ORD to accommodate any fluctuation in the projected and actual capacity rate at the ETA. The primary method used to control demand will be a ground delay program. The ground delay program will assign each scheduled flight a controlled departure time that is calculated to achieve a 65 flight-per hour arrival rate at ORD. This results in most delays being taken on the ground rather than in enroute.

The ATCSCC specialist makes one more telephone call before implementing the ground delay program. These calls are to the airline dispatch offices responsible for many of the flights going to and from ORD. Their purpose is to seek an opinion of the weather and its effect on operations, from the perspective of the carrier's meteorologists and dispatchers. They concur with the NWS forecasts and agree that conditions justify a ground delay program. The specialist then discusses these events with the NTMO and receives approval to implement a ground delay program at a rate of 65 arrivals each hour.

The ATCSCC specialist then initiates a program, Managed Arrival Reservoir (MAR), that will release a predetermined number of aircraft unrestricted and assign other flights going to ORD controlled departure times (CDTs). Each CDT is based on controlling the departure time of each flight. The arrival times of these flights are adjusted so that 65 flights will arrive, spread evenly throughout each hour. A list of CDTs for aircraft departing each ARTCCs airport is sent to that ARTCC and a list of CDTs for airline flights is sent to that airline. Also, an advisory is sent to all affected air traffic facilities and to all affected airline dispatch offices describing the reasons for and the details of the program.

The ABC airline dispatch office, in preparing for flight number 123 from ATL to ORD, is aware of the CDT assigned to this flight and the additional possibility of being rerouted around forecast severe weather north of Atlanta. These considerations are discussed with the flight crew during the preflight briefing. A flight plan is filed by the dispatch office and is routed, via computer network, to the Atlanta ARTCCs Host Computer. The Host Computer is interfaced with the traffic management computer used by the ATCSCC, and the CDT is automatically assigned to the flight plan. The CDT will appear on the flight plan when it prints out at Atlanta ARTCC, and at ATL tower and TRACON. Thus, the specialist in the tower issuing clearances knows that this flight is not authorized to depart before the CDT.

By this time, as forecast, a line of thunderstorms has developed north of Atlanta. Several aircraft have already deviated from their filed route of flight to avoid the storm, and the gaps through which they are penetrating the line are closing. Atlanta ARTCC TMU ;has instructed ATL tower to issue revised routings to those flights whose routes from Atlanta are to the north. Atlanta ARTCC TMU then contacts the ATCSCC so that alternate routes can be coordinated with adjacent ARTCCs, coordinates the routes, and then sends a message to the airline dispatch office advising of the reroute activity.

As the CDT for ABC 123 nears, the flight crew calls the tower for their clearance. They are advised of the severe weather north toward ORD. Flight ABC 123 departs ATL on its CDT, and enjoys a smooth flight to ORD. It lands without having deviated from its route incurring minimal, if any, airborne delay.

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITH CONTROL TOWERS

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Requests flight briefing and announces intention to file flight plan in person or by telephone with AFSS.	
	2. flight service provides weather and route briefing, accepts filed flight plan, and transmits pertinent flight plan data to the appropriate ARTCC for processing and entry into the automated system.
3. Contacts ground control/clearance delivery prior to engine start.	
	4. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne.
5. Acknowledges and follows ATC instructions.	
6. Requests that ATC cancel IFR flight plan while airborne, or, within 30 minutes after landing closes IFR flight plan with flight service.	

NOTE: General aviation aircraft are subject to the same traffic management initiatives that apply to scheduled air carrier flights. They are also subject to special traffic management initiatives due to excess demand at high density airports and in response to excess demand caused by special events (i.e., the Indianapolis 500, Kentucky Derby, Boston Marathon, etc. At high density airports, a reservation is required for general aircraft arrival and departure. Federal Aviation Regulations describe the rules and procedures used to fly to and from high density airports. Information concerning these programs is disseminated via a Notice to Airman (NOTAM) and the pilot will be made aware of responsibilities by the flight service specialist during the preflight briefing or when the pilot files the flight plan.

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITHOUT CONTROL TOWERS

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Requests weather and files flight plan via AFSS or vendor.	
	2. Flight service provides weather and route briefing and transmits pertinent flight plan data to the appropriate ARTCC
3. Advises flight service and other operators at the airport when ready to taxi out for departure.	
	4. Flight service relays ATC clearance, facility and frequency for control after departure, and provides airport weather and known traffic information.
5. After receipt and acknowledgment of IFR clearance, advises flight service prior to departure.	
6. After takeoff, follows published IFR departure procedure, and contacts the designated ATC facility.	
	7. Provides air traffic control service in the same manner as in air carrier operations while airborne.
8. Acknowledges and follows ATC instructions.	
9. When approximately 10 miles from destination airport, contacts CTAF and announces intentions.	
	10. When aircraft is nearing destination airport and direct communication and control is no longer required, issues clearance for the published instrument approach.
11. After landing, advised tie-in flight service station to close IFR flight plan with control facility.	

TRANSOCEANIC FLIGHT

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Pilot in command obtains briefing from aircraft dispatcher, who files IFR flight plan in accordance with ICAO procedures and formats, and authorizes flight.	
2. Contacts ground control/clearance delivery prior to engine start.	
	3. Issues engine start time, departure control frequency, beacon code, taxi and/or clearance information.
4. Reads back clearance to controller to ensure accuracy (readback is required per ICAO agreements).	
5. After receiving clearance, contacts ground control for taxi clearance if not previously provided.	
	6. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne within domestic airspace.
7. As aircraft approaches oceanic airspace, contacts enroute controller, reports altitude, and requests oceanic clearance from the controller responsible for the first oceanic area on flight route (if oceanic clearance not previously received).	
	8. Confirms radar contact, and aircraft is sequenced on cleared route to meet required oceanic separation.
	9. Issues oceanic clearance (if necessary) and control instructions.
10. Acknowledges receipt and reads back clearance to controller to ensure accuracy (required per ICAO agreements).	
11. Adheres to assigned routes and altitudes.	

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	12. Transfers control responsibility to appropriate oceanic sector.
	13. Coordinates transfer of control responsibility to receiving Flight Information Region.
14. Establishes communications with the appropriate oceanic radio station for passing required position reports.	
	15. Coordinates transfer of control responsibility to receiving flight Information Region (IFR) and passes transfer instructions to pilot thoughout the oceanic radio station.

NOTE: Aircraft flying to or from overseas destinations are not normally subject to traffic management initiatives taken in response to excess demand at airports. There are, however, constraints on the oceanic route system that frequency require traffic management action. Radar coverage does not extend over most oceanic airspace, therefore, non-radar separation procedures must be used. The increased separation requirements frequently result in demand of excess capability. The Air Traffic Control Center Command Center advises airline dispatch offices of potential delays due to this excess demand.

MILITARY AERIAL REFUELING AND TRAINING MISSION IN DOMESTIC AND SPECIAL USE AIRSPACE

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Obtains from base operations a preflight weather and mission briefing, including scheduled refueling time for designated refueling track and call signs for participating aircraft.	
2. Files flight plan with BASOPS.	
3. Follows military air traffic guidance until making contact with civil ATC services after departure.	
	4. Confirms radar contact, assigns beacon code and issues control instructions as necessary in similar fashion to those provided to commercial aircraft.
5. Contacts enroute controller and reports altitude. Requests clearance to enter the refueling track.	
	6. Authorizes aerial refueling within the specified track at the flight plan altitude and requests receiver aircraft to declare position when three miles from tanker aircraft.
	7. Releases to tanker aircraft appropriate communications frequency no later than the designated Air Refueling Initial Point (ARIP).
8. Maintains two-way radio contact with ATC until established in the altitude block, then contacts tanker.	
9. Tanker advises ATC that Military Assumes Responsibility for Separation of Aircraft (MARSA) is in effect. During refueling operations all communications with ATC is conducted by the tanker aircraft.	
	10. Avoids issuing altitude or course changes without tanker concurrence.
11. Tanker coordinates route and altitude clearance for both the receiver and tanker, and established vertical separation prior to reaching the planned exit point.	

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	12. Clears aircraft to depart the refueling track at a navigational reference point or egress fix.
13. Receiver contacts ATC and reports altitude, adheres to assigned airways, route and altitudes.	
	14. Provides ATC services until aircraft enters airspace dedicated to military training mission.
15. Aircraft completes training assignment and requests ATC clearance to reenter civil airspace and return to airport.	
	16. Provides ATC services in the same manner as provided to domestic carriers.

NOTE: The location and use times of aerial refueling tracks are established by Letters of Agreement between the scheduling military unit and the air traffic facility containing tract airspace. Normally, the military must provide advance notice of specific use times and aircraft call signs to the controlling air traffic facility. Also the using military unit may coordinate with the Central Altitude Reservation Function (CARF) for approval of an Altitude Reservation (ALTRV) to and from the aerial refueling track. CARF, located within the Air Traffic Control System Command Center in Washington, D.C. accomplishes advance coordination of the ALTRV mission requirements with all affected air traffic facilities. Thus, complex mission requirements or movement of large numbers of aircraft can be accomplished smoothly, and without impacting routine air traffic operations.

AFSS PROCESSING FOR VFR PILOT

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Calls the FAA 1-800-WX BRIEF telephone number at least 30 minutes prior to flight. Requests weather information and preflight briefing.	
	2. Call is handled by AFSS Preflight (PF) briefer standing by to relay information from Model 1 computer for data input and weather retrieval. PF also uses automated weather graphics system, which displays various weather maps.
	3. PF conducts standard weather briefing, including terminal area, enroute, and winds aloft observations and forecasts, etc.
4. Pilot decides weather is good for VFR flight, requests information about Notices to Airmen (NOTAMs).	
	5. PF relays local and distant NOTAMS that originate within the flight plan area, and FDC NOTAMS not formatted for the Model 1 computer.
7. Pilot files flight plan by reading specific aircraft data, characteristics, specific origin/ destination trip information, etc.	
	8. FSS specialist checks and accepts flight plan, and files with Flight Service Data Processing System.

AIRBORNE CHANGE IN FLIGHT PLAN

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Pilot determines a different destination. Calls AFSS closest to present position.	
	2. FSS Inflight (IF) specialist converses with pilot and provides additional briefing information such as weather, NOTAMS and route changes. Amend flight plan as necessary.
3. Pilot heads toward new destination. Once arriving, calls AFSS and closes flight plan.	
	4. AFSS Flight Data (FD) specialist closes flight plan.

THE FAA AIR TRAFFIC SYSTEM
VISION OF THE FUTURE

2000

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A TRIP THROUGH THE ATC SYSTEM

A. DOMESTIC FLIGHT.

Flying in the system in the years 2000 - 2004 sees avionics improvements that enable pilots to fly directly point-to-point on the most efficient route for a particular aircraft type. Tracking by the ATC system is precise and most communications between the aircraft and the ground are by datalink. The flight from Chicago to Washington demonstrates just how far ATC technology has progressed.

Most of the information needed for the flight is stored in data bases, ready for activation upon the decision to travel. ATC computers also provide weather forecasts and advisories specific to route and destination airport. These are stored in memory and print-outs are available for reference while in flight. Weather briefings are highly specific and customized, as the ability to forecast weather is dramatically improved. A centralized traffic management computer factors significant weather phenomena into its route-generation routines.

The accuracy of satellite and ground-based beacon surveillance systems ensure safety as the controller always knows the exact position and direction of movement of every vehicle on the field, even in the worst possible visibility. At most major airports lighting systems on the ground direct the aircraft to the end of the runway in preparation for takeoff. When it is time to depart, a local controller issues takeoff clearance, and the pilot moves the aircraft down the runway. As the aircraft lifts off, the pilot follows navigation coordinates loaded into the flight management system at the time the clearance was issued. The FMS has the flight's route coordinates all the way to Washington.

Air traffic computers, making both strategic and tactical plans and evaluations of the current situation in the air, provide controllers with the information necessary to issue instructions to enroute aircraft. The computers have the ability to look fifteen to twenty minutes ahead of the aircraft and predict potential conflicts long before they happen, so controllers can make the necessary adjustments to ensure aircraft separation. In addition, airborne collision avoidance equipment has been implemented throughout the fleet, including many general aviation aircraft flying within the ATC system. These systems serve as an additional safeguard to airborne conflict.

About 200 miles out of Washington, an ATC computer delivers a message that identifies the point in the sky where the aircraft is to begin descending, and the exact time it should reach that point. Reaching that point, the pilot begins the descent to National Airport. The aircraft follows a predetermined descent path toward the turn to final approach. Spacing on final approach and down to the runway involves critical parameters. Controllers issue instructions to maintain separation and exact timing as the aircraft approaches the runway threshold.

B. INTERNATIONAL FLIGHT.

On an international flight in 2000, the procedures followed by the pilot are exactly the same. Separation of aircraft is beginning to be achieved by using data derived from satellite-based

Automatic Dependent Surveillance information linked to the control positions in the oceanic sectors. A wide-spread implementation of this system will allow oceanic controllers the same degree of position accuracy as they have in the domestic system. Participating nations are linked up via satellite communications systems, datalinks and international computer networks so that information is shared with all the principal international terminals. Aircraft fly more minimum time track routes and altitudes (user preferred trajectories), optimizing fuel and time, and maximize the use of both airports and the airspace.

THE ATC PROCESS

The Air Traffic Control process in 2000 is characterized by high levels of automation in the various areas of control. However, the basic principles have not changed. In the preflight stage, pilots examine the data they need to operate their flight and notify the FAA of the proposed operation. ATC clearances, while still generated by tower controllers, are delivered in most cases via automated data channels, either to the commercial operator or directly to the aircraft. Controllers have sophisticated automation tools to assist them in directing the movement of aircraft, both on the surface and in the air, and highly accurate and reliable position data with which to ensure safe separation of all aircraft.

A. PREFLIGHT ACTIVITIES

In the area of preflight activities, the process has been simplified. The air traffic control computers maintain data bases of all aircraft types currently in service, along with airline schedules. These computers build dynamic models of the airspace to plan for the day's business. Each scheduled flight is projected along a route of flight that is direct to its destination, optimized for fuel efficiency, time enroute, and separation requirements. Air carrier flight planning, long a function of central dispatch offices, is highly streamlined. The dispatch office receives most of the information needed directly from the ATC system. Flight route plans are assigned by the air traffic computers based on traffic activity, weather forecasts, and current aeronautical information. Pilots receive a weather briefing relating specifically to their route of flight and destination, and are confident that the route recommended is optimized for conditions.

The preflight process for general aviation is streamlined as well. All 61 AFSSs are operational and the number of auxiliary FSSs is stable. The NOTAM function is fully automated.

Almost all briefings are conducted on terminals, either from home or at the Fixed Base Operation from which the flight will depart. Weather briefings are provided as an automated service, with high resolution graphics products available both at the computer terminal and on hard copy. Weather and aeronautical information is provided directly to pilots from a data base that is common to the AFSS, allowing pilots to consult with pilot weather briefers if necessary. Vendor operations providing briefings and flight plan filing continue to increase in numbers offering pilots a wide variety of choice.

The flight planning requirements for general aviation have been significantly reduced. Pilots now need only log onto a dedicated computer system located at a nearby facility, announce their aircraft identification, point of origin and destination, a requested takeoff time, and the computer responds with a preliminary clearance. This includes an optimized route of flight all the way to the destination and an expected departure clearance time. If pilots cannot make the departure time, they advise ATC and a new departure time is negotiated.

B. THE CLEARANCE PROCESS

In 2000, the clearance process is still a functional requirement of the air traffic control system. Clearances are issued to all aircraft flying in the system, but the method of developing and

delivering the clearances is automated. Central computers continuously process all the known data and develop a dynamic operational model of the system. The computer generates preliminary clearances for all known aircraft and sets them in a queue, either to wait for the request or to issue clearances to scheduled aircraft at predetermined times. The clearances include all pertinent information regarding weather phenomena and air traffic considerations. Each contains headings and instructions to departure fixes, and route and feeder fix coordinates. The information contained in the clearances is delivered via datalink systems, which are active as long as an aircraft has power, and messages can be delivered to an aircraft and placed in a message queue even when the pilot is away from the flight deck while an aircraft is at the gate.

The ATC system handles requests for clearance by unscheduled aircraft as they occur. Such requests are processed by the traffic management computer, which processes and displays for Traffic Management Specialists in the ATCSCC a dynamic picture of the system. Constantly updating its database, the traffic management processor assesses the current situation and generates a planned route of flight with two or three alternate departure times. The information is transmitted back to the pilot who made the request. Upon the acceptance of a departure time, the data changes are made within the ATC system and a clearance is issued. The clearance includes a controlled departure time. If the pilot misses that time, a new time may be negotiated with ATC.

C. SURFACE MOVEMENT (Departure Phase)

There is no change in the process of control of surface movement. The primary ATC functions of ground and local control are still in place, but tools for the position location and communication have been significantly improved. The primary control system at most of the larger airports is an automated surface lighting system that directs surface movement in much the same way as highway traffic lights. Both controllers in the tower and pilots in the cockpits have digital displays that present audible and visual alerts if a potential conflict exists. Ground controllers have highly accurate position data and positive identification of all aircraft and vehicles moving on the surface. Takeoff clearances are issued by the local controller, whose responsibility is to manage arrivals and departures in to a steady stream.

D. AIRBORNE PHASE

Control in the airborne phase is evolving into a more highly automated process, but the principal functions have not changed. Enroute controllers track the path of aircraft as they move through sectors of airspace, issue adjustments to flight paths for aircraft, and relay weather information to aircraft requesting assistance. A limited consolidation of air traffic control facilities has begun. Some arrival and departure facilities have been combined into Metroplex Control Facilities (MCFs), large regional terminal control facilities similar in function to the New York TRACON and Southern California TRACON. More accurate and reliable automation tools are available for controllers to handle vastly larger sectors of airspace; with planning tools that allow them to view situations in advance to assess the impact of a proposed change in flight routes of aircraft with others in the airspace. Enroute Flight Advisor Service (EFAS) is now located in IFR facilities to facilitate more timely processing and handling of PIREPs and the exchange of weather data. IFR facilities are now responsible for recording HIWAS messages.

Both separation and delivery of aircraft to arrival runways are based on time and distance. Controllers interact with aircraft only as a function of resolving a potential airborne conflict or to route an aircraft around weather. Both conflict detection and rerouting for weather are functions of the automation resident in the ATC computers, which look 20 minutes ahead of each airborne aircraft for potential conflicts. Controllers make the necessary adjustments well in advance of problems. Because routes are assigned based on arrival times, controllers using automation tools apply vectoring and speed management techniques to keep every aircraft on its flight plan to ensure that they reach the threshold of the arrival runway on time.

As aircraft approach their destination, timing of movement through arrival, or feeder fixes, is important. Automation tools provide controllers with exact plus or minus figures relative to the assigned time for each aircraft. Controllers then make the necessary adjustments to aircraft to keep them in conformance with the plan. Proper alignment of aircraft 200 miles out from the airport makes metering through terminal airspace, conformance with projected arrival times, and time spacing at the runway threshold much easier to perform. Controllers now have more sophisticated tools at their disposal.

Arrival and local controllers make micro-adjustments to descending aircraft to get them to the threshold at their assigned time. Precise timing is the necessary element of optimizing the capacity of an airport.

E. SURFACE MOVEMENT (Arrival Phase)

Movement control in the arrival phase is virtually the same as in the departure phase. Local controllers get the aircraft off the active runways, and ground controllers issue the necessary instructions to expedite movement of aircraft to their arrival gate. The controllers tools have improved dramatically, but the functions remain fundamentally unchanged.

ATC SYSTEM METHODOLOGY

The air traffic control system is undergoing many changes in the methodology used by both controllers and pilots in the execution of their roles. Both pilots and controllers share ground-based and airborne information for improvement in safety and efficiency of the system. The controller spends much more time in the strategic role of air traffic control and traffic flow management. Pilots, instead of being the recipient of services, become partners in providing airborne weather via automated datalink, and in limited cases, providing IFR separation between their aircraft and others.

In 2000, the FAA's NAS modernization plan is well under way. By 2002, the Host Computer System Replacement (HCSR) incorporates automation hardware and software to produce a highly reliable and flexible system that can be dynamically configured and reconfigured to satisfy the needs of the users and the demand on the system. It accomplishes a principal goal of the FAA to increase airspace and airport capacity through strategic planning, tracking, and efficient tactical control of aircraft. More accurate observation and forecast of weather and timely, credible communications systems enhance all phases of operations.

The 1994 Automation Strategic Plan includes the HCSR; the Display System Replacement (DSR), the controllers' common console workstations installed in 1998; the Tower Control Computer Complex (TCCC); Standard Terminal Automation Replacement System (STARS), hardware and software which consolidates and automates tower display systems; and Automated Enroute Air Traffic Control (AERA), a software system used for the tactical management of enroute traffic. In addition, controllers now have advanced stages of the Airport Surface Traffic Automation (ASTA) system; instant data from an all new Operational Database Management system (ODMS); and accurate weather data from the Weather and Radar Processor (WARP), the Integrated Terminal Weather System (ITWS) and the Aviation Weather Products Generator (AWPG).

A new advanced functionality of the Enhanced Traffic Management System (ETMS) automation has been implemented to perform the functions of the Traffic Management System. The ETMS performs the strategic planning required of the system. Using data gleaned from airline schedules, filed flight plans, connectivity with the HCSR, and the new generation weather processors, the ETMS processes a real-time model of the system every few minutes, reflecting the actual status of the system. The ETMS uses these models to assign each known aircraft a route and a projected arrival time at its intended airport. This information is shared with the HSCRs and with the controllers in the ARTCCs/TRACONs/MCFs, where the responsibility lies for keeping airborne aircraft in conformance with their scheduled arrival time.

Finally, one of the most significant changes in communications within the ATC system since its inception, is the implementation of Aeronautical Datalink (ADL). The Datalink affects all controllers, terminal, enroute and oceanic, in that it increases the speed and accuracy of air/ground communications. Up to this point, all communications between pilots and controllers was primarily by voice. Voice messages are subject to any number of corruptions, from frequency congestion to transmission interruptions to sunspots.

Datalink resolves a number of problems inherent in voice communications. One significant problem is the increased demand on the airwaves based on increased traffic. Air traffic counts are up every year, and each additional operation adds another voice demanding air time. When one person is keying a microphone, the frequency is completely tied up until that transmission is completed. For example, for the issuance of a clearance, a frequency may be unavailable for others for anywhere from 15 to 45 seconds. More if a mistake is made or if any part of the clearance is unintelligible. That can be a lifetime for another aircraft with a problem. In another example, the activity of an aircraft crossing a sector boundary requires four separate transmissions.

ADL enables controllers and pilots to communicate routine messages, such as enroute weather forecasts and sector crossing information over a digital channel, and the transfer rate of the data in the message normally takes less than a second. The significance of this is that the digital transfer of routine messages reduces the demand for air time. Channels assigned to datalink can absorb a significant amount of the communications time currently required of the voice channels. The voice channels are now freed up for time-critical control instructions and emergency transmissions.

Another benefit of datalink is that it reduces the number of errors encountered in transferring information. The messages, generally entered into the system by keyboard and received digitally on board the aircraft, are less subject to errors of perception. Messages are received on a screen, and can be backed up by hard copy. Once the message is received, it stays on screen until the pilot accepts it.

Another benefit to controllers is that datalink can reduce the repetitive nature of issuing routine messages. For example, a controller operating departures may issue the same climb-and-maintain instruction, containing altitude and heading information, to every aircraft passing along a certain departure route, and the instruction is issued verbally airplane after airplane. With datalink, the controller can type the message once into the computer, queue it up to a series of addresses, and the automation can issue the instruction when appropriate, without further controller intervention. Datalink significantly reduces the controllers workload, and at the same time increases the accuracy and reliability of the information.

A. PREFLIGHT ACTIVITIES

The role of the pilot is unchanged during this period of time. The pilot is still responsible for obtaining all pertinent data for the intended flight. However, the method of obtaining this information and the rules related to flight plan filing have evolved into a more highly automated process. Fewer operators use the direct services of the Flight Service System for preflight briefings and filing, as the Direct User Access Terminal System (DUATS) has gained in acceptance, and datalink services provide much more information directly to the aircraft. Airlines and the Department of Defense retain their own unique, in-house briefing capabilities, which have been designed to meet their specific needs. Other pilots obtain a full route briefing for their specific aircraft through interfaces such as a home computer, briefing terminals strategically placed at airports, or through datalink in the aircraft. The route briefing takes into account aircraft performance characteristics in climb, cruise, and descent. This briefing also

considers special-use airspace, equipment outages, special events and weather forecasts for the proposed departure time. The output of this briefing is route-specific data, in both pictorial and text form, that will give the pilot all the information necessary to plan and execute the flight. The weather products contained in this briefing are highly defined and include forecasted types of precipitation, icing conditions, turbulence, and potential hazardous weather areas. Graphic weather maps of this information are available, are presented in plain language that increase understanding, and require little to no interpretation or correlation of the multiple products.

Two automation enhancements apply directly to the preflight area of activities. The specialists' work stations in the Automated Flight Service Stations have been upgraded, and the AFSSs have been equipped with a PC Local Area Network (LAN) interconnecting all the positions in the facility and connecting the facility to the new ATC automation systems. The flight service specialists have instant access to all necessary voice and data channels with a communications panel similar in nature to the VSCS panel. The workstation has high resolution monitors for weather display and dissemination, and the specialists' access to weather products is much more complete. With the implementation of the Real-Time Weather Processor (RWP), the Integrated Terminal Weather System (ITWS), and the Aviation Products Weather Generator (AWPG) the ATC system has much higher weather capabilities, and the products of these systems are available to the AFSS specialists, as well as to the aircraft via datalink.

Another major improvement in the area of preflight activities is the implementation of the Operational Data Management System (ODMS). ODMS incorporates all the functionality of the National Flight Data Center (NFDC) and the Aeronautical Information System (AIS) into an 24-hour, interactive on-line system for the ATC system and all users. ODMS collects and manages operational data from all enroute and terminal ATC facilities, processes aeronautical data and NOTAMs, and significantly reduces the manual operation of handling requests for and the dissemination of that data. ODMS obtains current status information of that data, and automatically generates NOTAM and AIS changes, retrieves and archives vast amounts of data on the operational NAS for dissemination to the Air Traffic Control System Command Center for analysis, and provides to users more automated data with much higher levels of reliability, and with enhanced data quality and integrity.

Operationally, the roles of the user and provider remain unchanged for preflight activities. However, the movement and communication of information, which is accomplished more efficiently and accurately through the use of automation, has been exploited. The user is still fully responsible for obtaining the data necessary to exercise a go/no-go decision and information to safely execute the flight. The provider is responsible for ensuring the accuracy of the information given to the user in accomplishing the preflight task.

There are no specific restrictions with regard to how much lead time is needed for filing or requesting a clearance. However, the FAA's ability to better utilize airports and airspace have significantly increased the capacity of the system. As a result, the system has evolved into one that rewards advance planning. While filing a flight plan well in advance of a flight is not required, the more lead time a pilot provides to the FAA for planning purposes, the more likely the pilot is to get the desired departure time. At most larger, capacity-constrained airports, a minimum of four to six hours advance notice would be anticipated.

B. THE CLEARANCE PROCESS

Progress in the use of the automation and communication links addressed in the preflight phase of flight have also taken place in the clearance process. Since datalink is predominant for IFR flight communications, it is used to provide the initial clearance for IFR flight. In most cases, the initial contact of the user requesting a clearance to a destination airport in the CONUS is via datalink.

All the information necessary for preparing flight routes, departure instructions and clearances are routed through the ETMS. The ETMS is constantly rebuilding its model of the active airspace, adding each time the new flights in the system, and using this information to assign arrival times to requesting aircraft. When a flight is accepted and included by the ETMS, the information necessary is routed to the HCSR and TCCC for use by controllers in ensuring aircraft conformance. Most clearances are generated and delivered to the pilot with no controller intervention. For non-datalink-equipped aircraft, the clearance is provided through voice communications. For airports with no control or relay facility and no means of communicating with the aircraft, a clearance can be issued from a control facility by telephone. These instances are few and far between, however, since satellite datalink is in much higher use for communication. If an aircraft at a non-towered airport is equipped with both voice and satellite-based datalink communications capabilities, an ATC facility can communicate with that aircraft on the ground.

Based upon a check of the route of the flight, a taxi time is issued to every aircraft. This does not mean that the aircraft is checked for a conflict free route of flight. It means that the movement of the aircraft through the system is checked for impact on airspace and/or airport capacity. The taxi time is based on the allocation of airspace along the route of the flight all the way down to the runway threshold crossing at the destination airport. Demand pressure is placed on the destination airport so as not to leave unused capacity when events occur differently from the system plan. This means that each aircraft operating under IFR has a strategic plan for its intended flight and that the ground-based ATC system has an overall strategic plan for how each aircraft fits into the airspace.

Acceptance of the clearance is acknowledged by the pilot to the ground-based automation system, and the instructions contained in the departure clearance message can be loaded directly into the aircraft's flight management system (FMS).

C. SURFACE MOVEMENT

The ground movement of aircraft is managed to the point that automation assists the controller in queuing and taxiing aircraft to and from the runway to the gate. This is done by the integration of AMASS problem detection into the Airport Surface Traffic Automation (ASTA) system and traffic management data. This ensures that surface traffic will remain in conformance with traffic management initiatives. ASTA incorporates secondary surveillance integrated with ASDE and ASR-9 sensor data to provide much more accurate surface tracking data to controllers in the tower and via datalink to pilots in the aircraft. The aircraft/tower datalink

provides flight deck alerts for time-critical safety messages, flight deck display of surface traffic data, active taxi route guidance, and conformance monitoring capability by traffic management personnel in the tower. In addition, at this point, the surface traffic control system is interfaced with the STARS system to provide controllers with positive information about surface traffic. The net result is that from gate to runway and from runway to gate, aircraft are relatively free of constraints or waiting time for runway access.

ASTA automation provides safety alerting for controller or pilot error. Due to the critical nature of surface movement these alerts are delivered to both the controller and pilot. All alerts take into consideration aircraft on approach, about to land and the movement of vehicles on the ground. Airport lighting has been improved to inform non-datalinked aircraft of active runway status. This lighting is tied directly to the surveillance display and provides real-time status of movement on the runway.

The role of the controller and pilot remain the same. However, the tools that both have to accomplish surface movement is significantly improved, especially in on-board avionics. The potential for runway incursions has been minimized due to improved data sharing and automation tools.

D. AIRBORNE PHASE

The two phases of activities described in the baseline, terminal and enroute operations, have begun blending into what can be described as surveillance control. This is accomplished through automatic dependent surveillance combined with ground-based secondary surveillance, with a maximum four second update from the aircraft avionics to the controllers display. Air Traffic Controllers manage aircraft routes in a strategic manner from lift-off from the departure airport to touchdown at the destination.

Air traffic control facilities providing surveillance are, in most cases, remote from the airport. All phases of flight are controlled from these locations, with equal capabilities and service for all the airspace under their control. Sectors now may be changed dynamically, taking into consideration the workload of the controller. In the baseline, sectors were designed to accommodate traffic flows along predetermined and/or published routes. Since a specific wind route (minimum time track) is established for each aircraft, route structures are no longer a consideration except close into the airport. Sector and facility boundaries are dynamic to accommodate demand on a particular day or during a particularly busy time period.

The role of the pilot and controller are modified slightly during this time frame as the result of automation and datalink capability. Controllers are still responsible for the movement of aircraft, and the pilots are responsible the safe operation of his/her aircraft and compliance with the Federal Aviation Regulations. However, the exchange of data between the ground and the air, plus the participation of the pilot in the selection of traffic management options and limited participatory separation enhance and change the methodology of air traffic control. Conflict Resolution Advisory (CRA) software has been introduced into the enroute environment to provide controllers with alerts of potential conflicts between Mode C- or Mode S-equipped aircraft and suggested solutions to resolving the problem.

Automation enhancements in 2000-2004 include STARS, the HCSR and AERA services. STARS provides software enhancements to the HCSR for managing arrival traffic streams using time-based separation. STARS factors in maximum runway utilization rates, aircraft performance characteristics, and departure traffic schedules to produce a constant and orderly flow of traffic through the terminal area and down to the runway threshold, to help maintain the strategic ATC plan. STARS contains three principal functions, the traffic management advisory/planning tool, descent advisor, and final approach spacing tool.

The traffic management advisory tool displays aircraft arrival times and landing sequence to the enroute and terminal controller teams in order to ensure a steady flow of traffic to match the available capacity. Arrival plans are updated automatically based on surveillance-derived changes in aircraft locations and speeds, demand information, flight plans, and manually input data (e.g., runway configuration, visibility, and weather). A plan conformance indicator displays the amount of time each aircraft has deviated from the schedule. When demand is heavy, the traffic planner suggests aircraft landing sequences that reduce the average in-trail spacing by using the predictable differences in landing intervals caused by factors such as wake-vortex separation and landing speed.

Descent advisories, provided as far out as 200 miles from the airport, automate the function of guiding aircraft into their approach profile. In addition to automating the process, STARS provides fuel-efficient descents from cruise altitude using aircraft type-dependent fuel utilization models.

The final approach spacing tool suggests specific speed changes or turn-to-final commands for bringing aircraft into conformance with the plan and for precisely spacing aircraft on final approach. The converging approach delivery aid, an early version of the final-spacing advisor for the ARTS environment incorporated into the STARS functionality, assists controllers in feeding staggered approach streams to converging runways. This allows beneficial use of converging approaches in IFR conditions, and continued use of multiple runways under lower visibility ceilings.

AERA is the principal tactical management tool for enroute controllers, and gives the controller the ability to maximize the use of the airspace in a conflict-free environment. AERA projects a track of every aircraft 20 minutes ahead of its present position based on known flight plan data and the aircraft's performance characteristics, and checks for potential conflicts with other aircraft, severe weather phenomena and special-use airspace. AERA then calculates possible solutions to the conflict, checks the solutions for additional conflicts, orders the solutions relative to which solution has the least impact on the aircraft and on the system, and presents them to the controller for action.

Further capabilities are provided by the Aviation Weather Products Generator (AWPG). Weather system detection and data processing capabilities of both the FAA and the NWS are dramatically improved. Weather sensor systems like NEXRAD, weather satellite improvements, TDWR and others allow the acquisition of high-density state-of-the-atmosphere data. The FAA and NWS have jointly developed advanced weather forecasting techniques using the improved data, and the AWPG stores, merges, smooths, and processes the forecasts into spe-

cific, user-specific graphic and textual products and voice-activated messages. The AWPG ensures the appropriate integration of NWS data into FAA-derived data to provide the specialized products necessary for aviation activities.

Once the aircraft leaves the ground at the departure airport and is placed under the direction of the radar controller, datalink becomes the principal means of communication between the pilot and controller for data transfer. Voice communication is available for aircraft not data-linked equipped and as a secondary means of communication for special situations and extremely time critical instructions.

Although standard procedures still exist for the departure phase of flight, automation tools allow the controller to expedite the aircraft to intercept the optimized route for the flight. This means that even in the busiest terminal environments, advances in automation provide controllers with tools for maintaining separation as aircraft proceed along their routes without the constraints of defined airways.

Potential aircraft-to-aircraft and aircraft-to-airspace conflicts are recognized and resolved approximately 20 minutes in advance. The overall strategic traffic management plan for the aircraft, based on a runway threshold crossing time at the destination airport (plus or minus 30 seconds) is checked frequently to ensure conformance with the traffic management plan. If a conflict requires that an aircraft's route be modified and the aircraft placed out of conformance with the traffic management plan, a set of options is presented to the air traffic controller, to move the aircraft back into conformance.

Airport data, weather data and forecasts, in graphics and text, traffic management initiatives, and system performance data are available to aircraft via datalink. Similar information is available to non-datalinked aircraft via voice communications. When a pilot wishes to obtain a weather update enroute, several options are available. Most textual weather products are available through voice-recorded radio transmission. Along with limited government-provided services, commercial vendors also provide air-ground communications for the dissemination of weather information.

Upon approaching the destination airport, automation aids are provided to the air traffic controller in order to optimize the runway or runways in use. An advisory to begin descending, based on a conflict-free route being predicted by the automation system and the knowledge of aircraft performance from the flight management system and ground data base, is provided to the pilot. This method of descent provides a fuel efficient way of handling the arrival phase of flight. Once aircraft are placed on final approach to the designated runway, the responsibility for station-keeping on approach to ensure separation and in-trail spacing is shared between the pilot and the controller. In-trail spacing is maintained with the aid of a TCAS-like system using ground-based data uplinked to the aircraft. The approach navigational aid and precision landing system in most locations is a satellite-based GPS system with airport ground augmentation to provide the necessary accuracy. Ground-based precision landing systems (ILS and MLS) are still available, and relied upon by many aircraft.

Throughout the airborne phase of flight, the goal of the air traffic control system is to allow the

aircraft to move through the entire flight with little or no air traffic constraint. But when a constraint is necessary, it is accomplished in a strategic manner and with the least possible interference with the route, altitude, speed, or timing of the flight.

VFR OPERATIONS

Access to the National Airspace System will always be available. Weather services are available to the VFR pilot in the same way as the IFR pilot. For the non-datalinked pilot who wishes to obtain a weather update enroute, weather radar and satellite data relative to the aircraft position is available from the Inflight and Flight Watch specialists at the AFSS. These specialists also provide pilots with advisories regarding near real-time SUA activity, and initiate timely Search and Rescue activities.

ATC CONTROLLER POSITIONS: FUNCTIONAL DESCRIPTIONS

The functional descriptions contained in this level of discussion present an updated look at each of the positions as they exist in 2000. In most cases, the responsibilities of the individual controller positions have not changed, however, the individuals, systems and facilities they interface with for input and output of the information necessary for them to do their work has been rearranged. Virtually every controller now has new equipment and automated procedures that have changed the way they do business. The fundamental changes in the process and methodology of controller activities was described in the three previous levels of discussion.

The systems replacement hardware presented in the years leading up to 2000 have led to a limited consolidation of TRACONs into Metroplex Control Facilities (MCFs). The equipment in both is identical, and the functionality of those operating in those facilities is fundamentally the same.

With the level of automation present in 2000, certain positions have consolidated into similar functional descriptions. For example, the separate descriptions of some of the positions in the TRACON and ARTCC in earlier sections have been combined into single descriptions. This is done because the functions of the personnel in those positions become very similar in the ARTCC, TRACON and MCFs. The descriptions contain information which is pertinent to arrival, departure and enroute operations.

The Flight Watch position, located in the AFSS/FSS in previous years, has been relocated to the ARTCC in 2000. The changes in functionality and in the inputs and outputs, the operational process of the position and the systems used, are reflected in the description.

Similarly, there are significant changes in the functional descriptions of all Traffic Management personnel, due to the vastly increased role of Traffic Management with the implementation of the advanced ETMS. These changes and the routes of coordination between TM personnel in the ATCSCC, the TTMUs and the ARTCCs/TRACONs/MCFs are reflected in the descriptions.

The positions of Assistant Manager for Automation (AMA), Automation Specialist (AUS), and Data Systems Coordinator (DSC) do not appear in this section of the document. The functions of these positions have migrated into the Maintenance function within the FAA in this time frame.

TERMINAL FACILITIES

TOWER

Area Supervisor (AS)

The tower cab AS is responsible for overall tower cab operation. This includes management and direction of tower cab personnel, and observing, scanning and projecting the needs of the constantly changing airport operation

INPUTS:
- Visual observation of tower cab operations
- Flight Data Processing (FDP)
- STARS, TCCC data input
- Status information area
- Coordination from tower cab positions
- TRACON/MCF Terminal Area Supervisor (AS)
- Area Manager (AM)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/ weather conditions, staffing and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination to pilots information concerning vehicle conditions that may affect operations
- Coordinate with tower cab positions, TRACON/MCF, TTMU, AS and AM
- Ensure tower cab operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine tower cab positions
- Initiate action as input changes

SYSTEMS:
- ETMS, TCCC, STARS, ASTA, ITWS, VSCS, DBRITE, RVR, MLS, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, AWDS, crash phone system

TOWER

Cab Coordinator (CC)

The CC is primarily responsible for observing and scanning the active runways and airport traffic area/control zone to assist the LC. CC will coordinate for the LC and ensure procedures and flows are adhered to in the rapidly changing airport environment.

INPUTS:
- Receive requests for air traffic movement
- Visual observation of runways, taxiways, traffic pattern and airport traffic area/ control zone
- Flight Data Processing (FDP)
- STARS, TCCC data input-Status information area
- Coordination from other tower cab and TRACON/MCF terminal positions
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Observe local control (LC) operations and coordinate for the LC
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, separation standards, pilot requests, facility procedures, field/weather conditions and aircraft performance.
- Review Flight Data Processing (FDP)
- Ensure dissemination of information to pilots, vehicle operators, other cab positions, and the supervisor, of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Coordinate for the LC with other tower cab and TRACON/MCF terminal positions
- Scan airport operations and assist LC with duties
- Report airport conditions
- Forward flight data
- Initiate action as input changes

SYSTEMS:
- ETMS, STARS, TCCC, ASTA, ITWS, VSCS, DBRITE, light guns, RVR, NAVAID panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, ASDE, AWDS, crash phone system

TOWER

Local Control (LC)

The LC is primarily responsible for handling arriving and departing traffic at the airport. The area of responsibility includes the active runways and airport traffic area/control zone. It is a rapidly changing environment requiring constant evaluation of input and modification to existing plans. The LC position interfaces mainly with Ground Control (GC) and TRACON/ MCF/MCF departure and arrival positions.

INPUTS
- Receive request for air traffic movement
- Visual Observation of Runways, taxiways, traffic pattern and airport traffic area/ control zone
- Radio
- Flight Data Processing (FDP)
- STARS, TCCC Data input
- Status information area
- Coordination from other tower cab and TRACON/MCF Terminal positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)
- Runway incursion alert

PROCESS:
- Analyze information to determine priority of duties
- Project and plan ATC service based upon traffic flows, traffic management, separation standards, pilot requests, facility procedures, field and weather conditions, and aircraft performance
- Obtain, review, and amend flight data
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and AS of conditions that may affect operations.
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Issue arrival, departure, airport traffic area/control zone transition instructions and traffic information via radio, lights, and datalink
- Report airport conditions
- Coordinate with other tower cab and TRACON/MCF terminal positions
- Disseminate to pilots, vehicle operators, other tower cab positions and AS information that may affect airport operations
- Initiate action as input changes

SYSTEMS:
- ETMS, TCCC, STARS, ASTA, Datalink, light controls, ITWS, VSCS, DBRITE, light guns, RVR, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, ASDE, AWDS, crash phone system, DASI, Wind instruments

TOWER

Ground Control (GC)

The GC is primarily responsible for directing aircraft to and from the runway. Additional duties include directing other aircraft/vehicular movement on the airport movement area and disseminating information to support operations (e.g. traffic, weather, equipment status, delays/ flow etc,). It is a dynamic environment in which the GC must adjust traffic flows and evaluate new information.

INPUTS:
- Receive request for ground movement
- Visual observation of movement area or display
- Voice and Datalink communications
- Flight Data Processing (FDP)
- STARS, TCCC data input
- Status information area
- Coordination from other tower cab positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, pilot requests, facility procedures, field/weather conditions and aircraft performance
- Obtain, review, and amend flight data
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and the AS of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Issue movement instructions via voice, datalink or lights
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab positions
- Forward flight data
- Initiate action as input changes

SYSTEMS:
- ETMS, STARS, TCCC, ASTA, Datalink, Light Controls, ITWS, VSCS, DBRITE, light guns, RVR, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, ASDE, AWDS, crash phone system

TOWER

GATE HOLD (GH)

The GH position is intended to inform pilots when departure delays exceed or are anticipated to exceed 15 minutes. GH delivers aircraft to the ground controller in an orderly flow to minimize congestion on the movement area. Pilots monitor the frequency for engine start-up advisories or new proposed start times if the delay changes.

INPUTS:
- Requests for engine start time
- Visual observation of movement area
- Voice and Datalink communications
- Flight Data Processing (FDP)
- STARS, TCCC data input
- Status information area
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)
- ETMS

PROCESS:
- Analyze gate hold (GH) and traffic management requirements and implement gate hold procedures
- Record time of initial call-up on flight data display
- Maintain sequence for departure using initial call-up time, unless modified by flow control restrictions

OUTPUTS:
- Issue pilot engine start times and subsequent revisions if delays change

SYSTEMS:
- ETMS, STARS, TCCC, ASTA, ITWS, VSCS, 24-hour clock, ASDE

TOWER/TRACON/MCF

CLEARANCE DELIVERY (CD)

The CD position primarily issues departure clearances to pilots. The clearance is delivered to the pilot on the radio or via ARINC Communications Addressing and Reporting System (ACARS). Additionally, weather, route, delay and other significant information may be relayed to pilots.

INPUTS:
- Requests for departure clearance
- Voice and datalink communications
- Flight Data Processing (FDP)
- STARS, TCCC/HCSR data input
- Status information area
- Coordination from other tower cab positions
- ARINC Communications Addressing and Reporting System (ACARS)
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Upon receipt of flight plan/VFR departure information, ensure all required clearance items are received and recorded
- Forward clearance information to tower cab Flight Data (FD) for processing
- Obtain clearance from tower cab FD or formulate a clearance (e.g., IFR, TCA, ARSA, SVFR, VFR-on-top, or other VFR departure)
- Amend flight data as necessary
- Periodically review flight data for currency

OUTPUTS:
- Issue clearance to pilots and deliver information to Ground Control (GC) or Gate Hold (GH), if applicable
- Coordinate information with other tower cab positions

SYSTEMS:
- ETMS, STARS, ASTA, Datalink, ITWS, VSCS, ACARS, AWDS, 24-hour clock

TOWER/TRACON/MCF

FLIGHT DATA (FD)

The FD position primarily relays flight plan and airport information to other tower cab positions. FD closely interfaces with Clearance Delivery (CD) as a coordinator.

INPUTS:
- Receive weather information
- Flight Data Processing (FDP)
- STARS/TCCC data input
- Status information area
- Automated Weather Information System (AWIS)
- Automated Weather Display System (AWDS)
- National Weather Service (NWS)
- Operational Database Management System (ODMS)
- Notices to Airmen (NOTAMs)
- Coordination with other tower cab positions, Flight Service Station (FSS), and TRACON/MCF
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Review, and amend flight data
- Ensure dissemination of information that may affect operations to other tower cab positions
- Monitor and operate NAVAID panel and Automated Terminal Information System (ATIS)

OUTPUT:
- Disseminate flight plan information, flight data amendments, weather and traffic management information, and airport conditions
- Update status information area
- Record ATIS

SYSTEMS:
- STARS, ETMS, TCCC, ITWS, VSCS, AWIS, ATIS, AWDS, 24-hour clock

ARTCC/TRACON/MCF

AREA MANAGER (AM)

The Area Manager has the responsibility for the entire facility's shift operation. By projecting, planning, coordinating and strategizing with shift supervisors, the Area Manager facilitates the use of available resources to meet the demands of air traffic.

INPUTS:
- Area Supervisors
- Traffic Management Unit (TMU)
- Area Air Traffic Manager
- Flight Data Processing (FDP)
- STARS/TCCC/HCSR data input
- Facility Staff officers
- Airway Facility technicians
- National Weather Service
- Flight Service Stations
- AERA conflict and weather advisories
- Military Operations Specialist (MOS)
- Manager, NAS Operations (NOM)

PROCESS:
- Administrate shift operations
- Project and plan shift staffing, traffic flows, facility procedures, weather conditions, and sector configuration
- Analyze information to determine priority of duties
- Analyze, evaluate and update information to ensure effectiveness of operation

OUTPUTS:
- Ensure exchange of information with other ARTCC/TRACON/MCF positions, TMU, AS, and ATM that may affect operations
- Ensure adequate supervisory staffing
- Coordinate with adjacent ARTCC/MCF, AS, TMU, and ATM
- Ensure ARTCC/MCF operations are in accordance with procedures, current flows and weather conditions
- Document equipment outages/restorations

SYSTEMS:
- HCSR, ETMS, STARS, TCCC, Datalink, TATCA, DSR, WARP, AWPG, AERA, MLS, VSCS, LLWAS, Systems Atlanta Information Display System (SAIDS), RVR, Digital Altimeter Setting Indicator (DASI), ASR, ILS

ARTCC/TRACON/MCF

AREA SUPERVISOR (AS)

The AS is responsible for the operation of his/her area of specialization. Through planning, monitoring and evaluating operations, the AS will use available resources to accommodate traffic demands. It is a constantly changing environment where anticipating and communicating needs are as important as current operations.

INPUTS:
- Sector operation
- Flight Data Processing (FDP)
- STARS/TCCC/HCSR data input
- Status information area
- Coordination with other AS positions
- Traffic Management Unit (TMU)
- Tower cab Area Supervisor (AS)
- Center Weather Service Unit (CWSU)
- Area Manager (AM)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/ weather conditions, staffing, and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination of information concerning conditions that may affect facility operations, TMU, and tower operations
- Coordinate with sector positions, other AS, TMU, AM, tower AS and AM
- Ensure sector operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine sector positions as needed
- Initiate action as input changes

SYSTEMS:
- STARS, ETMS, HCSR, Air Route Surveillance Radar (ARSR), Voice and Datalink Communications, TATCA, TCCC, WARP, AWPG, VSCS

ARTCC/TRACON/MCF

RADAR POSITION (R)

The Radar Control position is designed according to the desired function--enroute, arrival, departure, and satellite. The controller responsible for each sector has defined airspace and can use a variety of techniques to accomplish the assigned tasks (e.g., vectoring, speed control. sequencing, altitude, lateral, diverging, and visual separation). The level of service and separation applied to the individual aircraft is dependent upon numerous factors including the pilot's request, type of flight plan, type of aircraft, and weather.

Aircraft are generally routed via published or facility-established routes. When established routes are unavailable or unusable, aircraft are directed into current traffic flows to avoid conflicts, adverse weather, obstructions and terrain. The sector environment is rapidly changing as input changes (e.g., aircraft, weather, pilot requests, flow control). The Radar Controller must continually evaluate current operations, conditions, and the effectiveness of the action plan. As new input is received, the controller must be flexible, and rapidly incorporate the information into the action plan.

The enroute position expedites the movement of traffic through the sector, maintains separation, and sequences aircraft toward arrival fixes, when necessary. The arrival position(s) primarily sequences aircraft delivered from adjacent sectors or VFR "pop-up" aircraft to the destination airport. Service may be provided to more than one runway at one or more airports.

The departure position(s) primarily delivers departing aircraft from one or more airports to the appropriate enroute sector, in accordance with established procedures.

The satellite position(s) normally provides arrival and departure service for secondary or military airports. Generally these aircraft are incorporated into the primary airport flow of traffic.

INPUTS:

- TCCC/STARS/HCSR (AERA, TATCA)
- NEXRAD Weather Display via WARP
- Pilot requests, PIREPS and SIGMETS
- DSR displays
- Manual and automated handoffs
- Voice and datalink communications
- Flight Data Processing (FDP)
- Status information area
- Coordination with other sector positions, AS, AM, and adjacent facilities
- Traffic Management Unit (TMU)
- Area Supervisor (AS)

ARTCC/TRACON/MCF

RADAR POSITION (continued)

PROCESS:
- Prepare and monitor automation equipment for settings and optimum performance
- Correlate flight data and Radar display information
- Manage flight data: scan, analyze, transfer and file
- Amend flight data as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft types and performance characteristics, requests) and evaluate additional factors (e.g., weather, equipment status, flow control) and develop an action plan
- Continuously evaluate the effectiveness of the plan and adjust as necessary

OUTPUTS:
- Issue control instructions, safety alerts, advisories and information to pilots
- Initiate control instructions and ensure separation
- Initiate manual and automated handoffs
- Disseminate weather information
- Make entries into HCSR, STARS
- Coordinate with tower cab, other ARTCC/MCF/TRACON sector positions and adjacent ATC facilities

SYSTEMS:
- STARS, ETMS, HCSR, TATCA, VSCS, Datalink, 24-hour clock, WARP/AWPG, DEDS, FDAD, FMAD, RADS

ARTCC/TRACON/MCF

RADAR ASSOCIATE OR HANDOFF POSITION (RA)

The Radar Associate Controller is responsible for providing assistance to the Radar (R) position as necessary to ensure continued smooth operation of the sector. The RA accepts or initiates manual and automated handoffs, manages Flight Data Processing (FDP) for the sector, and informs the R controller of all actions taken. Most sector tasks can be accomplished by the RA, thereby allowing the R controller to focus on the efficient flow and separation of aircraft.

INPUTS:
- DSR display
- Manual and automated handoffs
- Voice and datalink communications
- Flight Data Processing (FDP)
- STARS/TCCC/HSCR data input
- Status information area
- Coordination from towers, other sector positions and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor (AS)

PROCESS:
- Correlate flight data and Radar display information
- Scan, analyze, transfer and file flight data
- Amend flight data as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type and performance characteristics) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the R controller's action plan

OUTPUTS:
- Ensure orderly flow of traffic and separation of aircraft
- Ensure adherence to procedures and flow restrictions
- Assist R controller in implementing action plan
- Initiate manual and automated handoffs
- Make entries into HCSR, STARS, TCCC
- Coordinate with tower cab, other sector positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- HCSR, STARS, ETMS, TATCA, VSCS, 24-hour clock, AWDS

ARTCC/TRACON/MCF

RADAR COORDINATOR (RC)

The Radar Coordinator position is responsible for performing inter- and intra-facility coordination on traffic actions, and accomplishes any other functions that will assist the Radar team in meeting situational objectives. The RC advises the Radar Associate (RA) of any action taken.

INPUTS:
- Radar display
- Manual and automated handoffs
- Voice and Datalink communications
- Flight Data Processing (FDP)
- STARS, TCCC, HCSR data input
- Status information area
- Coordination from other radar and/or manual positions and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor in Charge (ASIC)

PROCESS:
- Correlate flight data and radar display information
- Scan, analyze, transfer, and update flight data
- Amend flight data as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type, aircraft performance, requests) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the Radar controller's action plan

OUTPUTS:
- Ensure safe and orderly traffic flow
- Ensure adherence to procedures and traffic management initiatives
- Assist Radar controller in implementing action plan
- Initiate manual and automated handoffs
- Make HCSR, TCCC, STARS entries
- Coordinate with other radar and non-radar positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- TCCC, STARS, HCSR, VSCS, radio and telephone equipment, Datalink

ARTCC/TRACON/MCF

FLIGHT WATCH (FW)

The Flight Watch position is a specialized air/ground position within the facility that has been relocated from the Flight Service Stations. FW services primarily--but is not limited to--VFR aircraft. Service is provided on unique VHF radio frequencies (122.0 nationwide between 6,000 and 17,000 MSL). Discrete frequencies are used for high altitude service. The service provided is entitled Enroute Flight Advisory Service (EFAS). EFAS service is limited to "near-real-time" weather information, and is specifically intended for aircraft in the enroute phase of flight. A primary function of EFAS is the solicitation and exchange of pilot weather reports (PIREPS) among aircraft. EFAS specialists are pilot weather briefers who have received additional specialized training and certification in the use and interpretation of weather radar and weather satellite data.

All information and service provided is in accordance with procedural handbooks, FAA orders, and facility directives.

INPUTS:
- Self briefings
- Pilots
- NWS (reports, charts, etc)
- Adjacent facility positions
- Adjacent control facilities
- Center Weather Service Unit

PROCESS:
- Receive, analyze and respond to pilot requests for enroute weather information
- Solicit reports from pilots (PIREPS) concerning enroute conditions
- Compare PIREPS to NWS forecasts and advisories of hazardous conditions to validate the accuracy of the forecast information
- Provide to pilots the most current information available, tailored to a specific altitude and route of flight

OUTPUTS:
- Enroute flight advisories
- PIREPS
- Record of aircraft contacted via aircraft identification
- Relay of reported conditions (PIREPS) to CWSU and NWS forecasters

SYSTEMS:
- HCSR, VSCS, discrete frequency outlets, WARP/AWPG, CWSU weather graphics, Geostationary Orbiting Environmental Satellite (GOES) imagery, weather radar displays.

AUTOMATED FLIGHT SERVICE STATION (AFSS)

PREFLIGHT (PF)

The Preflight (PF) position is the primary position providing weather and aeronautical information and flight plan filing services to pilots prior to flight, and is staffed with certified pilot weather briefers. Briefers are expected to be familiar with current and forecast conditions while on duty. They are required to maintain comprehensive knowledge of the topographical and physical characteristics of the facility's area of responsibility. Information is provided either by telephone or face-to-face. The services are available to all users of the National Airspace System, however general aviation is the predominant user.

Preflight briefers receive a pre-duty briefing, and then continually update operational data during the tour of duty. Weather information is interpreted, translated, and summarized by the briefer, rather than read verbatim. All information and service is provided in accordance with procedural handbooks, agency and facility directives, and best professional judgement for situations not otherwise specifically addressed.

INPUTS:
- Pilots
- National Weather Service (NWS)
- Operational Database Management System (ODMS)
- Other Facility Positions
- Adjacent control facilities
- Airport management/fixed base operators
- FSAS (M1FC)
- Charts and printed aeronautical information

PROCESS:
- Receive, analyze and respond to pilot requests for service
- Copy flight plan information
- Correctly format and transmit flight plan data

OUTPUTS:
- Preflight weather briefings
- Flight plans to ARTCC/MCF In Flight (IF) position
- Record of briefing via aircraft identification or pilot name

SYSTEMS:
- ETMS, ODMS, Flight Service Data Processing System (FSDPS), OASIS, weather graphics

AUTOMATED FLIGHT SERVICE STATION (AFSS)

INFLIGHT (IF)

The Inflight position provides air/ground communication with aircraft. Communication may be of a routine or an emergency nature. The position is staffed with certified pilot weather briefers. Briefers are expected to be familiar with current and forecast weather conditions while they are on duty. They are also required to maintain detailed current knowledge of the topographical and other physical features of the facility's area of responsibility. Routine services provided at the IF position include pilot weather briefings, position reporting, flight following, flight plan filing, activation, revision, and closure. Emergency services are provided in the form of orientation of lost aircraft.

INPUTS:
- Pilots
- NWS data
- NFDC/USNS
- Operational Database Management System (ODMS)
- Adjacent facility positions
- Adjacent control facilities
- Airport management/fixed base operators
- NAVAID monitor panels

PROCESS:
- Establish priority of duties
- Receive, analyze, and respond to pilot requests for service
- Copy, format and transmit flight plan data
- Determine appropriate course of action in emergency situations

OUTPUTS:
- Emergency services to aircraft in flight
- Inflight weather briefings
- Pilot reports (PIREPS)
- Flight plans to ARTCCs or ATCTs
- Aircraft information to FD position
- Relay of control information
- Record of briefing with aircraft identification or pilot name
- Notification of NAVAID malfunctions
- Initiation of NOTAMs
- Initiation of Search and Rescue for overdue aircraft
- Unscheduled broadcasts
- Local airport information and advisories

SYSTEMS:
- ETMS, FSDPS, OASIS, weather graphics, Remote Maintenance Monitoring System (RMM), Direction Finder (DF), SAMS, ETMS

AUTOMATED FLIGHT SERVICE STATION (AFSS)

BROADCAST (BC)

The Broadcast (BC) position is responsible for recording a number of messages concerning current and forecast weather, NOTAMS, and other significant operational information. These messages are accessible to pilots via phone, and in some cases, radio.

All information is broadcast in accordance with procedural handbooks, FAA orders, and facility directives.

INPUTS:
- National Weather Service (NWS) scheduled and unscheduled surface observations, forecasts and amendments, and weather advisories
- PIREPs
- NOTAMs
- Other facility positions
- Adjacent control facilities

PROCESS:
- Specialist assembles and edits specified weather reports and aeronautical information for various types of broadcasts in accordance with broadcast timetables
- Update broadcast recordings continually, on a scheduled or unscheduled basis, to include most current information
- Update recordings on an unscheduled basis upon receipt of significant new information such as special weather observations and newly issued or revised weather advisory data

OUTPUTS:
- Scheduled Weather Broadcast (SWB) (Alaska only)
- Unscheduled broadcasts of weather or significant operational data
- Weather advisories (SIGMET, AIRMET, Center Weather Advisory)
- Recorded messages:
  - Transcribed Weather Broadcast (TWEB)
  - Pilot Automatic Telephone Weather Answering Services (PATWAS)
  - Telephone Information Briefing Service (TIBS)
  - Hazardous In-flight Weather Advisory Service (HIWAS)

SYSTEMS:
- FSDPS, OASIS, Comex equipment, dedicated telephone service, recording equipment

AUTOMATED FLIGHT SERVICE STATION (AFSS)

WEATHER OBSERVER (WO)

The weather observer position is responsible for taking surface observations on a scheduled basis. A basic weather watch is maintained, with "record" observations taken every hour, and "special" observations taken when criteria dictates. Observations are made using a combination of visual techniques, instrument readings, and calculations. Weather observations are not taken at every FSS/AFSS location, or always by FSS/AFSS personnel at those FSS/AFSS locations that have weather observers. Weather observers are trained and certified by the National Weather Service.

INPUTS:
- Personal observation of clouds, precipitation, visibility and obstructions
- Instrument and indicator readouts of temperature, wind speed and direction and barometric pressure
- Calculations of dew point, sea level pressure and density altitude

PROCESS:
- Certified observers begin the observation of conditions so as to complete in time for scheduled transmission to Weather Message Switching Center (WMSC)
- Maintain basic weather watch
- Complete all elements of record observation in a timely manner
- Format required elements and transmit in a timely manner
- Initiate special observations when criteria so dictate

OUTPUT:
- Record special and local observations
- Climatological data
- Certified record of observations

SYSTEMS:
- Visibility chart and designated markers, temperature measuring devices, pressure indicator devices, wind instruments, local communications links, FSAS (OASIS), NADIN

AUTOMATED FLIGHT SERVICE STATION (AFSS)

FLIGHT DATA (FD)

Flight Data is an internal/external communication position within the FSS/AFSS. It is the focal point for messages such as flight plans, flight movement and notification data, and administrative message traffic. Search and Rescue (SAR) activities are also initiated from this position on aircraft that become overdue.

INPUTS:
- Other FSS/AFSS positions
- Flight plans
- Flight plan activation/cancellation
- Search and Rescue (SAR) initiation
- Other FSS/AFSS facilities
- Requests for arrival information
- SAR data
- Administrative messages

PROCESS:
- Receive IFR flight plans and other movement messages from other positions.
- Properly format flight plans and other pertinent data for transmission
- Initiate and respond to SAR messages in a timely manner based on established criteria and procedures
- Perform SAR duties as required
- Format and transmit administrative messages

OUTPUT:
- SAR information to other facilities/positions
- Flight plan closure/cancellation data to ATC facilities
- Relay of administrative traffic
- Transmit flight plans, flight movement/notification messages and administrative message traffic

SYSTEMS:
- FSAS (OASIS)

AUTOMATED FLIGHT SERVICE STATION (AFSS)

AREA SUPERVISOR (AS)

The FSS/AFSS area supervisor is responsible for overall facility operations during an assigned shift. Duties include ensuring adequate staffing for the operational situation, monitoring of all operational positions, ensuring that all functions are performed in accordance with various directives, and making timely notification in the event of equipment malfunctions.

INPUTS:
- Visual observation of positions
- Notification by specialists of unusual situations
- Coordination with other facilities

PROCESS:
- Continually analyze operational situation and assign duties in accordance with priority of duties

OUTPUT:
- Operational direction and guidance as needed
- Management of available resources

SYSTEMS:
- FSAS (OASIS), weather graphics system, NAVAID monitor systems

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO) -- ATCSCC

NTMOs gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives for their area of responsibility.

INPUTS:

- Official Airline Guide (OAG)
- HCSR/STARS flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Departure Delivery Rate (ADDR)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- ARTCC/MCF and Tower/TRACON traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS),
- International ATC systems

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO) continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- STARS, ETMS, CVARS, WARP, AWPG, ODMS, Aircraft Situation Display (ASD), specialists' workstations, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS),

TRAFFIC MANAGEMENT

NATIONAL OPERATIONS MANAGER (NOM) - ATCSCC

National operations managers gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives.

INPUTS:

- Official Airline Guide (OAG)
- HCSR/STARS flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Departure Delivery Rate (ADDR)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- ARTCC/MCF and Tower/TRACON traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS)
- National Flight Data Center (NFDC)
- International ATC systems

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

NATIONAL OPERATIONS MANAGER (NOM) - ATCSCC continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- STARS, ETMS, AWPG, WARP, ODMS, CVARS, specialists' workstations, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (TMS) -- ATCSCC

TMSs/NTMOs gather all the pertinent information relative to current and projected future operations, and develop tentative TM plans to balance demand with capacity; initiate and implement TM plans with other facilities/TMUs, supervisors and control specialists and the ATCSCC; maintain awareness of capacity reductions throughout the NAS; document delay information; evaluate effectiveness of TM initiatives and make necessary adjustments.

TMSs disseminate TM initiative information to users and TMUs via ATCSCC advisories and records delay information. NTMOs coordinate the efforts of TMSs into a coordinated NAS Traffic Management Plan.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- HCSR flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Arrival Acceptance Rate and Departure Delivery Rate
- WARP, ITWS, AWPG, CWFSU
- Coordinati with other ATC facilities
- ATCSCC Operations Center
- Central Altitude Reservation Function (CARF) users (airlines, military, general aviation)
- ETMS
- Special Use Airspace Management System (SAMS)

PROCESS:
- Input current/forecasted capacities, i.e., Departure delivery Rates, Airport Arrival Rates, OALT, Feeder fix rates

OUTPUTS:
- Traffic Management Initiatives:
  - A. Mile/minutes in-trail restrictions
    Local ground delay programs
    Arrival spacing (ASP)
  - B. Arrival fix rates
  - C. Flight reroutes
  - D. Traffic stops
  - E. Transcontinental routes
  - F. Exemptions from TM initiatives
- Coordination with:
  - A. National Traffic Management Offices (NTMOs) and TMSs/TMCs to implement traffic management initiatives and flight reroutes

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (TMS) continued

B. Traffic Management Units (TMU)/TMCs to maintain awareness of current and anticipated conditions
C. Users, to inform them of local/national TM initiatives and advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:
- ETMS, STARS, WARP, AWPG, ODMS, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (STMC) -- ENROUTE

STMCs are responsible for assessing the capacity and demand for airspace and airports within their facility's area of responsibility; developing and administering traffic management initiatives including arrival and departure metering, enroute spacing, ground delays, and severe weather avoidance routes; providing intra- and inter-center coordination on military aircraft missions and airspace usage; disseminating weather information to center personnel and to other air traffic facilities in their area of responsibility; and assigning work within the Traffic Management Unit to ensure the most effective use of resources.

INPUTS:

- Official Airline Guide (OAG)
- HCSR flight plan data
- Enroute radar
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- Enroute and terminal traffic management personnel
- Air Traffic Control System Command Center (ATCSCC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- National Flight Data Center (NFDC)

PROCESS:

- Use inputs to gather information about the status of the airspace and airports within the Center's boundaries. Considerations include weather, system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Coordinate and disseminate information concerning the status of the NAS, weather, traffic management initiatives, and military airspace and mission requirements to personnel within the facility, air traffic facilities with adjacent airspace, and the ATCSCC
- Establish priorities and assign work to TMCs to achieve maximum efficiency and utilization of operations personnel
- Monitor and evaluate traffic management initiatives to ensure effectiveness.

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (STMC) continued

OUTPUTS:

- Utilizes available resources to ensure balanced traffic flows and the maximum utilization of airspace
- Establishes departure, enroute, and arrival fix rates
- Coordinates weather, traffic management, and other information pertaining to the efficient operation of the NAS to concerned personnel

SYSTEMS:

- ETMS; HCSR; WARP/AWPG; Aircraft Situation Display (ASD); specialists' work-stations; interphone, dedicated long-line, and commercial telephones; walkie-talkie; Special Use Airspace Management System

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) -- TOWER

Tower TMCs gather all necessary information and develop tentative TM plans to balance demand with capacity; negotiate tentative TM plans with terminal/enroute TMC/TMUs, supervisors, control specialists, and the ATCSCC; maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives and make necessary adjustments; disseminate TM initiatives to supervisory/control personnel, approach controllers, and parent TMU; and forward delay information to parent TMU.

INPUTS:
- TCCC, STARS
- HCSR/STARS flight plan data
- Engineered Performance Standards (EPS)
- Weather data (WARP, ITWS, AWPG, CWSU)
- Traffic Management Unit (TMU) -- ARTCC/MCF)
- Air Traffic Control System Command Center (ATCSCC)
- Users (Airlines, Military, General Aviation)
- Airport manager
- AMASS, ASTA, TATCA (TMA advisor), ITWS/AWPG

PROCESS:
- Gather information about terminal/enroute sector
- Assess current and forecasted capacities at the airport
- Input data to ETMS and maintain current status

OUTPUTS:
- Traffic Management Initiatives (strategic/tactical):
  - A. Airport arrival Rates (AAR)
  - B. Departure Delivery Rates (DDR)
  - C. Initial flight reroutes
  - D. Traffic stops
- Coordination with:
  - A. SATCs/ATCSs (internal) to change AARs/DDRs and flight reroutes
  - B. Traffic Management Unit (TMU)/TMCs with parent terminal facilities to maintain awareness of current and anticipated conditions.
  - C. ATCSCC to advise of current and anticipated airport delays and airspace/airport conditions

SYSTEMS:
- ETMS, STARS, HCSR, TATCA, AMASS, ASTA, TCCC, WARP, AWPG, interphone, long-line and commercial telephone

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) — ARTCC/TRACON/MCF

TMCs gather all necessary information and develop TM plans to balance demand with capacity; input and maintain OALTs in ETMS, input appropriate departure, feeder fix and arrival rates, and coordinate output with other facilities and TMUs, supervisors, control specialists and the ATCSCC. They maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives; and make necessary adjustments to disseminate TM initiatives to supervisory and control personnel. This includes towers, approach control sectors, and other TMUs via the ATCSCC. TMCs also forward delay information to the ATCSCC.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- Terminal and enroute radar
- HCSR/STARS Flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Weather data (WARP, ITWS, AWPG, CWSU)
- ATCSs and SATCSs, (towers, TRACONs, ARTCCs)
- Users (airlines, military, general aviation)
- Airport Arrival Rates (AAR) and Departure Delivery Rates
- TATCA (TMA Advisor)
- ETMS

PROCESS:
- Gather information for airports and enroute sectors within their ARTCC to assess current and forecasted demand and capacities
- Develop or recommend Traffic Management initiatives necessary to balance demand with capacity
- Input OALT into ETMS, keep current.

OUTPUTS:
- Traffic Management initiatives (strategic and tactical)
  - A. Mile and minutes in-trail restrictions, local ground delay programs
  - B. Current and projected OALTs
  - C. Arrival fix rate
  - D. Flight reroutes
  - E. Traffic Stops
- Coordination with:
  - A. SATCSs and ATCSs (internal) to initiate restrictions, implement traffic management initiatives and flight reroutes

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (ARTCC/TRACON/MCF) continued

B. Traffic Management Units (TMU/TMCs in adjacent ARTCC and Terminal facilities to maintain awareness of current and anticipated conditions and capacities

C. ATCSCC to request national TM initiatives and advise of current and anticipated delays and airspace and airport capacities

SYSTEMS:

- HCSR, ETMS, STARS, TATCA, WARP, ITWS, AWPG, interphone, long-line and commercial telephone, walkie-talkie.

ATC TECHNOLOGY AND SUPPORT INTERFACES

ATC AUTOMATION

AUTOMATED ENROUTE AIR TRAFFIC CONTROL (AERA)

AERA provides the automation support that will permit controllers in the enroute center to monitor the 4-dimensional flow of air traffic, and grant user preferred routes and altitude profiles whenever possible. AERA services comprise a number of functional capabilities including: a long term conflict probe which will provide detection of aircraft-to-aircraft and aircraft-to-airspace conflicts, as well as flow instruction non-compliance, based on trajectories of current and trial flight plans; flight plan conformance monitoring which will determine whether an aircraft is within its lateral, vertical and longitudinal conformance bounds and provide notification of non-conformance; trial planning which will provide the ability to propose amendments to flight plans and determine whether the amended flight plan is conflict-free; and a pilot request replan capability which will allow continued testing of a user request that initially resulted in a conflict and provide notification to the controller when the conflict no longer exists and the pilot's request can be granted. AERA functions provide the automation framework for sharing system management responsibility between airborne and ground-based systems.

INPUTS:
- HCSR
- All associated inputs from NAS, including oceanic and terminal areas

PROCESS:
- Receive map, target, flight plan, and weather data from HCSR
- Generate prediction of aircraft position in four dimensions (X, Y, Z, and time)
- Generate prediction of aircraft-aircraft, aircraft-airspace, and aircraft-traffic management separation standards incursions

OUTPUTS:
- Continual monitoring/maintenance of aircraft conformance with their respective flight plans
- AERA provides to controllers ranked solutions to potential conflicts
- Automated aids to facilitate coordination among controllers
- Pre-flight problem detection
- Traffic Management instructions

INTERFACED SYSTEMS:
- HCS/HCSR, DSR, TATCA.

ATC AUTOMATION

AIRPORT SURFACE TRAFFIC AUTOMATION (ASTA)

ASTA-2 includes ASTA-1 lighting capabilities, AMASS problem detection, and ASDE-3 alphanumeric identification tags. ASTA-2 also incorporates surface datalink capabilities to provide specific alerts to pilots, and a departure traffic sequence planner, a function of traffic management. ASTA-2 also interfaces with the TATCA and the TCCC, to provide full surface automation.

ASTA-3 includes the traffic management functions and Mode-S datalink services such as initial and progressive taxi instructions, and cockpit displays of airport surface traffic and alerts.

INPUTS:
- X-band radar
- Airport Radar Terminal System (ARTS)
- Controller-entered current runway configuration
- AMASS inputs
- Datalink systems
- TATCA
- TCCC
- TMS
- GPS

PROCESS:
- The ASTA-1 employs AMASS-like safety logic, with X-band radar and ARTS data to provide lighting signals to pilots
- Generate clutter map
- Integrate ARTS and ASDE-3 target data
- Generate targets
- Project the movement of traffic, determine time and distance between potential conflicts, provide traffic alerts

OUTPUTS:
- Lighting signals to pilots for "hot" runways and potential conflicts, Automated graphic, text and voice alerts to tower controllers of potential runway incursions
- ASDE-3 alphanumeric identification tags
- Departure traffic sequence planning
- Communications via datalink between pilots and controllers
- Cockpit display of airport surface traffic and alerts
- TMS planning functions

INTERFACED SYSTEMS:
- Surface lighting systems, AMASS, ARTS Interface Unit (AIU), ASDE-3, ARTS, PRM E-SCAN, datalink systems, TMS systems, TATCA, TCCC

ATC AUTOMATION

CONFLICT RESOLUTION ADVISORY (CRA)

Confiict Resolution Advisory is a National Airspace System (NAS) software enhancement designed to provide the radar controller with a display of possible alternatives for resolution of conflicts identified by Mode C Intruder (MCI) and Enroute Minimum Safe Altitude Warning (EMSAW) in the enroute environment. A visual display for conflict resolution is shown as an up or down arrow (for vertical resolution) witb an altitude needed to achieve appropriate separation (e.g., " 100" - climb to 10,000 feet, "210" - descend to 21,000 feet, or "M330" - maintain at 33,000 feet). The intent is to reduce the controller's decision-making time and the instances of aircraft separation violation. Automating the conflict resolution process will reduce the controller's workload and allow the controller to introduce considerations beyond current capabilities, such as hazardous weather and communications failures.

INPUTS:
- Aircraft transponder
- Keyboard entries
- Technicians

PROCESS:
- Analyze Mode C Intruder (MCI) and Enroute Minimum Safe Altitude Warning
- (EMSAW) and process data
- Process uncontrolled tracks
- Display alert
- Update data continuously
- Provide suggested resolution to conflict alert

OUTPUTS:
- Display processed data on controller Plan View Display (PVD)
- Resolution determination (multiple solutiom)
- Resolution ranking (prioritized advisory)
- Resolution validation (ensures resolution does not conflict)

INTERFACED SYSTEMS:
- Radar Data Processing (RDP). HCSR and DSR, Aircraft Earth Stations (AES), Ground Earth Stations (GES), ARTCC Terminals

ATC AUTOMATION

DISPLAY SYSTEM REPLACEMENT (DSR)

In 1998, the Display System Replacement project will replace the radar displays used by air traffic controllers in the conterminous United States, and at Alaska, and Hawaii. DSR will provide for the display of surveillance, track, weather, and traffic management information to the controller. It will also provide the capacity and expandability for future growth and accommodate user benefit enhancements such as datalink and Automated En Route ATC (AERA). DSR will replace equipment used to provide communications with the Host Computer System, the alphanumeric displays for data sent from the Host Computer, and flight strip printers. With the fielding of DSR, operations will transition from the old to new control rooms at the enroute center.

INPUTS:
- NEXRAD Weather data via WARP
- AERA display on controller workstations
- Flight and track data from the HCS
- Messages for Host and EDARC from the controller
- Traffic Management data
- Datalink & TATCA messages from the Host

PROCESS:
- Processes all display information from the Host including primary and secondary radar
- Stores the NEXRAD picture for the entire ARTCC in each workstation
- Accepts, sends and receives flight data/amendments and alphanumeric data from the HCS
- Monitors the status, integrity, and performance of all system resources
- Communicates with AERA processors

OUTPUTS:
- Displays the current situation display to controllers and supervisors
- Prints flight progress strips at the appropriate sector position
- Displays the TATCA metering lists
- Displays the NEXRAD weather picture
- Provides menus for message preparation (e.g., datalink)
- Provides the AERA future situation display

SYSTEM INTERFACES:
- Host Computer System, EDARC, Weather and Radar Processor (WARP), AERA

ATC AUTOMATION

ENHANCED DIRECT ACCESS RADAR CHANNEL (EDARC) REPLACEMENT

The Enhanced Direct Access Radar Channel Replacement project will provide an up-to-date enroute automation backup infrastructure to all Air Route Traffic Control Centers. It will replace the EDARC system and the EDARC System Interface processor. Using a modern application programming language, this enhancement system will provide, at a minimum, the functionality of the current system and will interface with the Weather and Radar Processor to provide Next Generation Weather Radar (NEXRAD) data to the controller. The EDARC Replacement will provide a platform that can be expanded and extended to meet increasing traffic demands.

INPUTS:
- Radar data
- Weather information from Weather and Radar Processor (WARP)
- Host
- Controller keyboard
- Data Systems Specialist
- Technicians

PROCESS:
- Receive radar data
- Process radar data and display on controller's workstation
- Update data continuously
- Display data sent from Host

OUTPUTS:
- Display radar data on workstation
- Correlate radar target with Data Block
- Respond to Inputs/Request from Host
- Send transfer request to Host

INTERFACED SYSTEMS:
- HCS/HCSR, DSR, WARP

ATC AUTOMATION

HOST COMPUTER SYSTEM REPLACEMENT (HCSR)

The Host Computer System Replacement (HCSR) will provide a new automation infrastructure to sustain the operation of enroute facilities and provide the flexibility to support expanded automation functions. HCSR will provide hardware, software, local area networks, and interfaces required to replace the flight data processing, radar data processing and other processing previously provided by the Host Computer System. HCSR will include improved wind data modeling, as well as new flight data, datalink, and traffic management functionality. It will also accommodate AERA and other new functionality as it becomes available. The HCSR will provide a platform that can be expanded and extended to meet increasing traffic demands.

INPUTS:
- Display System Replacement (DSR)
- Standalone TRACON Automation Replacement System (STARS)
- Tower Interim Display System (TIDS)
- FAATC for centralized software maintenance
- Other Systems (see below)

PROCESS:
- Receives and generates select data from/to the above sources
- Processes single and multi-sensor radar tracking, flight data and weather information and generates data to be displayed on controller workstations
- Processes and coordinates facility-level program changes with FAATC for centralized software maintenance

OUTPUTS:
- DSR
- Flight data processing
- Strategic, real-time weather products
- Traffic Management information
- Initial AERA services (i.e., automated problem detection, automated coordination)

INTERFACED SYSTEMS:
- DSR, Datalink, TATCA, DSP, ETMS, EDARC Replacement, Voice Switching and Control System (VSCS)

ATC AUTOMATION

OPERATIONAL AND SUPPORTABILITY IMPLEMENTATION SYSTEM (OASIS)

The OASIS will be a set of microcomputer-based workstations connected by a Local Area Network (LAN). It replaces existing terminals and related cache memory, communication and position processors, and other peripherals at 61 Automated Flight Service Stations (AFSS). Each OASIS AFSS will connect with a Flight Service Data Processing System (FSDPS) that operates in conjunction with the Aviation Weather Processor (AWP) and through the National Airspace Data Interchange Network (NADIN) to receive, process, store, format, display, and distribute a wide variety of meteorological, flight movement, and aviation data. OASIS will draw much of its processing capability from the installed Model 1 software. OASIS will incorporate additional software needed to meet a variety of Air Traffic operational requirements. These requirements include automated data retrieval, multiple concurrent operations, and offloading Model 1 CPU transactions.

INPUTS:
- Air Traffic Control Specialists (ATCS)
- Automation Specialists (AUS)
- Technicians

PROCESS:
- Receive, store, retrieve, and display meteorological data
- Receive, categorize, store, retrieve, and display flight movement data
- Receive, store, retrieve, and display aviation data
- Display and accept flight plan data and transfer data for further processing

OUTPUTS:
- Transmit meteorological data to other NAS facilities through FSDPS/AWP
- Transmit flight movement data to other NAS facilities through FSDPS/NADIN
- Transmit aviation data to other NAS facilities through FSDPS/AWP and FSDPS/NADIN
- Display flight plan information
- Display weather information

INTERFACED SYSTEMS:
- FSDPS

ATC AUTOMATION

STANDARD TERMINAL AUTOMATION REPLACEMENT SYSTEM (STARS)

The Standard Terminal Automation Replacement System (STARS) is the next-generation terminal automation system which will provide a modern, scalable, and expandable platform for essential ATC services. This sytem will remove the functional limitations of existing Automated Radar Terminal Systems (ARTS), serve as a single hardware./software system for all terminal facilities, provide a suitable base for functional capacity expansion, and facilitate the introduction of datalink, TATCA, traffic flow management and other functional enhancements. As a part of the STARS program, controllers will receive modern ATC workstations which will enable the deployment of user beneficial functions. The STARS system architecture will be open to the maximum extent possible to facilitate the introduction of planned product improvements.

INPUTS:
- DSR/Host Computer System, then HCSR
- Airport surveillance and air route surveillance radar data
- FAATC for centralized software maintenance

PROCESS:
- Multi-sensor tracking
- Mosaic/Single Sensor Display
- Ground or Slant Range Target positioning

OUTPUTS:
- FDAD, DEDS, CA, MSAW
- Sweepless, rectangular display of geographic area of concern

INTERFACED SYSTEMS:
- DSR, main display, Auxiliary display
- DBRITE, HCSR
- ASR, ARSR, DEDS, BANS, telephone lines, microwave links

ATC AUTOMATION

TERMINAL AIR TRAFFIC CONTROL AUTOMATION (TATCA)

The TATCA program provides automation functions to assist air traffic controllers by providing expert advisories to enhance traffic management planning. The two major functional capabilities of TATCA are the Converging Runway Display Aid (CRDA) functionality, and Center/ TRACON Automation (CTAS). The CRDA was implemented at St. Louis/Lambert International, and was in the ARTS baseline software version 3.05.

There are three components of CTAS. The Traffic Management Advisor (TMA), the Final Approach Spacing Tool (FAST), and the Descent Advisor (DA). The TMA displays aircraft arrival times and landing sequence to enroute and terminal controllers, and ensures a steady flow of traffic to match available capacity. The FAST suggests specific speed changes or turn-to-final commands for bringing aircraft into compliance with the Traffic Management plan and for precisely spacing aircraft on final approach. The converging approach delivery aid--evolved from the CRDA--assists controllers in feeding staggered approach streams to converging runways, to allow beneficial use of converging approaches under IMC, and continued use of multiple runways under lower ceilings. The DA provides fuel-efficient descents from cruise altitude using aircraft type-dependent fuel utilization models.

INPUTS:
- High resolution weather information (i.e. ITWS)
- Information from the Host software
- Information from stored flight plan information
- Automated Radar Terminal System (ARTS)
- ASR-9 radar data

PROCESS:
- Interfaces CTAS software to enhanced color displays
- Uses advanced set of algorithms to optimize top-of-descent, sequencing to runway threshold, and runway utilization
- Bases in-trail spacing on aircraft types and characteristics

OUTPUTS:
- Ghost targets for controllers to sequence arrivals from converging or intersecting runways
- TMA outputs are displayed on a Sun workstation, DA outputs are displayed on a PVD, and FAST outputs are displayed on a an enhanced color display
- Traffic mangers receive a schedule and sequence for arrival aircraft on a dedicated workstation
- Sector controllers in ARTCCs and TRACONs receive expert advisories on existing hardware

INTERFACED SYSTEMS:
- Sun workstation, TATCA Interface Unit (TIU), contractor- developed software, STARS, ARTS, Host Computer, ASR-9, PRM

ATC AUTOMATION

TOWER CONTROL COMPUTER COMPLEX (TCCC)

The Tower Control Computer Complex (TCCC) project is designed to consolidate various tower cab and air traffic control systems into a single uniform and efficient computer-human interface, provide additional functionality to tower air traffic control that will provide economic benefits to ATC users, improve controller efficiency, and provide an extendible computer platform to accommodate future tower enhancements and systems. The TCCC will use flat-panel color display technology and provide a common computer-human interface for flight data, airport lighting, airport environment data, predeparture clearance, and the digital Automated Terminal Information System functions of the Tower Data Link System. The TCCC will be characterized as a highly reliable, available, and extensible system built upon an open system architecture. TCCC will reduce space requirements in the tower cab, and reduce cabling requirements between the tower cab and equipment room.

INPUTS:
- Aircraft (with or without transponder)
- Automated Weather Observating System (AWOS)
- Low Level Windshear Alert System (LLWAS)
- Controller Keyboard
- Control Grip Device (CGD)
- Touch Entry Device
- CADRE (Voice Recognition)
- Programmers

PROCESS:
- Receive weather data from airport equipment and interface with tower cab display
- Supplement AWOS sensor data with controller-entered remarks
- Receive aircraft target information from radar
- Interface with associated ARTCC, Metroplex Control Facilities (MCF), or Local Control Facility (LCF) for approach control coordination and exchange of flight planning and tracking information
- Move Flight Data Entries (FDE) between control positions, and automatically send interfacility messages

OUTPUTS:
- Tower Cab Displays

SYSTEMS:
- AWOS, HCSR, LLWAS, Search and Beacon Radar, Operational Program

ATC AUTOMATION

ENHANCED TRAFFIC MANAGEMENT SYSTEM (ETMS)

The ETMS maintains data about all aircraft, aeronautical and meteorological data, and air traffic control information. Using data provided by the ATC computers, weather processors and aviation data bases, the ETMS makes a strategic plan of activities and disseminates the plan to the ATC system. The ETMS creates and maintains a dynamic, real-time model of the operational ATC environment for use by the HCSR to generate the "look-ahead" feature of AERA, and receives and processes information from the HCSR to update the ATC model based on AERA movements. The ETMS interfaces with the Terminal ATC Automation (TATCA) system to exchange information relative to arrival spacing functions performed within TATCA to ensure conformance with the ETMS strategic plan and optimum use of the NAS system's airport resources.

INPUTS:
- Official Airline Guide (OAG)
- Other filed flight plans or requests
- Aviation Weather Products Generator (AWPG)
- Integrated Terminal Weather System (ITWS)
- Operational Data Base Management System (ODMS)
- Registered Aircraft Data Base
- HCSR

PROCESS:
- Analyze flight information, weather, schedules, and demand to maximize airspace and airport usage
- Maintain and dynamically update NAS operational data base
- Create a dynamic model of the NAS
- Disseminate operational information to Area Control Computer Complex and Traffic Management functions within the Air Traffic Control facilities

OUTPUTS:
- User-preferred routes (minimum time track, fuel efficiency, passenger comfort, etc.)
- Projected arrival times at descent advisory fix and runway threshold
- Departure time windows for all scheduled flights.

INTERFACED SYSTEMS:
- HCSR, TCCC, ITWS, ODMS, DUATS (2-way interface), Flight Service WANs/ LANs, TATCA

COMMUNICATIONS

AERONAUTICAL Datalink

Because of a finite number of radio frequencies and an increased amount of air traffic, frequency congestion problems have increased proportionately to increased air traffic activity. To address these problems, the FAA developed and implemented a non-voice communication system called Datalink. The system electronically transfers digital messages to computer screen displays located on the ground and in the aircraft cockpit. Datalink improves communications between pilots and air traffic controllers by providing each with accurate information in text form. The major advantage of the digital system is the ability to provide information to aircraft selectively.

INPUTS:
- Air traffic controllers
- Pilots
- Computer Data
- Weather Data

PROCESS:
- Datalink provides two-way digital communications between the ground and the air. As data is transmitted, computers select the optimum method of transmission to and from the aircraft. Based on pre-determined priorities, the computer may choose from VHF radio, Mode S beacon, satellite, or other proposed transmission system.

OUTPUTS:
- Standardized ATC instructions, which will have a datalink cockpit equivalent response
- Information from databases that can be accessed independently without contacting an air traffic controller. These messages may be automatically uplinked or downlinked without intervention by a pilot or controller.

INTERFACED SYSTEMS:
- Mode S Radar Beacon System, VHF communications system, satellite networks, Host Computer/HCSR.

COMMUNICATIONS

AERONAUTICAL MOBILE SATELLITE SERVICE (AMSS)

The AMSS is an integral element of overall improvements being implemented for the enhancement in safety, capacity, service flexibility, and operating cost of air traffic safety services, aeronautical administrative communications, and aeronautical public correspondence. These improvements, which include the Global Navigation Satellite System (GNSS), Automatic Dependent Surveillance (ADS), Oceanic Display and Planning System (ODAPS), and the Aeronautical Telecommunications Network (ATN), are initially scheduled for implementation during this decade in oceanic airspace and are being considered for subsequent partial or full implementation in domestic airspace. The FAA, in conjunction with the aviation community, is developing the requirements, standards, and new technical approaches for the AMSS, and is planning to validate and evaluate them during the next five years and thereafter. Subsequently, it will issue to industry operational service requirements for implementation of these enhancements.

INPUTS:
- Global Navigation Satellite System (GNSS)
- Automatic Dependent Surveillance (ADS)
- Aeronautical Telecommunication Network (ATN)

PROCESS:
- Reviews and transmits from satellites data and voice messages at the Aircraft Earth Station (AES), from aircrews and/or passengers
- On the ground, the data and voice messages to/from satellites are handled by the GESs appropriately interconnected through the Aeronautical Telecommunication Network (ATN) with the service subscribers (ARTCCs, airline offices, packet-switched network (PSN), etc.

OUTPUTS:
- Data messages displayed on AESs in the aircraft
- Data messages displayed on ODAPS terminals at ARTCCs
- Voice connected to pilot and controller microphones and public telephones

INTERFACED SYSTEMS:
- Aircraft Earth Stations (AES), Ground Earth Stations (GES), ARTCC Terminals

NAVIGATION

GLOBAL POSITIONING SYSTEM (GPS)

The GPS system, developed and operated by the Department of Defense, consists of 24 satellites, and provides two levels of service: Standard positioning service (SPS), and Precise Positioning Service (PPS).

SPS is a positioning and timing service that is available on a continuous worldwide basis with no direct charter. SPS is provided on the GPS L1 frequency, which contains a course acquisition (C/A) code and a navigation data message. SPS provides the capability to obtain horizontal positioning accurate to within 100 meters 2 drms (95% probability), and 300 meters 99.99% probability.

PPS is a highly accurate military positioning, velocity, and timing service that is available on a continuous worldwide basis to users authorized by the DOD. PPS was designed primarily for U.S. military use, and is denied to unauthorized users by use of cryptography. PPS data is transmitted on the L1 and L2 frequencies, and is available to U.S. federal and allied government uses through special agreements by the DOD. PPS improves the navigation accuracy of aircraft operating in airspace where aids to navigation are limited or non-existent.

INPUTS:

- The ground monitoring stations will be developed and implemented by the FAA. Integrity of the system, and differential corrections to improve accuracy will be provided by the ground monitoring stations. Up to 20 ground stations may be required to cover the continental United States.

PROCESS:

- The ground monitoring stations will provide references based on surveyed locations. They will verify satellite integrity and generate corrections to improve accuracy. Integrity and differential corrections will be broadcast to users by using geostationary satellites or local area broadcast. Also position information will be datalinked to the ARTCCs.

OUTPUTS:

- In the terminal environment GPS information will be provided on the avionics display. The position of the aircraft will be compared with stored approach or departure procedures. Ground maps will be displayed for airport surface navigation. GPS information will be datalinked to towers.
- Automatic Dependent Surveillance will use GPS for position accuracy.

NAVIGATION

GLOBAL POSITIONING SYSTEM (GPS) continued

INTERFACED SYSTEMS:

- The operational GPS constellation will consist of 21 Block II satellites plus three spares. The DoD will declare the GPS constellation fully operational when 21 operational satellites are functioning in their assigned orbits. The implementation mechanism for GPS for civil use has not yet been determined.

NAVIGATION

MICROWAVE LANDING SYSTEM (MLS)

MLS is a precision approach and landing guidance system that provides position information and ground-to-air data. MLS is an air-derived system where ground transmitters radiate signals that are received in the aircraft to provide lateral and vertical guidance and range to the runway. The MLS has the capability to fulfill a variety of needs in the transition, approach, and departure phases of flight. For example, selectable glide path angles, 3-D positioning of the aircraft in space, and the establishment of boundaries to ensure clearance from obstructions in the terminal area.

INPUTS:
- Maintenance commands
- Operational control from the ATC tower
- Interrogation pulse pairs from airborne interrogator

PROCESS:
- Electronic precision path guidance in the form of lateral, vertical, and distance information to designated runways and landing areas.
- Electronic non-precision approach guidance in the form of azimuth and distance information to designated runways and landing areas.
- Transmission of a facility identification
- Continuous operation by providing backup power capability
- Monitoring and automatic shutdown of electronic precision landing systems that transmit signals outside of specified performance limits
- Shutdown of an alarm or alert to a control point
- Collection of data for the RMMS

OUTPUTS:
- Azimuth guidance provides lateral guidance and transmits basic data and auxiliary data. On runways with MLS at both ends, the azimuth equipment may be switched from operation as an approach azimuth to a back azimuth through the use of a Remote Control and Status Unit (RCSU) located in the control tower. The MLS broadcasts azimuth guidance throughout a specified volume of airspace to enable straight, curved, and segmented approaches
- Elevation guidance provides vertical guidance to the runway touchdown zone through signals transmitted on the same C-band frequency as the azimuth station
- Range guidance is provided by precision distance-measuring equipment (DME/P), which is normally collocated with the azimuth station
- The MLS broadcasts facility identifications on the appropriate time slot: Morse code identification of the DME/P, and facility identification via data word

NAVIGATION

MICROWAVE LANDING SYSTEM (MLS) continued

- The MLS broadcasts data words containing the data necessary for aircraft utilization of azimuth, elevation, and distance data transmissions
- The MLS monitors its operational status, equipment failure alarms, and certification and diagnostic test data to ensure the subsystem is operating within normal performance criteria
- The MLS indicates its operational status to the ATC tower

INTERFACED SYSTEMS:

- Each MLS contains a Remote Monitoring Subsystem (RMS). The RMMS interface port provides an interface to connect to the Maintenance Processor Subsystem (MPS). The RMS also provides interfaces for connection to the Maintenance Data Terminals (MDT); The interface of the Tower Control Computer Complex (TCCC) to the MLS is provided at the RCSU Electronics Unit (REU) remote panel interface port; an interim Instrument Landing System (ILS) used for synchronization of the identification with the ILS during the transition period will be provided.

SUPPORT INTERFACES

AVIATION WEATHER PRODUCTS GENERATOR (AWPG)

The AWPG, accesses the National Weather Service Gridded Forecast System (GFS) and provides tailored aviation weather products covering the Area Control Facility area of responsibility. Products include current and short-term forecast aviation weather depictions for flight planning and hazardous weather avoidance. The implementation of the AWPG is dependent on the availability of the GFS.

INPUTS:
- NWS Gridded Forecast System (GFS)
- NEXRAD
- Integrated Terminal Weather System (ITWS)
- AWOS/ASOS
- MWP-2
- Other Systems (see below)

PROCESS:
- System integrates and stores data relevant to ACF area
- System generates current/short-term weather products

OUTPUTS:
- System delivers variety of current/short-term forecasts to systems below

INTERFACED SYSTEMS:
- NWS GFS; HCSR, ETMS; MWP-2, Datalink Processor (DLP), Flight Service Automation System; ITWS

SUPPORT INTERFACES

INTEGRATED TERMINAL WEATHER SYSTEM (ITWS)

ITWS integrates the weather data from several terminal area sensors and provides value-added, compatible, consistent, real-time weather products that need no additional interpretation. ITWS products are tailored for immediate use by controllers and pilots via datalink.

The purpose of ITWS is to provide simple and timely terminal area alerts and short-term forecasts. The weather products are in formats that are if immediate operational use, and support controller tactical and strategic decision-making.

INPUTS:
- NWS/AWIPS-90
- Aviation Weather Products Generator (AWPG)
- AWOS/ASOS/RVR
- TDWR/ASR-8/9
- LLWAS
- High resolution upper winds data from automated pilot reports

PROCESS:
- System integrates and stores current weather data
- System creates short-term forecast products

OUTPUTS:
- System delivers end products via TIDS or TCCC and/or discrete color display
- System provides discrete data to supporting systems, e.g., TATCA
- Provides capability to send product sets to other facilities/systems for further distribution, e.g., AFSS

INTERFACED SYSTEMS:
- HCSR, TCCC, AWPG, NWS/AWIPS-90, communications systems, local weather sensor systems including weather radar

SUPPORT INTERFACES

OPERATIONAL DATA MANAGEMENT SYSTEM (ODMS)

The Operational Data Management System (ODMS) is an automated system to manage the collection, validation, and timely dissemination of aeronautical data within the NAS. The data is used for the generation of the common national data base required the NAS processors and to support FAA air traffic control, flight services, airspace management, maintenance, flight operations, and management information systems. The ODMS is the single source of national-level aeronautical information to the government, industry, and the aviation community. Aeronautical information is provided in the form of reports, publications, charts, magnetic tapes, and direct digital data transfer to civil government, military, commercial and individual users of the NAS. The ODMS also supports management and administrative information needs for program planning, tracking, decision-making, and analysis of the operational system to determine capacity and demands on the system.

INPUTS:
- FAA offices; i.e., Airports, Flight Standards, regional offices, local facilities, etc.
- National Maintenance Processor System
- National Data Interchange Network (NADIN) I and II
- ODMS workstations
- ATC automated systems

PROCESS:
- Receive and validate data from sources of input
- Allocate space on direct access media and store data
- Catalog data sets of aeronautical information
- Parse operational data from ATC automated systems
- Receive data requests and set up appropriate data in buffers
- Control user access according to naming conventions, logons, passwords, etc.
- Process system status data
- Process national database for digital output
- Process master file for publications and charts
- Process data to meet specific external subscriber requirements

OUTPUTS:
- Operational data for capacity and demand analysis
- National digital data for ATC automated systems
- Subscriber-required data in requested format
- Aeronautical data for publications and charts
- System status data

SUPPORT INTERFACES

OPERATIONAL DATA MANAGEMENT SYSTEM (ODMS) continued

INTERFACED SYSTEMS:

- Air Traffic Control System Command Center (ATCSCC) ETMS, Instrument Approach Procedure Automation (IAPA), Obstruction Evaluation and Airport Airspace Analysis (OE/AAA), National Ocean Service (NOS), Defense Mapping Agency Aeronautical Center (DMAAC), Nadin I an II, Air Route Traffic Control Center (ARTCC), HCSR, System Support Laboratory/System Support Computer Complex (SSL/SSCC), Direct User Access Terminal System (DUATS), National Maintenance Processor System (NMPS), National Flight Data Center (NFDC) workstations, Datalink Processor (DLP), Flight Service Data Processing System (FSDPS)

SUPPORT INTERFACES

WEATHER AND RADAR PROCESSOR (WARP)

Deployed at each of the enroute centers, the Weather and Radar Processor (WARP) provides controllers, Traffic Management Coordinators, and the Center Weather Service Unit (CWSU) meteorologists with a more accurate presentation of current weather via the Next Generation Weather Radar (NEXRAD). The display of NEXRAD weather will enable increased use of airspace capacity and reduce avoidable weather-related delays.

INPUTS:
- Next Generation Weather Radar WSR-88D (NEXRAD)
- HCSR
- Meteorologist Weather Processor (MWP)
- AWOS Data Acquisition System (ADAS)
- Weather Message Switching Center Replacement (WMSCR)
- Other WARPs
- Satellite transmissions

PROCESS:
- Generate a NEXRAD mosaic product
- Simultaneous and continuous receipt, processing, dissemination, and storage of weather product from external sources, (HCSR, ADAS, MWP, and WMSCR)
- Collect and disseminate NEXRAD products with other WARPs
- Collect and distribute PIREPs

OUTPUTS:
- NEXRAD mosaic products
- Weather reports/products
- MWP products

INTERFACED SYSTEMS:
- Datalink Processor (DLP), WMSCR, HCSR, ADAS, MWP, other WARPs, National Weather Service family of services.

ATC FLIGHT SCENARIOS

COMMERCIAL CARRIER (DOMESTIC SERVICE) FROM/TO AIRPORTS WITH A CONTROL TOWER

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	1. Pilot in command obtains briefing from aircraft dispatcher, who authorizes flight.
	2. Verify IFR flight plan and notify changes to air traffic as required. **[2000: ETMS incorporates flight plan program/air carrier computer interface program].**
	3. ~~Contacts ground control/clearance delivery prior to engine start.~~ **[2000: Logs onto ATC for clearance prior to engine start].**
	4. Issues engine start time, taxi or clearance information, departure control frequency,and beacon code.
5. After receiving clearance, contacts ground control for taxi clearance if not previously provided.	
	6. Issues taxi instructions.
7. Acknowledges and follows taxi instructions. [2000: Views information on cockpit CRT and acknowledges].	
8. Contacts local control for clearance to take off.	
	9. Issues departure information and takeoff clearance.
	10. After takeoff, instructs pilot to contact departure controller (TRACON/MCF).
	11. Flies specific departure route, climbing to assigned altitude, and contacts departure control as directed.[2000: Some TRACONs replaced by MCF].

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	12. Provides air traffic control service from point of handoff to enroute controller ~~(ARTCC)~~. **[2000: ARTCC/MCF]**.
	13. Transfers radio communications and control responsibility to enroute controller and instructs pilot to contact the next facility, by name, on a specified frequency. Repeated as required from sector to sector.
14. Contacts enroute controller and reports altitude.	
	15. Confirms radar contact and issues control instructions as required.
16. Adheres to assigned route and altitudes.	
	17. When aircraft is nearing destination, a clearance time is specified — including route, altitude information, and instructions on further communications. **[2000: Routine communications via datalink, including "top of descent"]**.
	18. Transfers radio communications and control responsibility to approach controller (TRACON). **[2000: ARTCC/TRACON/MCF]**
	19. Instructs pilot to contact approach control on a specific frequency.
20. Contacts approach controller, confirms position and altitude, and advised of any approach requirements or requests.	
	21. Clears aircraft for approach, issues special instructions/radar vectors where appropriate. Instructs pilot to contact tower. **[2000: Information developed by TATCA]**.
22. Follows specific approach procedures and contacts tower when instructed.	

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	23. Acknowledges initial contact and issues landing instructions or clearance.
	24. Instructs aircraft when to turn off runway and contact ground control.
25. Exits runway without delay. Change to ground control frequency when instructed by tower.	
	26. Ground control issues specific instructions to direct pilot to gate area.

Note: ~~Flight crew and air traffic control actions are subject to traffic management action or initiatives, which are taken in response to air traffic demand (and in excess of capacity) to direct aircraft to avoid severe weather. The Air Traffic Control System Command Center (ATCSCC) transmits advisories to airline dispatch offices concerning the status of the national management initiatives. These initiatives in response to excess demand frequently utilize delay departure times to smooth the flow of traffic and to avoid costly airborne holding. Initiatives designed for severe weather avoidance usually result in a non-standard route of flight.~~ **[2000: Traffic plan now directed by ETMS/AERA. Optimum routings will be generated by ETMS if no specific route of flight is requested. ETMS manages all weather traffic changes through AERA].**

TRAFFIC MANAGEMENT AIR CARRIER FLIGHT FROM ATLANTA (ATL) TO CHICAGO O'HARE (ORD)

Note: This scenario is invalid beginning in 2000. The ETMS coordinates data and early warnings from AERA concerning the thunderstorm, and quickly datalinks information to flights while rerouting traffic accordingly. Furthermore, some TRACONs operating in this scenario have been incorporated into MCFs.

~~Early in the morning, traffic management specialists (TMS) at the Air Traffic Control Systems Command Center (ATCSCC) receive a weather briefing from National Weather Service (NWS) personnel located at the Central Flow Weather Service Unit (CFWSU). They are told that weather at Chicago's O'Hare International (ORD) will experience low ceilings, reduced visibility and rain showers. Also, thunderstorm activity is expected to occur along a cold front extending from southwest Tennessee to northeast Georgia. The thunderstorms are predicted to be most numerous in the area north of Atlanta, GA.~~

~~At the same time, traffic management specialists in the Chicago and Atlanta Air Route Traffic Control Center Traffic Management Units (ARTCC TMUs) are receiving similar briefings from NWS personnel located in the Center Weather Service Units (CWSU) at their facilities. The TMS' and supervisors at all three facilities are beginning to consider the impact that this adverse weather will have upon air traffic operations, and what actions will be required to mitigate that impact.~~

~~Later in the morning, the National Traffic Management Officer (NTMO) at the ATCSCC conducts one of two daily telephone conference (TELCON) briefings with Traffic Management personnel from each of the ARTCCs and the larger airport air traffic facilities, and representatives of the major airline dispatch offices. The briefing begins with a summary of the known and expected constraints on the National Airspace System (NAS) such as adverse weather, airport construction activity, and other factors, and evolves into a discussion of probable results or traffic management actions that may be required. During this briefing, the airline dispatch offices are made aware that traffic management actions, or initiatives, may be required for aircraft flying to ORD and for aircraft flying on routes that normally traverse the area where thunderstorms are predicted to exist.~~

~~Specialists at the Atlanta ARTCC TMU have decided to plan for possible reroutes around sever weather if thunderstorms close normal routes. They coordinate this information with the ATL approach control (TRACON) and tower (ATCT), and with the Severe Weather and National Route Management (NRM) specialist at the ATCSCC. The NRM specialist sends a message to the airline dispatch offices advising that flights to ATL, or through the area north of Atlanta can expect to be rerouted around areas of severe weather.~~

~~Meanwhile, the TMS responsible for the central portion of the country is considering the situation at ORD. This will require increased spacing between aircraft, which will reduce the arrival capacity of the airport. In addition, the rain will leave runways wet, thus reducing braking traction. So, instead of being able to land aircraft on three runways at the same time, only two runways will be available for arrivals. Given these conditions, the specialist calculates the~~

~~airport's arrival capacity.~~

~~The Specialists then accesses a computer database that stores records of all regularly scheduled flights to determine the number of aircraft scheduled to arrive at ORD will exceed the available capacity. If nothing is done to manage this situation, the result will be aircraft stacked in holding patterns over the airport waiting their turn to land. This would significantly increase controller workload, waste fuel and reduce equitable access to the airspace for other aircraft.~~

~~The ATCSCC central area specialist, having determined that a problem exists, decides to conduct a conference call with the Chicago ARTCC TMU and the ORD TRACON TMU, to determine a course of action. Another check is made with the meteorologists at the CFWSU and the Chicago CWSU, and they agree that there will be low ceilings and rain all day at ORD. Specialists at ORD TRACON confirm that they will only be able to land on two runways. All concerned facilities agree that the arrival capacity will be 65 aircraft per hour. A check of the flight schedule data base shows that the hourly demand will indeed exceed the 65 aircraft arrival rate. A national traffic management initiative to limit the arrival demand to 65 is agreed to by all. The method used to control demand will be a ground delay program. The ground delay program will assign each scheduled flight a delayed departure time that is calculated to achieve a 65 flight-per hour arrival rate at ORD. This results in the delays being taken on the ground rather than in holding patterns over the airport.~~

~~The ATCSCC specialist makes one more telephone call before implementing the ground delay program. These calls are to the airline dispatch offices responsible for many of the flights going to and from ORD. Their purpose is to seek an opinion of the weather and its effect on operations, from the perspective of the carrier's meteorologists and dispatchers. They concur with the NWS forecasts and agree that conditions justify a ground delay program. The specialist then discusses these events with the NTMO and receives approval to implement a ground delay program at a rate of 65 arrivals each hour.~~

~~The ATCSCC specialist then runs a program that assigns each flight going to ORD a controlled departure time (CDT). Each CDT is based on controlling the departure time of each flight. The arrival times of these flights are adjusted so that 65 flights will arrive, spread evenly throughout each hour. A list of CDTs for aircraft departing each ARTCCs airport is sent to that ARTCC and a list of CDTs for airline flights is sent to that airline. Also, an advisory is sent to all affected air traffic facilities and to all affected airline dispatch offices describing the reasons for and the details of the program.~~

~~The ABC airline dispatch office, in preparing for flight number 123 from ATL to ORD, is aware of the CDT assigned to this flight and the possibility of being rerouted around the severe weather north of Atlanta. These considerations are discussed with the flight crew during the preflight briefing. A flight plan is filed by the dispatch office and is routed, via computer network, to the Atlanta ARTCCs Host Computer. The Host Computer is interfaced with the traffic management computer used by the ATCSCC, and the CDT is automatically assigned to the flight plan. The CDT will appear on the flight plan when it prints out at Atlanta ARTCC, and at ATL tower and TRACON. Thus, the specialist in the tower issuing clearances knows that this flight is not authorized to depart before the CDT.~~

~~By this time, as forecast, a line of thunderstorms has developed north of Atlanta. Several aircraft have already deviated from their filed route of flight to avoid the storm, and the gaps through which they are penetrating the line are closing. Atlanta ARTCC TMU has instructed ATL tower to issue revised routings to those flight whose routes from Atlanta are to the north. Atlanta ARTCC TMU then contacts the ATCSCC so that alternate routes can be coordinated with adjacent ARTCCs, coordinates the routes, and then sends a message to the airline dispatch office advising of the reroute activity.~~

~~As the CDT for ABC 123 nears, the flight crew calls the tower for their clearance. They are advised of the severe weather north toward ORD. Flight ABC 123 departs ATL on its CDT, and enjoys a smooth flight to ORD. It lands without having deviated from its route or incurring any airborne delays.~~

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITH CONTROL TOWERS

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Requests flight briefing and announces intention to file flight plan in person or by telephone with AFSS.	
	2. flight service provides weather and route briefing, accepts filed flight plan, and transmits pertinent flight plan data to the appropriate ARTCC **[2000: Some TRACONs replaced by MCF]** for processing and entry into the automated system.
3. Contacts ground control/clearance delivery prior to engine start.	
	4. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne.
5. Acknowledges and follows ATC instructions.	
6. Requests that ATC cancel IFR flight plan while airborne, or, within 30 minutes after landing closes IFR flight plan with flight service.	

NOTE: [2000: Datalink available for GA] General aviation aircraft are subject to the same traffic management initiatives that apply to scheduled air carrier flights. They are also subject to special traffic management initiatives due to excess demand at high density airports and in response to excess demand caused by special events (i.e., the Indianapolis 500, Kentucky Derby, Boston Marathon, etc. At high density airports, a reservation is required for general aircraft arrival and departure. Federal Aviation Regulations describe the rules and procedures used to fly to and from high density airports. Information concerning these programs is disseminated via a Notice to Airman (NOTAM) and the pilot will be made aware of responsibilities by the flight service specialist during the preflight briefing or when the pilot files the flight plan.

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITHOUT CONTROL TOWERS

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Requests weather and files flight plan via AFSS or vendor.	
	2. Flight service provides weather and route briefing and transmits pertinent flight plan data to the appropriate ARTCC. **[2000: Some TRACONs now MCF]**
3. Advises flight service and other operators at the airport when ready to taxi out for departure.	
	4. Flight service relays ATC clearance, facility and frequency for control after departure, and provides airport weather and known traffic information.
5. After receipt and acknowledgement of IFR clearance, advises flight service prior to departure.	
6. After takeoff, follows published IFR departure procedure, and contacts the designated ATC facility.	
	7. Provides air traffic control service in the same manner as in air carrier operations while airborne.
8. Acknowledges and follows ATC instructions.	
9. When approximately 10 miles from destination airport, contacts local advisory frequency and announces intentions.	
	10. When aircraft is nearing destination airport and direct communication and control is no longer required, issues clearance for the published instrument approach.
11. After landing, advised tie-in flight service station to close IFR flight plan with control facility.	

TRANSOCEANIC FLIGHT

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	1. Advise to dispatcher of available routes. Coordinates route selection. Traffic advisories required. **[2000: Coordinates route options via ETMS]**.
2. Pilot in command obtains briefing from aircraft dispatcher, who files IFR flight plan in accordance with ICAO procedures and formats, and authorizes flight.	
	3. Issues engine start time, departure control frequency, beacon code, taxi and/or clearance information.
4. Reads back clearance to controller to ensure accuracy (readback is required per ICAO agreements).	
5. After receiving clearance, contacts ground control for taxi clearance if not previously provided.	
	6. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne within domestic airspace.
7. As aircraft approaches oceanic airspace, contacts enroute controller, reports altitude, and requests oceanic clearance from the controller responsible for the first oceanic area on flight route (if oceanic clearance not previously received).	
	8. Confirms radar contact, and aircraft is sequenced on cleared route to meet required oceanic separation. [1995: No longer valid because of track advisories].
9. Issues oceanic clearance (if necessary) and control instructions.	
10. Acknowledges receipt and reads back clearance to controller to ensure accuracy (required per ICAO agreements).	
11. Adheres to assigned routes and altitudes.	
	12. Transfers control responsibility to appropriate oceanic sector.

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	13. Coordinates transfer of control responsibility to receiving Flight Information Region.
14. Establishes communications **[2000: Position reports are relayed by ADS]** with the appropriate oceanic radio station for passing required position reports.	
	15. Coordinates transfer of control responsibility to receiving Flight Information Region (IFR) and passes transfer instructions to pilot throughout the oceanic radio station.

NOTE: Aircraft flying to or from overseas destinations are not normally subject to traffic management initiatives taken in response to excess demand at airports. There are, however, constraints on the oceanic route system that frequently require traffic management action. Radar coverage does not extend over most oceanic airspace, therefore, oceanic-radar separation procedures must be used. The increased separation requirements frequently result in demand in excess capacity. The Air Traffic Control System Command Center advises airline dispatch offices of potential delays due to this excess demand.

MILITARY AERIAL REFUELING AND TRAINING MISSION IN DOMESTIC AND SPECIAL USE AIRSPACE

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Obtains from base operations a preflight weather and mission briefing, including scheduled refueling time for designated refueling track and call signs for participating aircraft.	
2. Files flight plan with BASOPS.	
3. Follows military air traffic guidance until making contact with civil ATC services after departure.	
	4. Confirms radar contact, assigns beacon code and issues control instructions as necessary in similar fashion to those provided to commercial aircraft.
5. Contacts enroute controller and reports altitude. Requests clearance to enter the refueling track.	
	6. Authorizes aerial refueling within the specified track at the flight plan altitude and requests receiver aircraft to declare position when three miles from tanker aircraft.
	7. Releases to tanker aircraft appropriate communications frequency no later than the designated Air Refueling Initial Point (ARIP).
8. Maintains two-way radio contact with ATC until established in the altitude block, then contacts tanker.	
9. Tanker advises ATC that Military Assumes Responsibility for Separation of Aircraft (MARSA) is in effect. During refueling operations all communication with ATC is conducted by the tanker aircraft.	
	10. Avoids issuing altitude or course changes without tanker concurrence.
11. Tanker coordinates route and altitude clearance for both the receiver and tanker, and established vertical separation prior to reaching the planned exit point.	

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	12. Clears aircraft to depart the refueling track at a navigational reference point or egress fix.
13. Receiver contacts ATC and reports altitude, adheres to assigned airways, route and altitudes.	
	14. Provides ATC services until aircraft enters airspace dedicated to military training mission.
15. Aircraft completes training assignment and requests ATC clearance to reenter civil airspace and return to airport.	
	16. Provides ATC services in the same manner as provided to domestic carriers.

NOTE: The location and use times of aerial refueling tracks are established by Letters of Agreement between the scheduling military unit and the air traffic facility containing tract airspace. Normally, the military must provide advance notice of specific use times and aircraft call signs to the controlling air traffic facility. Also the using military unit may coordinate with the Central Altitude Reservation Function (CARF) for approval of an Altitude Reservation (ALTRV) to and from the aerial refueling track. CARF, located within the Air Traffic Control System Command Center in Washington, D.C. accomplishes advance coordination of the ALTRV mission requirements with all affected air traffic facilities. Thus, complex mission requirements or movement of large numbers of aircraft can be accomplished smoothly, and without impacting routine air traffic operations.

AFSS PROCESSING FOR VFR PILOT

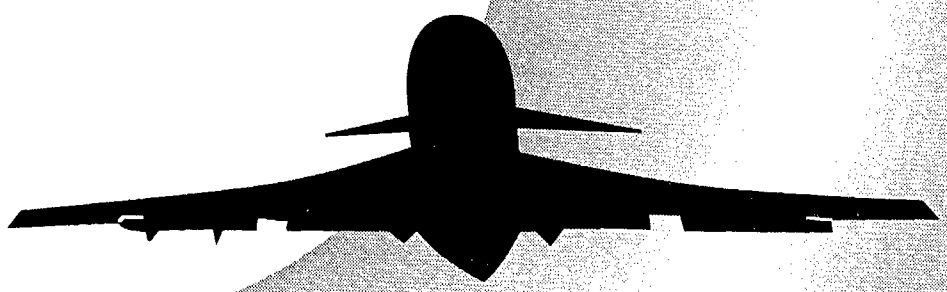
FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Calls the FAA 1-800-WX BRIEF telephone number at least 30 minutes prior to flight. Requests weather information and preflight briefing.	
	2. Call is handled by AFSS Preflight (PF) briefer standing by to relay information from OASIS computer for data input and weather retrieval. PF also uses automated weather graphics system, which displays various weather maps.
	3. PF conducts standard weather briefing, including terminal area, enroute, and winds aloft observations and forecasts, etc.
4. Pilot decides weather is good for VFR flight, requests information about Notices to Airmen (NOTAMs).	
	5. PF relays local and distant NOTAMS that originate within the flight plan area, and FDC NOTAMS not formatted for the OASIS computer.
6. Pilot files flight plan by reading specific aircraft data, characteristics, specific origin/ destination trip information, etc.	
	7. FSS specialist checks and accepts flight plan, and files with OASIS.

AIRBORNE CHANGE IN FLIGHT PLAN

1. Pilot determines a different destination. Calls AFSS closest to present position.	
	2. FSS Inflight (IF) specialist converses with pilot and provides additional briefing information such as weather, NOTAMS and route changes. Amend flight plan as necessary.
3. Pilot heads toward new destination. Once arriving, calls AFSS and closes flight plan.	
	4. AFSS Flight Data (FD) specialist closes flight plan.

THE FAA AIR TRAFFIC SYSTEM
VISION OF THE FUTURE

2005



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A TRIP THROUGH THE ATC SYSTEM — 2005

A. DOMESTIC FLIGHT

In the years between 2000 and 2005, operators have taken full advantage of new equipment capabilities, new procedures, and software. This is evident in the flight from Chicago to Washington.

The pilot calls a commercial vendor and receives a full weather briefing. This includes accurate forecasts along the route of flight at the precise times anticipated by the projected flight plan. The request may be made over a computer or terminal system, or the pilot may access the system using a touch-tone telephone to request the necessary information. Vendors have streamlined the process further, through the use of automated voice response systems to make the pilots task easier and more precise than ever. At the end of the briefing, the pilot provides an identification and the trip is filed into the ATC computers, a departure, time en route, and arrival time are provided, and the pilot is ready to go. Weather information is more accurate and timely.

The IFR clearance is part of the preflight process in 2005, as the acceptance of a departure time completes the clearance action. When the pilot powers up the aircraft and logs on to the ATC data system, details of the clearance are uploaded. This includes a departure route, en route navigation points, an approximate top-of-descent fix, and an arrival route. The pilot checks the data for accuracy, and requests an amendment, if necessary, before accepting the route. Upon acceptance, the route, from one airport to the other, is loaded into the aircraft's flight management system. The pilot is confident that the route provided is the most efficient one, based on parameters developed by the FAA and the operator. Furthermore, the weather, NOTAM and PIREP information provided is the most updated information.

As the aircraft moves away from the gate, on-board equipment receives advisories and instructions from systems on the ground providing data through electronic datalink and visual and aural cues from the lights and signs on the surface. A local controller clears the aircraft onto the active runway, and the clearance is confirmed by a lighting system managed by the tower controllers. The flight is now cleared for take off. Once the aircraft rolls down the runway and lifts off, the on-board flight management system takes over and guides it along the cleared departure route away from the airport and on to Washington.

ATC computers and on-board avionics constantly check the skies around the aircraft for potential conflict with other aircraft, but the likelihood of such events has been reduced by the accuracy of information passing between the ground and the air. All aircraft operating in the Terminal Control Area are known to the ATC computers and to other aircraft, through the use of advanced airborne collision avoidance equipment. Commercial aircraft have cockpit displays that present a clear picture of other traffic, including data block information, and the speed and direction of their movement. Pilots use this information to assist Airspace Managers (AM), as controllers are now called, in maintaining the proper distance from preceding aircraft and to avoid potential threats. Also, as the aircraft makes its way toward its destination, on-board sensors and communications systems are automatically sending data back data to the ground

over the datalink. This information includes position data derived from the on-board navigation system and weather data observed and collected by advanced weather observation and communication equipment.

Instant, switched voice and data communications between the ground and the air make communications between pilots and controllers—now called Airspace Mangers—more effective. The pilot no longer has to change radio frequencies each time the aircraft passes through a sector boundary. Airborne and ground communication systems make the frequency changes automatically, using discrete addressing for each aircraft, and the task of passing information up or down is a matter of keying a microphone or enabling a datalink message. In this way, every aircraft under control of ATC is in immediate voice or data contact.

As the flight approaches Washington, the aircraft reaches a predetermined top-of-descent point in the sky, where it begins descent toward National Airport. Both pilots and airspace managers and ground and airborne automation systems communicate to ensure conformance, and the aircraft's flight management system follows its preset arrival route into the terminal area. AMs advise the pilot of which traffic to follow and at what interval, and the pilot tracks and follows that traffic precisely using on-board avionics to mark, identify, and display the other aircraft on a screen in the cockpit. Assured that the descent is conflict-free all the way down to the runway, the pilot continues to monitor the flights progress as the flight management system guides the aircraft down the approach course and onto the runway.

Equipped with surface traffic information, the pilot taxis the aircraft off the runway, through the airports network of taxiways and all the way to the parking area. This is accomplished by following lights, signs, and advisories received via datalink. The aircraft taxis to a full stop, the engines are shut down, and an arrival message notifies the ATC computers that the flight has been completed.

B. INTERNATIONAL FLIGHT

From the perspective of the pilot and passenger taking the international flight between Chicago and London, little has occurred since 2000 to change the flight scenario. Traffic Management information is now shared globally, with abutting nations linked by computers so that international flight routes are known to all the jurisdictions where the flight will be of interest. For example, in the scenario of the flight between Chicago and London, the traffic management entities in the U.S., Canada, Ireland, and United Kingdom all share data about the planned flight. As the aircraft makes its way across the continent and the ocean, ATC systems are aware of its presence and receive the appropriate notices from the on-board dependent surveillance systems, and weather, traffic advisories and any necessary control instructions are dispatched instantly to the aircraft and to all the ATC agencies participating in the flight.

THE ATC PROCESS

In 2005, the ATC system is an open communications network system with ground-based facilities and aircraft having vast resources to draw on; and the information is automatically shared. Weather prediction is much more precise, as ATC systems have reliable information in the 12- to 24-hour time period. Traffic Management has more accurate forecasts of traffic, and on-board weather collection systems provide reliable reports on specific conditions aloft.

Improvements in airborne systems on both existing and newly-introduced aircraft include a highly sophisticated collision avoidance system. All commercial and some general aviation aircraft carry avionics that recognize and identify other aircraft in the system. Shared information ensures that aircraft tracked by airborne or ground-based radar systems are identified, tagged, and their relative position, altitude, and movement displayed to appropriately equipped aircraft.

Finally, the ATC system is now fail-soft. Automation improvements are such that even in the event of a failure of a system as large as a HOST Computer System, the system shifts on-line via connectivity with adjoining centers, offloading air traffic—in fact, entire sectors—to other ARTCCs, whose systems simply redefine sectors, combine sector workstations from the impaired facility, and continue moving traffic. Redefining sectors and maintaining the dynamic nature of the system ensures that traffic will always be tracked through the ATC automation system.

A. PREFLIGHT ACTIVITIES

The ATC system in the year 2005 has seen significant changes in preflight activities. In the baseline (1995) system automated preflight briefing and filing services were in the formative stages. Now, 10 years later, the entire process of receiving the information necessary to fly is automated. Both commercial operators and the independent pilot community have ready access to automated sources of meteorological and aeronautical information. The largest proportion of preflight information is now provided by vendors. Information such as NOTAMs and pilot reports, collected and categorized by the FAA , is shared through computer links with vendors. They provide the service to pilots with a higher level of automation through a number of different channels, including personal computer and linked terminal systems, telephones, and voice requests. Commercial vendors have developed a sophisticated automated voice response system that enables full flight briefings conducted over the telephone. This makes the information available to everyone in the aviation community regardless of their level of computer literacy or training. In addition, preflight weather forecasts, route briefings, NOTAMs and PIREPs, and even requests for alternate flight routing is available from vendors directly to the aircraft via datalinks. The FAA and the vendors share the information with each other, so that continuity of data is ensured.

System management for flight planning allows operators to plan optimum climb and decent profiles based on their individual needs, whether it be minimum time track, most fuel efficient route, most comfort in the air, or some other parameter. A significant benefit of route management by ATC is that Traffic Management planning is streamlined. The TM computers assign

most routes and arrival times as requested by the user. Coordination between the airlines and the FAA on scheduling has become routine, and delays other than those caused by weather have been greatly reduced. The technology allows for more efficient use of airports, translating to more capacity.

The requirements for weather information are reduced in 2005, as forecasting has become more accurate. Traffic Management computers now know accurately where weather phenomena are and will be for 12-18-, and 24-hour periods. The TM computer establishes flight routes using information provided by the system. Terminal forecasts are provided as a function of the preflight briefing and serve as an additional safety assurance.

With an internationally-connected Traffic Management system in place, the requirement for flight plans has become a shared activity between pilots and the system. The ATC computers have the ability to project the optimum routing for each flight request, based on the operators requirements. The pilot requests an arrival time, and Traffic Management computes the optimum route to get the flight to its destination at or as close as possible to the requested ETA.

B. THE CLEARANCE PROCESS

The process of issuing clearances has changed very little from 2000, the major differences being flight management systems that are upgraded with software enhancements, and more aircraft that are datalink- equipped. Any aircraft with a datalink can request and receive a clearance directly from the ATC computers, and clearances are formatted with departure, en route, and arrival instructions. The data is either displayed on a CRT screen in the flight deck, output to a printer, or downloaded directly into the flight management system by the pilot, depending on the aircraft's equipment. The process still permits voice-relayed clearances for aircraft without datalink. There are fewer unequipped aircraft, however, because equipment costs are significantly reduced and the value of participating in the IFR system greatly increased.

C. SURFACE MOVEMENT

On the ground, surveillance and automated communications systems move traffic quickly from gate to runway with a minimum of congestion. Ground-based transmitter devices continuously broadcast airport surface status information, and the information received in the flight deck is displayed to pilots. Light bars and sign systems provide additional information to pilots to ensure safe ground movement. Ground Control Managers (GCM) direct the movement of traffic by updating the status of each aircraft through voice transmissions. Voice recognition systems within the ATC computer complex understand the commands and instructions and translate the data to status information that is used by the ATC computers and by the ground-based transmitters and light bar systems. Automated sensor systems on the airport surface track the movement of aircraft and check that movement against the GCMs instructions. This information keeps the system updated as to the current status of the airport.

Takeoff clearances are issued by the GCMs as departing aircraft near the active runway, based

on movement activity on the runway, in the approach pattern, and within the separation criteria established in this time frame.

D. AIRBORNE PHASE

Control in the airborne phase is highly automated, with most of the enhancements occurring in the 1995 to 2000 time frame. In terms of control actions, there have been few hardware enhancements since 2000. Airborne and ground-based systems share information in both directions. Updates and upgrades to the tower and Area Control Facility automation software refine airspace manager procedures and user interfaces. Time has become the primary separation criteria in the environment, as Airspace Managers (AMs) now have the tools to accurately project where aircraft will be at a point 20 minutes ahead. Particularly valuable in the terminal environment, airspace managers space arriving aircraft to cross the runway threshold at timed intervals, facilitating significantly more capacity at existing airports.

Certain procedural changes have been adopted as the result of the highly capable nature of the automation. Computations made for the spacing and separation of aircraft are done to project separation in terms of time, rather than distance. It has been recognized that with the advent and improvement of the AERA algorithms, AMs need to concern themselves now with time as the only key factor to consider in resolving potential conflict situations. Tracking of aircraft is now so accurate that airspace managers recognize when aircraft moving close to each other do not present a threat, even if their trajectories cross. AMs know precisely where each aircraft is and where it is projected to be 20 minutes into the future. The automation is measuring each aircraft track with its 20-minute look-ahead track. Only when these look-ahead tracks cross at a common altitude within specified time parameters does a potential threat exist, and the AMs know precisely how much time there is before an incursion occurs. When that happens, the AM is alerted and the situation resolved. With this technology in place, AMs now can begin to space aircraft much closer together in trail, setting up specific times to a particular fix or waypoint, and using the times as the spacing tool.

Another advancement made possible by the automation introduced in the last few years is the possibility of dynamic resectorization of airspace. This means that sector—even center—boundaries are no longer fixed and separate parcels of airspace. The U.S. airspace is now a seamless volume of navigable air that can be controlled efficiently, facilitating tactical decisions that were not possible just a few years ago. The automation permits Airspace Managers to redefine sector boundaries—even move sectors into the control of another ARTCC—to facilitate the efficient movement of traffic.

Airborne collision avoidance (CAS) equipment using shared transponder data, GPS navigation fixes, and information transmitted over datalinks track the movement of aircraft and present the information on a screen in the flight deck. This enables the controller to call traffic to pilots and the pilots to find and identify each one quickly and positively. The airborne CAS systems, evolved from the TCAS, are highly reliable, and in addition to being a reliable on-board safety system, are used by pilots to maintain spacing on departure and approach tracks.

ATC SYSTEM METHODOLOGY

The methodology of moving aircraft through the system from 2000 to 2005 has been a learning process for the operators of the ATC system. They have had five years to become familiar with major system changes up to the full replacement automation system. In 2005 the major system improvements are software upgrades to make the system more efficient.

The system is primarily a strategic one, with the number of tactical interventions dramatically reduced. Improvements in the speed and clarity of communications are evident, with accurate satellite-based navigation readily available. Every aircraft in the system can be located and identified, and aircraft-to-aircraft surveillance is more accurate and reliable.

Air traffic controllers use the airspace as a tool for moving traffic. They rely on the resources of the automation and the improvements in communications, navigation and surveillance to utilize strategic planning.

A. PREFLIGHT ACTIVITIES

Preflight activities are a highly automated procedure for users in 2005, with most activities formerly performed by the FAA now being handled by vendors. The primary role of system operators in the area of preflight activities is the collection, verification, and communication of aeronautical information from pilots to the automation systems. This information is readily available to managers of the ATC system, but the information is managed by vendors operating in coordination with ATC. The ATC system acts as a conduit, or pass-through of information when requested.

Most functions relating to the dissemination of preflight briefing information are also passed to vendors. Many flight service functions are now handled by these vendors, as the FAA flight service facilities are seeing more and more consolidation of activities, either into the ARTCC/ MCF or with the transfer of functions to the commercial vendors. AFSS specialists still provide real-time weather and advisory information, and conduct Search and Rescue activities at Inflight and Flight Watch positions.

The principal role of the FAA in preflight activities is to process flight intention requests and to establish strategic plans for the movement of aircraft. This is accomplished in the facilities, as the flight information produced by the ETMS is communicated to all involved facilities in advance of operations. Surface movement planning is highly efficient, as traffic managers in the tower are aware of and orchestrating the movement of aircraft about the surface, and airborne sector managers know what their sector workload will be well in advance of the aircraft entering their sector.

Weather forecasting in this time frame takes full advantage of the capabilities of the weather systems introduced prior to 2001. Accurate predictions are made for 12-, 18-, and 24- hour periods for the purpose of planning and route assignment, and the accuracy of short-term nowcasts has improved to allow pinpoint location of severe weather activity at airports. This

permits better utilization of airports, because they no longer are hostage to weather changes. Additionally, potentially hazardous phenomena such as wind shear, microbursts and storm and gust fronts can be identified and avoided. Because of the strategic nature of air traffic control, most communications are anticipated in advance, and queues of messages are established in data bases and transmitted digitally upon request from an aircraft. This includes most weather information, as weather forecasting has become more precise. Airspace managers use the automation to schedule aircraft movement around severe weather, and to adjust flight routes to adapt to the movement of weather across the U.S.

Filing of flight plans and the assignment of routes is an automated function in 2005, with the information being passed directly to the HCSR and ETMS from the flight service vendors. The ETMS assigns each flight a route and clearance that has been optimized for the users needs, and the data is stored for retrieval by pilots and passed to the appropriate ATC facilities for use by the airspace managers in establishing work plans for facilities.

B. THE CLEARANCE PROCESS

When a clearance is generated for an aircraft, it is placed in a queue for the pilot, provided to the traffic manager in the departure tower and the airspace manager in the appropriate departure sector. The clearance is checked for accuracy and conformance with operating procedures. Clearances include departure instructions, identification of a top-of-descent point, and an arrival routing into the destination airport. Once the clearance is checked, it is stored within the system in a data bank that can be accessed directly from the aircraft via datalink. It is the role of the Clearance Delivery Manager to validate clearances and establish the queue of clearances for access by pilots. In addition, the Clearance Delivery function still communicates by voice with non-participating aircraft. The automation reports which aircraft have accessed their clearances, and the tower control managers ensure that all clearances have been received prior to engine start.

C. SURFACE MOVEMENT

Control of the movement of traffic is now a highly automated process, but the tower control managers orchestrate that movement. Each aircraft has a proposed push-back time—called a block time—and ground controllers (GCMs) ensure that the aircraft are ready to move at their assigned block time, or the time is reassigned. The precise timing of aircraft movement is vital to the operation of airport facilities, as increased capacity and demand require the most efficient use of the airport resource.

Prior to push back, the GCM assigns a taxi route to each aircraft and sends the route to the aircraft via datalink. The taxi route checked for potential conflicts, is entered into the aircraft's avionics and into the airport automation equipment, and a taxi clearance is authorized. This clearance may be placed in a queue, and the pilot may request it through an automated datalink. If the request is made on time, the clearance is issued directly to the aircraft. Both pilots and control managers work together in this phase, as one of the benefits derived from automating the system is that long lines of aircraft awaiting their turn on the taxiway have been eliminated. When an aircraft receives taxi clearance, it proceeds on the assigned taxi

resolution alerts is required, so that the ATC automation knows of the movement of the aircraft to resolve the alert and can make the necessary adjustments to the system plan.

Airspace managers have an additional tool at their disposal which has been developed for the purpose of optimizing the use of airspace through out the system. The system, called Dynamic Sectorization (DYSEC) is a software enhancement to AERA that permits controllers to redefine airspace dynamically, even across sector boundaries. The advent of random routing presents the possibility that at certain times of the day, small portions of airspace near high-traffic feeder fixes may be virtually saturated with traffic. In this event, supervisors can simply redraw the sector, add other temporary sectors and additional controllers and workstations to handle the additional traffic for the period when traffic is heavy.

This capability can be extremely helpful in the event of the movement of a severe weather event through a particular geographic area. A large area of severe thunderstorms hanging over an area can force the rerouting of many aircraft around the storm. This can create a burden on ATC sectors outside the boundaries of the storm activity, perhaps in airspace that is under the control of a different ARTCC. In order to share the workload and ensure that no controller or team of controllers is overloaded with traffic while the controllers in the area of the storm activity sit without traffic waiting for the storm to pass, the airspace can be reconfigured to even out the traffic workload so that no controllers have to handle more aircraft than they might normally handle. When the weather event clears up, the airspace is configured back and normal activity resumes.

A third advantage of DYSEC is the use of airspace not currently available to civil air traffic. In 2005, agreements exist between the FAA and the DOD for inclusion of certain Special Use Airspace (SUA) for use by commercial traffic. Information is shared between the agencies, and ATC planning computers factor in times when certain types of special use airspace are in use, and when they are not. When the military needs to keep civilian traffic out of an area because of operations, the airspace is closed, then reopened as soon as the activity has ceased or moved to another area.

The introduction of DYSEC into the ATC system has produced a benefit to the system that has been a long-time goal, that the system is now fail-soft. This means that failure of a major system can be compensated for on the fly. When all the ARTCCs were fully equipped with the HCSR, failure mode switching modules were built into the system. The final piece of the failure mode switching system is the DYSEC software, which automatically restructures the airspace in the event of a system failure. The failure is recognized when it occurs, and the automation redraws the airspace, incorporating all the airspace into the automation of another facility. It also switches the control of aircraft within the area of the failure to other sectors. The AERA route projection algorithms guarantee the continued separation during the switchover, and the AMs pick up the traffic as it is presented.

E. VFR OPERATIONS

Preflight and in-flight service are still available, and VFR flight is still very active in 2005. A larger proportion of preflight services are now provided by commercial vendors through auto-

mated terminal hook-ups and telephones. VFR pilots receive full weather briefings on automated voice-response systems, and VFR flight plans can be filed with the vendor. Fewer in-flight services are performed by AFSS specialists. Some AFSS function have begun to migrate to the IFR facilities. Some of the older facilities are being decommissioned, as fewer and fewer pre-flight services are provided by the FAA. Commercial vendors offer air/ground services, principally in-flight weather briefings and advisories. Search and rescue activities are being activated and followed by DOD from Scott Air Force Base, Illinois.

ATC CONTROLLER POSITIONS: FUNCTIONAL DESCRIPTIONS

The changes to the ATC system from 2000 to 2005 are more subtle. This period is marked by the growth in experience in the automation by the operators. In the ARTCCs/MCFs/ TRACONs, controllers are now known as Airspace Managers, as detailed in the text of Levels Two and Three preceding this section.

There has been further consolidation of some flight service functions into the ARTCCs/MCFs/ TRACONs and others to the vendor providers. Flight service retains certain functions, such as continuing to provide preflight briefing services to certain VFR users, and in-flight services to most VFR operators. Two flight service functions, Weather Observer (WO) and Broadcast (BC) have been taken over by automation in this period. The WO function is incorporated into AWOS/ASOS-type ground stations and by additional services provided by vendors. The Weather Observer function has been overtaken by technology introduced in 2000, the WARP, ITWS, AWPG, and by services provided by vendors.

Two technology enhancements have come into use in this time frame, the Enhanced Collision Avoidance System (ECAS) and the Dynamic Sectorization (DYSEC) tool. The applications of these systems are explained in the preceding section (Level 3, Methodology), and the designs of the systems are shown in the preceding section, (Level 5, ATC Technology and Support Interfaces.

How these systems affect the functions of the operators of the system are shown in the functional descriptions in these pages.

TERMINAL FACILITIES

TOWER

AREA SUPERVISOR (AS)

The tower cab AS is responsible for overall tower cab operation. This includes management and direction of tower cab personnel, and observing, scanning and projecting the needs of the constantly changing airport operation

INPUTS:
- Visual observation of tower cab operations
- Flight Data Processing (FDP)
- STARS, TCCC data input,
- Status information area
- Coordination from tower cab positions
- TRACON/MCF Terminal Area Supervisor (AS)
- Area Manager (AM)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/weather conditions, staffing and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination to pilots information concerning vehicle conditions that may affect operations
- Coordinate with tower cab positions, TTMU, AS and AM
- Ensure tower cab operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine tower cab positions
- Initiate action as input changes

SYSTEMS:
- ETMS, TCCC, STARS, ASTA, ITWS, VSCS, ICSS, ETD (Enhanced Tower Display), RVR, MLS, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock,AWDS, crash phone system

TOWER

CAB COORDINATOR (CC)

The CC is primarily responsible for observing and scanning the active runways and airport traffic area/control zone to assist the LC. CC will coordinate for the LC and ensure procedures and flows are adhered to in the rapidly changing airport environment.

INPUTS:
- Receive requests for air traffic movement
- Visual observation of runways, taxiways, traffic pattern and airport traffic area/ control zone
- Flight Data Processing (FDP)
- STARS, TCCC data input
- Status information area
- Coordination from other tower cab and TRACON positions
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Observe Local Control operations and coordinate for the LC
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, separation standards, pilot requests, facility procedures, field/weather conditions and aircraft performance.
- Review flight data
- Ensure dissemination of information to pilots, vehicle operators, other cab positions, and the supervisor, of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Coordinate for the LC with other tower cab and TRACON/MCF terminal positions
- Scan airport operations and assist LC with duties
- Report airport conditions
- Forward flight data
- Initiate action as input changes

SYSTEMS:
- ETMS, TCCC, STARS, ASTA, ITWS, VSCS, ICSS, ETD, light guns, RVR, NAVAID panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, AWDS, crash phone system

TOWER

LOCAL CONTROL (LC)

The LC is primarily responsible for handling arriving and departing traffic at the airport. The area of responsibility includes the active runways and airport traffic area/control zone. It is a rapidly changing environment requiring constant evaluation of input and modification to existing plans. The LC position interfaces mainly with the ground controller (GC) and TRACON/MCF departure and arrival positions.

INPUTS:

- Receive request for air traffic movement
- Visual Observation of Runways, taxiways, traffic pattern and airport traffic area/ control zone
- Radios and Datalink communications
- STARS, TCCC data input
- Flight Data Procesing (FDP)
- Enhanced Collision Avoidance System (ECAS) data
- Status information area
- Coordination from other tower cab and TRACON/MCF positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)
- Runway incursion alerts

PROCESS:

- Analyze information to determine priority of duties
- Project and plan ATC service based upon traffic flows, traffic management, separation standards, pilot requests, facility procedures, field and weather conditions, and aircraft performance
- Obtain, review, and amend flight data
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and AS of conditions that may affect operations.
- Analyze/evaluate effectiveness of plan

OUTPUTS:

- Issue arrival, departure, airport traffic area/control zone transition instructions via radio, lights, and datalink
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab and TRACON/MCF terminal positions
- Disseminate to pilots, vehicle operators, other tower cab positions and AS information that may affect airport operations
- Initiate action as input changes

TOWER

LOCAL CONTROL (LC) continued

SYSTEMS:

- ECAS, ETMS, TCCC, STARS, ASTA, Datalink, light controls, ITWS, VSCS, ICSS, radios, ETD, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, AWDS, crash phone system, DASI, Wind instruments

TOWER

GROUND CONTROL (GC)

The GC is primarily responsible for directing aircraft to and from the runway. Additional duties include directing other aircraft/vehicular movement on the airport movement area and disseminating information to support operations (e.g. traffic, weather, equipment status, delays/flow etc,). It is a dynamic environment in which the GC must adjust traffic flows and evaluate new information.

INPUTS:
- Receive request for ground movement
- Visual observation of movement area or display
- Voice and Datalink communications
- Flight Data Processing (FDP)
- STARS, TCCC data input
- Enhanced Collision Avoidance System (ECAS) data
- Status information area
- Coordination from other tower cab positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, pilot requests, facility procedures, field/weather conditions and aircraft performance
- Obtain, review, and amend flight data
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and the AS of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Issue ground movement instructions via voice, datalink or lights
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab positions
- Forward flight data
- Initiate action as input changes

SYSTEMS:
- ECAS, ETMS, TCCC, STARS, ASTA, Datalink, Light Controls, ITWS, VSCS, ICSS, radios, ETD, light guns, RVR, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, AWDS, crash phone system

TOWER

GATE HOLD (GH)

The GH position is intended to inform pilots when departure delays exceed or are anticipated to exceed 15 minutes. GH delivers aircraft to the ground controller in an orderly flow to minimize congestion on the movement area. Pilots monitor the frequency for engine start-up advisories or new proposed start times if the delay changes.

INPUTS:
- Requests for engine start time
- Visual observation of movement area
- Voice and Datalink communications
- STARS, TCCC data input
- Flight Data Processing (FDP)
- Status information area
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)
- ETMS

PROCESS:
- Analyze gate hold (GH) and traffic management requirements and implement gate hold procedures
- Record time of initial call-up on flight data display
- Maintain sequence for departure using initial call-up time, unless modified by flow control restrictions

OUTPUTS:
- Issue pilot engine start times and subsequent revisions if delays change

SYSTEMS:
- ETMS, TCCC, STARS, ASTA, ITWS, VSCS, ICSS, radios, 24-hour clock

TOWER/TRACON/MCF

CLEARANCE DELIVERY (CD)

The CD position primarily issues departure clearances to pilots. The clearance is delivered to the pilot via datalink, on the radio or via ARINC Communications Addressing and Reporting System (ACARS). Additionally, weather, route, delay and other significant information may be relayed to pilots.

INPUTS:
- Requests for departure clearance
- Voice and datalink communications
- TCCC/STARS data input
- Flight DataProcessing (FDP)
- Status information area
- Coordination from other tower cab positions
- ARINC Communications Addressing and Reporting System (ACARS)
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:

- Upon receipt of flight plan/VFR departure information, ensure all required clearance items are received and recorded
- Forward clearance information to tower cab Flight Data (FD) for processing
- Obtain clearance from tower cab FD or formulate a clearance
- Amend flight data as necessary
- Periodically review flight data for currency

OUTPUTS:
- Issue clearance to pilots and deliver information to Ground Control (GC) or Gate Hold (GH), if applicable
- Coordinate information with other tower cab positions

SYSTEMS:
- ETMS, STARS, ASTA, Datalink, ITWS, VSCS, ICSS, radios, ARTS, ACARS, AWDS, 24-hour clock

TOWER/TRACON/MCF

FLIGHT DATA (FD)

The FD position primarily relays flight plan and airport information to other tower cab positions. FD closely interfaces with Clearance Delivery (CD) as a coordinator.

INPUTS:
- Receive weather information
- Flight Data Processing (FDP)
- TCCC/STARS data input
- Status information area
- Automated Weather Information System (AWIS)
- Automated Weather Display System (AWDS)
- National Weather Service (NWS)
- Operational Database Management System (ODMS)
- Notices to Airmen (NOTAMs)
- Coordination with other tower cab positions and other terminal and en route positions
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Review, and amend flight data
- Ensure dissemination of information that may affect operations to other tower cab positions
- Monitor and operate NAVAID panel and Automated Terminal Information System (ATIS)

OUTPUT:
- Disseminate flight plan information, flight data amendments, weather and traffic management information, and airport conditions
- Update status information area
- Record ATIS

SYSTEMS:
- STARS, ETMS, TCCC, ITWS, VSCS, ICSS, AWIS, ATIS, AWDS, 24-hour clock

ARTCC/TRACON/MCF

AREA MANAGER (AM)

The Area Manager has the responsibility for the entire facility's shift operation. By projecting, planning, coordinating and strategizing with shift supervisors, the Area Manager facilitates the use of available resources to meet the demands of air traffic.

INPUTS:
- Area Supervisors
- Traffic Management Unit (TMU)
- Area Air Traffic Manager
- Flight Data Processing (FDP)
- STARS, TCCC, HCSR data input
- Dynamic Sectorization (DYSEC) tool
- Facility Staff officers
- Airway Facility technicians
- National Weather Service
- Flight Service Stations
- AERA conflict and weather advisories
- Military Operations Specialist (MOS)
- Manager, NAS Operations (NOM)

PROCESS:
- Administrate shift operations
- Project and plan shift staffing, traffic flows, facility procedures, weather conditions, and sector configuration
- Analyze information to determine priority of duties
- Analyze, evaluate and update information to ensure effectiveness of operation

OUTPUTS:
- Ensure exchange of information with other ARTCC/MCF positions, TMU, AS, and ATM that may affect operations
- Ensure adequate supervisory staffing
- Coordinate with adjacent ARTCC/MCF, AS, TMU, and AM
- Ensure ARTCC/MCF operations are in accordance with procedures, current flows and weather conditions
- Document equipment outages/restorations

Systems:
- DYSEC, ETMS, STARS, TCCC, Datalink, TATCA, DSR, WARP, AWPG, AERA, VSCS, LLWAS, IDS, RVR, Digital Altimeter Setting Indicator (DASI), ASR, ILS, MLS

ARTCC/TRACON/MCF

AREA SUPERVISOR (AS)

The AS is responsible for the operation of his/her area of specialization. Through planning, monitoring and evaluating operations, the AS will use available resources to accommodate traffic demands. It is a constantly changing environment where anticipating and communicating needs are as important as current operations.

INPUTS:
- Sector operations
- Flight Data Processing (FDP)
- STARS/TCCC/HCSR data input
- Dynamic Sectorization (DYSEC) tool
- Status information area
- Coordination with other AS positions
- Traffic Management Unit (TMU)
- Tower cab Area Supervisor (AS)
- Center Weather Service Unit (CWSU)
- Area Manager (AM)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/ weather conditions, staffing, and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination of information concerning conditions that may affect facility operations, TMU, and tower operations
- Coordinate with sector positions, other AS, TMU, AM, tower AS and AM
- Ensure sector operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine sector positions as needed
- Initiate action as input changes

SYSTEMS:
- DYSEC, ETMS, STARS, DSR, HSCR, Air Route Surveillance Radar (ARSR), Voice and Datalink Communications, TATCA, TCCC, WARP, AWPG, VSCS

ARTCC/TRACON/MCF

RADAR/SURVEILLANCE AIRSPACE MANAGER (R)

The R position is designed according to the desired function—en route, arrival, departure, and satellite. The R responsible for each sector has defined airspace and can use a variety of techniques to accomplish the assigned tasks (e.g., vectoring, speed control. sequencing, altitude, lateral, diverging, and visual separation). The level of service and separation applied to the individual aircraft is dependent upon numerous factors including the pilot's request, type of flight plan, type of aircraft, and weather.

Aircraft fly along a direct route assigned by the ETMS. When assigned routes need amending, aircraft are directed onto another route to avoid conflicts, adverse weather, special use airspace, obstructions and terrain. The sector environment is rapidly changing as input changes (e.g., aircraft, weather, pilot requests, traffic management). The R must continually evaluate current operations, conditions, and the effectiveness of the action plan. As new input is received, the R must be flexible, and rapidly incorporate the information into the action plan.

The en route position expedites the movement of traffic through the sector, maintains separation, and sequences aircraft toward arrival fixes, when necessary. The arrival position(s) primarily sequences aircraft delivered from adjacent sectors or VFR "pop-up" aircraft to the destination airport. Service may be provided to more than one runway at one or more airports. The departure position(s) primarily delivers departing aircraft from one or more airports to the appropriate en route sector, in accordance with established procedures. The satellite position(s) normally provides arrival and departure service for secondary or military airports. Generally these aircraft are incorporated into the primary airport flow of traffic.

INPUTS:

- STARS/HCSR/TCCC (AERA, TATCA)
- Pilot requests, PIREPS and SIGMETS
- DSR displays
- Manual and automated handoffs
- Voice and datalink communications
- Flight Data Processing (FDP)
- Enhanced Collision Avoidance System (ECAS)
- Status information area
- Coordination with other sector positions, AS, AM, and adjacent facilities
- Traffic Management Unit (TMU)
- Area Supervisor (AS)

ARTCC/TRACON/MCF

RADAR/SURVEILLANCE AIRSPACE MANAGER (R) (continued)

PROCESS:

- Prepare and monitor automation equipment for settings and optimum performance
- Correlate flight data and Radar display information
- Manage flight data: scan, analyze, amend, transfer and file
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft types and performance characteristics, requests) and evaluate additional factors (e.g., weather, equipment status, flow control) and develop an action plan
- Continuously evaluate the effectiveness of the plan and adjust as necessary

OUTPUTS:

- Issue control instructions, safety alerts, advisories and information to pilots
- Initiate control instructions and ensure separation
- Initiate manual and automated handoffs
- Disseminate weather information
- Make entries into DSR/HCSR/STARS
- Coordinate with tower cab, other ARTCC/TRACON/MCF sector positions and adjacent ATC facilities

SYSTEMS:

- ECAS, ETMS, STARS, DSR, HCSR, TATCA, VSCS, ICSS, radios, Datalink, 24-hour clock, WARP/AWPG

ARTCC/TRACON/MCF

ASSOCIATE OR HANDOFF POSITION (RA)

The RA is responsible for providing assistance to the R position as necessary to ensure continued smooth operation of the sector. The RA accepts or initiates manual ad automated handoffs, manages electronic flight data for the sector, and informs the R of all actions taken. Most sector tasks can be accomplished by the RA, thereby allowing the R controller to focus on the efficient flow and separation of aircraft.

INPUTS:
- DSR display
- Manual and automated handoffs
- Voice and datalink communications
- Flight Data Processing (FDP)
- Enhanced Collision Avoidance System (ECAS)
- Status information area
- Coordination from towers, other sector positions and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor (AS)
- STARS, TCCC, HCSR data input

PROCESS:
- Correlate flight data and Radar display information
- Scan, analyze, transfer and file flight data
- Amend flight data as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type and performance characteristics, requests) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the R's action plan

OUTPUTS:
- Ensure orderly flow of traffic and separation of aircraft
- Ensure adherence to procedures and flow restrictions
- Assist R controller in implementing action plan
- Initiate manual and automated handoffs
- Make entries into DSR/HCSR/STARS/TCCC computer system
- Coordinate with tower cab, other sector positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- ECAS, HCSR, STARS, ETMS, TATCA, VSCS, ICSS, 24-hour clock, AWDS, DEDS, COTS color displays, RADS

ARTCC/TRACON/MCF

FLIGHT WATCH (FW)

The Flight Watch position is a specialized air/ground position within the facility that has been relocated from the Flight Service Stations. FW services primarily—but is not limited to—VFR aircraft. Service is provided on unique VHF radio frequencies (122.0 nationwide between 6,000 and 17,000 ft. MSL). Discrete frequencies are used for high altitude service. The service provided is entitled En Route Flight Advisory Service (EFAS). EFAS service is limited to "near-real-time" weather information, and is specifically intended for aircraft in the en route phase of flight. A primary function of EFAS is the solicitation and exchange of pilot weather reports (PIREPS) among aircraft. EFAS specialists are pilot weather briefers who have received additional specialized training and certification in the use and interpretation of weather radar and weather satellite data.

All information and service provided is in accordance with procedural handbooks, FAA orders, and facility directives.

INPUTS:
- Self briefings
- Pilots
- NWS (reports, charts, etc.)
- Adjacent facility positions
- Adjacent control facilities
- Center Weather Service Unit

PROCESS:
- Receive, analyze and respond to pilot requests for en route weather information
- Solicit reports from pilots (PIREPS) concerning en route conditions
- Compare PIREPS to NWS forecasts and advisories of hazardous conditions to validate the accuracy of the forecast information
- Provide to pilots the most current information available, tailored to a specific altitude and route of flight

OUTPUTS:
- En route flight advisories
- PIREPS
- Record of aircraft contacted via aircraft identification
- Relay of reported conditions (PIREPS) to CWSU and NWS forecasters

SYSTEMS:
- DSR, VSCS, ICSS, discrete frequency outlets, WARP/AWPG, CWSU weather graphics, Geostationary Orbiting Environmental Satellite (GOES) imagery, weather radar displays,

AUTOMATED FLIGHT SERVICE STATION (AFSS)

PREFLIGHT (PF)

The Preflight (PF) position is the primary position providing weather and aeronautical information and flight plan filing services to pilots prior to flight, and is staffed with certified pilot weather briefers. Briefers are expected to be familiar with current and forecast conditions while on duty. They are required to maintain comprehensive knowledge of the topographical and physical characteristics of the facility's area of responsibility. Information is provided either by telephone, r face-to-face. The services are available to all users of the National Airspace System, however general aviation is the predominant user.

Preflight briefers receive a pre-duty briefing, and then continually update operational data during the tour of duty. Weather information is interpreted, translated, and summarized by the briefer, rather than read verbatim. All information and service is provided in accordance with procedural handbooks, agency and facility directives, and best professional judgement for situations not otherwise specifically addressed.

INPUTS:
- Pilots
- National Weather Service (NWS)
- Operational Database Management System (ODMS)
- Other Facility Positions
- Adjacent control facilities
- Airport management/fixed base operators
- NEXTGEN
- Charts and printed aeronautical information

PROCESS:
- Receive, analyze and respond to pilot requests for service
- Copy flight plan information
- Correctly format and transmit flight plan data

OUTPUTS:
- Preflight weather briefings
- Flight plans to ARTCC/MCF/TRACON In Flight (IF) position
- Record of briefing via aircraft identification or pilot name

SYSTEMS:
- ODMS, ETMS, NEXTGEN

AUTOMATED FLIGHT SERVICE STATION (AFSS)

INFLIGHT (IF)

The Inflight position provides air/ground communication with aircraft. Communication may be of a routine or an emergency nature. The position is staffed with certified pilot weather briefers. Briefers are expected to be familiar with current and forecast weather conditions while they are on duty. They are also required to maintain detailed current knowledge of the topographical and other physical features of the facilitiy's area of responsibility. Routine services provided at the IF position include pilot weather briefings, position reporting, flight following, flight plan filing, activation, revision, and closure. Emergency services are provided in the form of orientation of lost aircraft.

INPUTS:
- Pilots
- NWS data
- Operational Database Management System (ODMS)
- Adjacent facility positions
- Adjacent control facilities
- Airport management/fixed base operators
- NAVAID monitor panels

PROCESS:
- Establish priority of duties
- Receive, analyze, and respond to pilot requests for service via two-way radio
- Copy flight plan information
- Format and transmit flight plan data
- Determine appropriate course of action in emergency situations

OUTPUTS:
- Emergency services to aircraft in flight
- Inflight weather briefings
- Pilot reports (PIREPS)
- Flight plans to ARTCC/MCFs/TRACONS or ATCTs
- Aircraft information to FD position
- Relay of control information
- Record of briefing with aircraft identification or pilot name
- Notification of NAVAID malfunctions
- Initiation of NOTAMs
- Initiation of Search and Rescue for overdue aircraft
- Unscheduled broadcasts
- Local airport information and advisories

AUTOMATED FLIGHT SERVICE STATION (AFSS)

INFLIGHT (IF) continued

SYSTEMS:

- ODMS (First System Input) ETMS, NEXTGEN, Remote Maintenance Monitoring System (RMM), Direction Finder (DF)

AUTOMATED FLIGHT SERVICE STATION (AFSS)

FLIGHT DATA (FD)

Flight Data is an internal/external communication position within the FSS/AFSS. It is the focal point for messages such as flight plans, flight movement and notification data, and administrative message traffic. Search and Rescue (SAR) activities are also initiated from this position on aircraft that become overdue.

INPUTS:
- Other FSS/AFSS positions
- Flight plans
- Flight plan activation/cancellation
- Search and Rescue (SAR) initiation
- Other FSS/AFSS facilities
- Requests for arrival information
- SAR data
- Administrative messages

PROCESS:
- Receive IFR flight plans and other movement messages from other positions.
- Properly format flight intention requests and other pertinent data for transmission
- Initiate and respond to SAR messages in a timely manner based on established criteria and procedures
- Perform SAR duties as required
- Format and transmit administrative messages

OUTPUTS:
- SAR information to other facilities/positions
- Flight closure/cancellation data to ATC facilities
- Relay of administrative traffic
- Transmit flight intention requests, flight movement/notification messages and administrative message traffic

SYSTEMS:
- NEXTGEN, ICSS

AUTOMATED FLIGHT SERVICE STATION (AFSS)

AREA SUPERVISOR (AS)

The FSS/AFSS area supervisor is responsible for overall facility operations during an assigned shift. Duties include ensuring adequate staffing for the operational situation, monitoring of all operational positions, ensuring that all functions are performed in accordance with various directives, and making timely notification in the event of equipment malfunctions.

INPUTS:
- Visual observation of positions
- Notification by specialists of unusual situations
- Coordination with other facilities

PROCESS:
- Continually analyze operational situation and assign duties in accordance with priority of duties

OUTPUT:
- Operational direction and guidance as needed
- Management of available resources

SYSTEMS:
- NEXTGEN, weather graphics system, ICSS, NAVAID monitor systems

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO) — ATCSCC

NTMOs gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives for their area of responsibility.

INPUTS:

- Official Airline Guide (OAG)
- HCSR/STARS flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Departure Delivery Rate (DDR)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- ARTCC/MCF and Terminal traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS),
- International ATC systems

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO) continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- ETMS, STARS, CVARS, WARP, AWPG, ODMS, Aircraft Situation Display (ASD), specialists' workstations, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS),

TRAFFIC MANAGEMENT

NATIONAL OPERATIONS MANAGER (NOM) - ATCSCC

National operations manager gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives.

INPUTS:

- Official Airline Guide (OAG)
- HCSR/STARS flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Departure Delivery Rate (DDR)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- ARTCC/MCF and Terminal traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS),
- International ATC systems

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

NATIONAL OPERATIONS MANAGER (NOM) - ATCSCC continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- DYSEC, ETMS, STARS, AWPG, WARP, ODMS, Aircraft Situation Display (ASD), specialists' workstations, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (TMS) — ATCSCC

TMSs/NOMs gather all the pertinent information relative to current and projected future operations, and develop tentative TM plans to balance demand with capacity; initiate and implement TM plans with other facilities/TMUs, supervisors and control specialists and the ATCSCC; maintain awareness of capacity reductions throughout the NAS; document delay information; evaluate effectiveness of TM initiatives and make necessary adjustments.

TMSs disseminate TM initiative information to users and TMUs via ATCSCC advisories and records delay information. NOMs coordinate the efforts of TMSs into a coordinated NAS Traffic Management Plan.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- HCSR/STARS flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Arrival Acceptance Rate (AAR) and Departure Delivery Rate (DDR)
- WARP, ITWS, AWPG, CWFSU
- Coordination with other ATC facilities
- ATCSCC Operations Center
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, general aviation)
- ETMS
- Special Use Airspace Management System (SAMS)

PROCESS:
- Input current/forecasted capacities, i.e., Departure delivery Rates, Airport Arrival Rates, OALT, Feeder fix rates

OUTPUTS:
- Traffic Management Initiatives:
  - A. Traffic stops
  - B. Exemptions from TM initiatives
- Coordination with:
  - A. NOMs and TMSs/TMCs to implement traffic management initiatives and flight reroutes
  - B. Traffic Management Units (TMU)/TMCs to maintain awareness of current and anticipated conditions
  - C. Users, to inform them of local/national TM initiatives and advise of current and anticipated delays and airspace/airport conditions

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (ATCSCC) continued

SYSTEMS:

- ETMS, STARS, WARP, AWPG, ODMS, Aircraft Situation Sisplay (ASD), long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (STMC) — ENROUTE

STMCs are responsible for assessing the capacity and demand for airspace and airports within their facility's area of responsibility; developing and administering traffic management initiatives including arrival and departure metering, en route spacing, ground delays, and severe weather avoidance routes; providing intra- and inter-center coordination on military aircraft missions and airspace usage; disseminating weather information to center personnel and to other air traffic facilities in their area of responsibility; and assigning work within the Traffic Management Unit to ensure the most effective use of resources.

INPUTS:

- Official Airline Guide (OAG)
- HCSR flight plan data
- En route radar
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- En route Terminal traffic management personnel
- Air Traffic Control System Command Center (ATCSCC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- National Flight Data Center (NFDC)

PROCESS:

- Use inputs to gather information about the status of the airspace and airports within the Center's boundaries. Considerations include weather, system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Coordinate and disseminate information concerning the status of the NAS, weather, traffic management initiatives, and military airspace and mission requirements to personnel within the facility, air traffic facilities with adjacent airspace, and the ATCSCC
- Establish priorities and assign work to TMCs to achieve maximum efficiency and utilization of operations personnel
- Monitor and evaluate traffic management initiatives to ensure effectiveness.

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (ENROUTE) continued

OUTPUTS:

- Utilizes available resources to ensure balanced traffic flows and the maximum utilization of airspace
- Establishes departure, en route, and arrival fix rates
- Coordinates weather, traffic management, and other information pertaining to the efficient operation of the NAS to concerned personnel

SYSTEMS:

- ETMS; HCSR, DSR, WARP/AWPG; Aircraft Situation Display (ASD); specialists' workstations; interphone, dedicated long-line, and commercial telephones; walkie-talkie; SAMS

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) — TOWER

Tower TMCs gather all necessary information and develop tentative TM plans to balance demand with capacity; negotiate tentative TM plans with terminal/en route TMC/TMUs, supervisors, control specialists, and the ATCSCC; maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives and make necessary adjustments; disseminate TM initiatives to supervisory/control personnel, approach controllers, and parent TMU; and forward delay information to parent TMU.

INPUTS:
- TCCC
- HCSR/STARS flight plan data
- Engineered Performance Standards (EPS)
- Weather data (WARP, ITWS, AWPG, CWSU)
- Traffic Management Unit (TMU) — (ARTCC/MCF/TRACON)
- Air Traffic Control System Command Center (ATCSCC)
- Users (Airlines, Military, General Aviation)
- Aircraft movement (visual)
- Airport manager
- AMASS, ASTA, TATCA (TMA advisor), ITWS/AWPG

PROCESS:
- Gather information about terminal/en route sectors
- Assess current and forecasted capacities at the airport
- Input data to ETMS and maintain current status

OUTPUTS:
- Traffic Management Initiatives (strategic/tactical):
  - A. Airport arrival Rates (AAR)
  - B. Departure Delivery Rates (DDR)
  - C. Initial flight reroutes
  - D. Traffic stops
- Coordination with:
  - A. SATCs/ATCSs (internal) to change AARs/DDRs and flight reroutes
  - B. Traffic Management Unit (TMU)/TMCs with parent terminal facilities to maintain awareness of current and anticipated conditions.
  - C. ATCSCC to advise of current and anticipated airport delays and airspace/airport conditions

SYSTEMS:
- ETMS, STARS, TATCA, AMASS, ASTA, TCCC, RWP, AWPG, interphone, long-line and commercial telephone

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) — ARTCC/TRACON/MCF

TMCs gather all necessary information and develop TM plans to balance demand with capacity; input and maintain OALTs in ETMS, input appropriate departure, feeder fix and arrival rates, and coordinate output with other facilities and TMUs, supervisors, control specialists and the ATCSCC. They maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives; and make necessary adjustments to disseminate TM initiatives to supervisory and control personnel. This includes towers, approach control sectors, and other TMUs via the ATCSCC. TMCs also forward delay information to the ATCSCC.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- Terminal and en route radar
- HCSR/STARS Flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Weather data (WARP, ITWS, AWPG, CWSU)
- ATCSs and SATCSs, (towers, ARTCC/TRACON/MCF)
- Users (airlines, military, general aviation)
- Airport Arrival Rates (AAR) and Departure Delivery Rates
- TATCA (TMA Advisor)
- ETMS

PROCESS:
- Gather information for airports and en route sectors within their ARTCC/MCF to assess current and forecasted demand and capacities
- Develop or recommend Traffic Management initiatives necessary to balance demand with capacity
- Input OALT into ETMS, keep current.

OUTPUTS:
- Traffic Management initiatives (strategic and tactical)
  - A. Current and projected OALTs
  - B. Arrival fix rate
  - C. Traffic Stops
- Coordination with:
  - A. SATCSs and ATCSs (internal) to initiate restrictions, implement traffic management initiatives and flight reroutes
  - B. Traffic Management Units (TMU/TMCs in adjacent ARTCC/MCF/TRACON and terminal facilities to maintain awareness of current and anticipated conditions and capacities

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (ARTCC/TRACON/MCF) continued

C. ATCSCC to request national TM initiatives and advise of current and anticipated delays and airspace and airport capacities

SYSTEMS:

- HCSR, STARS, DSR, ETMS, TATCA, WARP, ITWS, AWPG, interphone, commercial telephone, walkie-talkie.

ATC TECHNOLOGY AND SUPPORT INTERFACES

ATC AUTOMATION

DYNAMIC SECTORIZATION (DYSEC)

Dynamic sectorization (DYSEC) is a function of AERA, utilized in ARTCCs, MCFs, TRACONs, and, to a limited degree, in LCFs. DYSEC is designed to allow airspace sectorization to change according to traffic demands, controller workload and available equipment. DYSEC capabilities are complemented by the Voice Switching and Control System (VSCS).

DYSEC permits the ARTCC/MCF/TRACON Area Manager, Area Supervisor, Traffic Management Unit, and Air Traffic Control System Command Center to rearrange the design of any sector or combination of sectors, even across airspace boundaries, to meet the changing needs of the NAS due to changing weather, demand on the airspace, maintenance or equipment outage, or changing workforce resources. These changes in sector boundaries can be made on demand, through the software, with the coordination of the operational organizations that will participate in the changes.

INPUTS:
- ARTCC/MCF/TRACON AM and AS
- Traffic Management Units
- ATCSCC
- ETMS
- AERA
- VSCS

PROCESS:
- Make determination that resectorization is necessary
- Analyze traffic patterns through interface with AERA and ETMS
- Perform coordination tasks with ATCSCC and affected Traffic Management Units, sector managers and supervisors, and control personnel
- Perform redesign of airspace boundaries
- Perform redistribution of Airspace Manager workload

OUTPUTS:
- Notification of ATCSCC, TMUs, ARTCC/MCF/TRACON managers and supervisors, Airspace Managers
- Display of redesigned airspace
- Display of aircraft position on appropriate DSR displays

INTERFACED SYSTEMS:
- HCSR, STARS, DSR, AERA, VSCS, ETMS

SURVEILLANCE

ENHANCED COLLISION AVOIDANCE SYSTEM (ECAS)

ECAS is an airborne collision avoidance system which portrays any tracked aircraft on a cockpit display. This system builds on the capabilities of earlier collision avoidance systems. ECAS displays, in addition to aircraft target, an associated data block including call sign, altitude of the aircraft (AGL and relative), range, intrusion alerts, and resolutions to allow pilots to operate the system in busy terminal airspace and in less crowded en route airspace, within selected parameters.

In addition to the collision avoidance aspect of the system, ECAS allows pilots to maintain separation with other aircraft on approach and departure tracks, with participative separation, through two-way data communications channels incorporated in the system. This means that both Airspace managers on the ground and pilots in tracked aircraft to know in advance what actions a pilot will take.

INPUTS:
- Beacon transponder data
- GPS position information
- Datalink communications
- HCSR
- AERA data

PROCESS:
- Identify proximate aircraft
- Perform position location of other aircraft
- Communicate with ground-based ATC computers
- Connect data block with appropriate target on display
- Perform data handshaking with other aircraft

OUTPUTS:
- Resolution advisories
- Notification of HCSR and Airspace Managers of intent to change course
- Data sharing with other aircraft
- Flight deck display of proximate traffic

INTERFACED SYSTEMS:
- HCSR, AERA, Datalink, Beacon transponder, flight deck display

ATC FLIGHT SCENARIOS

COMMERCIAL CARRIER (DOMESTIC SERVICE) FROM/TO AIRPORTS WITH A CONTROL TOWER

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Pilot in command obtains briefing from aircraft dispatcher, who authorizes flight.	
2. Verify IFR flight plan and notify changes to air traffic as required. [2000: ETMS incorporates flight plan program/air carrier computer interface program].	
3. ~~Contacts ground control/clearance delivery prior to engine start.~~ [2000: Logs onto ATC for clearance prior to engine start]._	
	4. Issues engine start time, taxi or clearance information, departure control frequency,and beacon code.
5. After receiving clearance, contacts ground control for taxi clearance if not previously provided.	
	6. Issues taxi instructions.
7. Acknowledges and follows taxi instructions. [2000: Views information on cockpit CRT and acknowledges].	
8. Contacts local control for clearance to take off.	
	9. Issues departure information and takeoff clearance.
	10. After takeoff, instructs pilot to contact departure controller (TRACON).
11. Flies specific departure route, climbing to assigned altitude, and contacts departure control as directed._[2000: Some TRACONs replaced by MCF].	
	12. Provides air traffic control service from point of handoff to enroute controller ~~(ARTCC).~~ [2000: ARTCC/MCF].
13. Transfers radio communications and	

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	control responsibility to enroute controller and instructs pilot to contact the next facility, by name, on a specified frequency. Repeated as required from sector to sector.
14. Contacts enroute controller and reports altitude.	
	15. Confirms radar contact and issues control instructions as required.
16. Adheres to assigned route and altitudes.	
	17. When aircraft is nearing destination, a clearance time is specified — including route, altitude information, and instructions on further communications. [2000: Routine communications via datalink, including "top of descent"].
	18. Transfers radio communications and control responsibility to approach controller (TRACON). [2000: TRACON/MCF]
	19. Instructs pilot to contact approach control on a specific frequency.
20. Contacts approach controller, confirms position and altitude, and advised of any approach requirements or requests.	
	21. Clears aircraft for approach, issues special instructions/radar vectors where appropriate. Instructs pilot to contact tower. [2000: Information developed by TATCA].
22. Follows specific approach procedures and contacts tower when instructed.	
	23. Acknowledges initial contact and issues landing instructions or clearance.
	24. Instructs aircraft when to turn off runway and contact ground control.
25. Exits runway without delay. Change to ground control frequency when instructed by tower._	
	26. Ground control issues specific instructions to direct pilot to gate area.

Note: ~~Flight crew and air traffic control actions are subject to traffic management action or initiatives, which are taken in response to air traffic demand (and in excess of capacity) to direct aircraft to avoid severe weather. The Air Traffic Control System Command Center (ATCSCC) transmits advisories to airline dispatch offices concerning the status of the national management initiatives. These initiatives in response to excess demand frequently utilize delay departure times to smooth the flow of traffic and to avoid costly airborne holding. Initiatives designed for severe weather avoidance usually result in a non-standard route of flight.~~ **[2000: Traffic plan now directed by ETMS/AERA. Optimum routings will be generated by ETMS if no specific route of flight is requested. ETMS manages all weather traffic changes through AERA].**

TRAFFIC MANAGEMENT AIR CARRIER FLIGHT FROM ATLANTA (ATL) TO CHICAGO O'HARE (ORD)

This scenario is invalid beginning in 2000. The enhanced traffic management system (ETMS) coordinates data and early warnings from AERA concerning the thunderstorm. ETMS datalinks information to flights while rerouting traffic accordingly.

~~Early in the morning, traffic management specialists (TMS) at the Air Traffic Control Systems Command Center (ATCSCC) receive a weather briefing from National Weather Service (NWS) personnel located at the Central Flow Weather Service Unit (CFWSU). They are told that weather at Chicago's O'Hare International (ORD) will experience low ceilings, reduced visibility and rain showers. Also, thunderstorm activity is expected to occur along a cold front extending from southwest Tennessee to northeast Georgia. The thunderstorms are predicted to be most numerous in the area north of Atlanta, GA.~~

~~At the same time, traffic management specialists in the Chicago and Atlanta Air Route Traffic Control Center Traffic Management Units (ARTCC TMUs) are receiving similar briefings from NWS personnel located in the Center Weather Service Units (CWSU) at their facilities. The TMS' and supervisors at all three facilities are beginning to consider the impact that this adverse weather will have upon air traffic operations, and what actions will be required to mitigate that impact.~~

~~Later in the morning, the National Traffic Management Officer (NTMO) at the ATCSCC conducts one of two daily telephone conference (TELCON) briefings with Traffic Management personnel from each of the ARTCCs and the larger airport air traffic facilities, and representatives of the major airline dispatch offices. The briefing begins with a summary of the known and expected constraints on the National Airspace System (NAS) such as adverse weather, airport construction activity, and other factors, and evolves into a discussion of probable results or traffic management actions that may be required. During this briefing, the airline dispatch offices are made aware that traffic management actions, or initiatives, may be required for aircraft flying to ORD and for aircraft flying on routes that normally traverse the area where thunderstorms are predicted to exist.~~

~~Specialists at the Atlanta ARTCC TMU have decided to plan for possible reroutes around sever weather if thunderstorms close normal routes. They coordinate this information with the ATL approach control (TRACON) and tower (ATCT), and with the Severe Weather and National Route Management (NRM) specialist at the ATCSCC. The NRM specialist sends a message to the airline dispatch offices advising that flights to ATL, or through the area north of Atlanta can expect to be rerouted around areas of severe weather.~~

~~Meanwhile, the TMS responsible for the central portion of the country is considering the situation at ORD. This will require increased spacing between aircraft, which will reduce the arrival capacity of the airport. In addition, the rain will leave runways wet, thus reducing braking traction. So, instead of being able to land aircraft on three runways at the same time, only two runways will be available for arrivals. Given these conditions, the specialist calculates the airport's arrival capacity.~~

~~The Specialists then accesses a computer database that stores records of all regularly scheduled flights to determine the number of aircraft scheduled to arrive at ORD will exceed the available capacity. If nothing is done to manage this situation, the result will be aircraft stacked in holding patterns over the airport waiting their turn to land. This would significantly increase controller workload, waste fuel and reduce equitable access to the airspace for other aircraft.~~

~~The ATCSCC central area specialist, having determined that a problem exists, decides to conduct a conference call with the Chicago ARTCC TMU and the ORD TRACON TMU, to determine a course of action. Another check is made with the meteorologists at the CFWSU and the Chicago CWSU, and they agree that there will be low ceilings and rain all day at ORD. Specialists at ORD TRACON confirm that they will only be able to land on two runways. All concerned facilities agree that the arrival capacity will be 65 aircraft per hour. A check of the flight schedule data base shows that the hourly demand will indeed exceed the 65 aircraft arrival rate. A national traffic management initiative to limit the arrival demand to 65 is agreed to by all. The method used to control demand will be a ground delay program. The ground delay program will assign each scheduled flight a delayed departure time that is calculated to achieve a 65 flight-per hour arrival rate at ORD. This results in the delays being taken on the ground rather than in holding patterns over the airport.~~

~~The ATCSCC specialist makes one more telephone call before implementing the ground delay program. These calls are to the airline dispatch offices responsible for many of the flights going to and from ORD. Their purpose is to seek an opinion of the weather and its effect on operations, from the perspective of the carrier's meteorologists and dispatchers. They concur with the NWS forecasts and agree that conditions justify a ground delay program. The specialist then discusses these events with the NTMO and receives approval to implement a ground delay program at a rate of 65 arrivals each hour.~~

~~The ATCSCC specialist then runs a program that assigns each flight going to ORD a controlled departure time (CDT). Each CDT is based on controlling the departure time of each flight. The arrival times of these flights are adjusted so that 65 flights will arrive, spread evenly throughout each hour. A list of CDTs for aircraft departing each ARTCCs airport is sent to that ARTCC and a list of CDTs for airline flights is sent to that airline. Also, an advisory is sent to all affected air traffic facilities and to all affected airline dispatch offices describing the reasons for and the details of the program.~~

~~The ABC airline dispatch office, in preparing for flight number 123 from ATL to ORD, is aware of the CDT assigned to this flight and the possibility of being rerouted around the severe weather north of Atlanta. These considerations are discussed with the flight crew during the preflight briefing. A flight plan is filed by the dispatch office and is routed, via computer network, to the Atlanta ARTCCs Host Computer. The Host Computer is interfaced with the traffic management computer used by the ATCSCC, and the CDT is automatically assigned to the flight plan. The CDT will appear on the flight plan when it prints out at Atlanta ARTCC, and at ATL tower and TRACON. Thus, the specialist in the tower issuing clearances knows that this flight is not authorized to depart before the CDT.~~

~~By this time, as forecast, a line of thunderstorms has developed north of Atlanta. Several aircraft have already deviated from their filed route of flight to avoid the storm, and the gaps through which they are penetrating the line are closing. Atlanta ARTCC TMU has instructed ATL tower to issue revised routings to those flight whose routes from Atlanta are to the north. Atlanta ARTCC TMU then contacts the ATCSCC so that alternate routes can be coordinated with adjacent ARTCCs, coordinates the routes, and then sends a message to the airline dispatch office advising of the reroute activity.~~

~~As the CDT for ABC 123 nears, the flight crew calls the tower for their clearance. They are advised of the severe weather north toward ORD. Flight ABC 123 departs ATL on its CDT, and enjoys a smooth flight to ORD. It lands without having deviated from its route or incurring any airborne delays.~~

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITH CONTROL TOWERS

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Requests flight briefing and announces intention to file flight plan in person or by telephone with AFSS.	
	2. flight service provides weather and route briefing, accepts filed flight plan, and transmits pertinent flight plan data to ~~the appropriate ARTCC~~ **[2000: Some TRACONs replaced by MCFs]** for processing and entry into the automated system.
3. Contacts ground control/clearance delivery prior to engine start.	
	4. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne.
5. Acknowledges and follows ATC instructions.	
6. Requests that ATC cancel IFR flight plan while airborne, or, within 30 minutes after landing closes IFR flight plan with flight service.	

NOTE: [2000: Datalink available for GA] [2005: "Flight intentions" replace "flight plans"]. General aviation aircraft are subject to the same traffic management initiatives that apply to scheduled air carrier flights. They are also subject to special traffic management initiatives due to excess demand at high density airports and in response to excess demand caused by special events (i.e., the Indianapolis 500, Kentucky Derby, Boston Marathon, etc. At high density airports, a reservation is required for general aircraft arrival and departure. Federal Aviation Regulations describe the rules and procedures used to fly to and from high density airports. Information concerning these programs is disseminated via a Notice to Airman (NOTAM) and the pilot will be made aware of responsibilities by the flight service specialist during the preflight briefing or when the pilot files the flight plan.

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITHOUT CONTROL TOWERS

FLIGHT CREW ACTIONS

1. Requests weather and files flight plan via AFSS or vendor.

3. Advises flight service and other operators at the airport when ready to taxi out for departure.

5. After receipt and acknowledgement of IFR clearance, advises flight service prior to departure.

6. After takeoff, follows published IFR departure procedure, and contacts the designated ATC facility._

8. Acknowledges and follows ATC instructions.

9. When approximately 10 miles from destination airport, contacts local advisory frequency and announces intentions.

11. After landing, advised tie-in flight service station to close IFR flight plan with control facility.

AIR TRAFFIC CONTROL ACTIONS

2. Flight service provides weather and route briefing and transmits pertinent flight plan data to the appropriate ARTCC. [2000: Some TRACONs now MCF]

4. Flight service relays ATC clearance, facility and frequency for control after departure, and provides airport weather and known traffic information.

7. Provides air traffic control service in the same manner as in air carrier operations while airborne.

10. When aircraft is nearing destination airport and direct communication and control is no longer required, issues clearance for the published instrument approach.

[2005: "Flight intentions" replace "flight plans." ECAS equipped aircraft could be cleared for successive approaches with shared separation responsibility provided by the pilot through ECAS].

TRANSOCEANIC FLIGHT

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	1. Advise to dispatcher of available routes. Coordinates route selection. Traffic advisories required. [2000: Coordinates route options via ETMS].
2. Pilot in command obtains briefing from aircraft dispatcher, who files IFR flight plan in accordance with ICAO procedures and formats, and authorizes flight.	
	3. Issues engine start time, departure control frequency, beacon code, taxi and/or clearance information.
4. Reads back clearance to controller to ensure accuracy (readback is required per ICAO agreements).	
5. After receiving clearance, contacts ground control for taxi clearance if not previously provided.	
	6. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne within domestic airspace.
7. As aircraft approaches oceanic airspace, contacts enroute controller, reports altitude, and requests oceanic clearance from the controller responsible for the first oceanic area on flight route (if oceanic clearance not previously received).	
	8. ~~Confirms radar contact, and aircraft is sequenced on cleared route to meet required oceanic separation.~~ [1995: No longer valid because of track advisories].
9. Issues oceanic clearance (if necessary) and control instructions.	
10. Acknowledges receipt and reads back clearance to controller to ensure accuracy (required per ICAO agreements).	

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
11. Adheres to assigned routes and altitudes.	
	12. Transfers control responsibility to appropriate oceanic sector.
	13. Coordinates transfer of control responsibility to receiving Flight Information Region.
14. Establishes communications [1995: Position reports are relayed by ADS] with the appropriate oceanic radio station for passing required position reports.	
	15. Coordinates transfer of control responsibility to receiving Flight Information Region (IFR) and passes transfer instructions to pilot throughout the oceanic radio station.

NOTE: ~~Aircraft flying to or from overseas destinations are not normally subject to traffic management initiatives taken in response to excess demand at airports. There are, however, constraints on the oceanic route system that frequently require traffic management action. Radar coverage does not extend over most oceanic airspace, therefore, oceanic-radar separation procedures must be used. The increased separation requirements frequently result in demand in excess capacity. The Air Traffic Control System Command Center advises airline dispatch offices of potential delays due to this excess demand.~~ **[2005: ECAS equipped aircraft may benefit with reduced separation through shared operation].**

MILITARY AERIAL REFUELING AND TRAINING MISSION IN DOMESTIC AND SPECIAL USE AIRSPACE

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Obtains from base operations a preflight weather and mission briefing, including scheduled refueling time for designated refueling track and call signs for participating aircraft.	
2. Files flight plan with BASOPS.	
3. Follows military air traffic guidance until making contact with civil ATC services after departure.	
	4. Confirms radar contact, assigns beacon code and issues control instructions as necessary in similar fashion to those provided to commercial aircraft.
5. Contacts enroute controller and reports altitude. Requests clearance to enter the refueling track.	
	6. Authorizes aerial refueling within the specified track at the flight plan altitude and requests receiver aircraft to declare position when three miles from tanker aircraft.
	7. Releases to tanker aircraft appropriate communications frequency no later than the designated Air Refueling Initial Point (ARIP).
8. Maintains two-way radio contact with ATC until established in the altitude block, then contacts tanker.	
9. Tanker advises ATC that Military Assumes Responsibility for Separation of Aircraft (MARSA) is in effect. During refueling operations all communication with ATC is conducted by the tanker aircraft.	
	10. Avoids issuing altitude or course changes without tanker concurrence.

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
11. Tanker coordinates route and altitude clearance for both the receiver and tanker, and established vertical separation prior to reaching the planned exit point.	
	12. Clears aircraft to depart the refueling track at a navigational reference point or egress fix.
13. Receiver contacts ATC and reports altitude, adheres to assigned airways, route and altitudes.	
	14. Provides ATC services until aircraft enters airspace dedicated to military training mission.
15. Aircraft completes training assignment and requests ATC clearance to reenter civil airspace and return to airport.	
	16. Provides ATC services in the same manner as provided to domestic carriers.

NOTE: The location and use times of aerial refueling tracks are established by Letters of Agreement between the scheduling military unit and the air traffic facility containing tract airspace. Normally, the military must provide advance notice of specific use times and aircraft call signs to the controlling air traffic facility. Also the using military unit may coordinate with the Central Altitude Reservation Function (CARF) for approval of an Altitude Reservation (ALTRV) to and from the aerial refueling track. CARF, located within the Air Traffic Control System Command Center in Washington, D.C. accomplishes advance coordination of the ALTRV mission requirements with all affected air traffic facilities. Thus, complex mission requirements or movement of large numbers of aircraft can be accomplished smoothly, and without impacting routine air traffic operations.

AFSS PROCESSING FOR VFR PILOT

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Calls the FAA 1-800-WX BRIEF telephone number at least 30 minutes prior to flight. Requests weather information and preflight briefing.	
	2. Call is handled by AFSS Preflight (PF) briefer standing by to relay information from OASIS computer for data input and weather retrieval. PF also uses automated weather graphics system, which displays various weather maps.
	3. PF conducts standard weather briefing, including terminal area, enroute, and winds aloft observations and forecasts, etc.
4. Pilot decides weather is good for VFR flight, requests information about Notices to Airmen (NOTAMs).	
	5. PF relays local and distant NOTAMS that originate within the flight plan area, and FDC NOTAMS not formatted for the ARTCC computer.
6. Pilot files flight plan by reading specific aircraft data, characteristics, specific origin/ destination trip information, etc.	
	7. FSS specialist checks and accepts flight plan, and files with OASIS.

AIRBORNE CHANGE IN FLIGHT PLAN

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Pilot determines a different destination. Calls AFSS closest to present position.	
	2. FSS Inflight (IF) specialist converses with pilot and provides additional briefing information such as weather, NOTAMS and route changes. Amend flight plan as necessary.
3. Pilot heads toward new destination. Once arriving, calls AFSS and closes flight plan.	
	4. AFSS Flight Data (FD) specialist closes flight plan.

THE FAA AIR TRAFFIC SYSTEM
VISION OF THE FUTURE

2010

U.S. Department of
Transportation
**Federal Aviation
Administration**

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A TRIP THROUGH THE ATC SYSTEM - 2010

A. DOMESTIC FLIGHT

The evolution of the system to the year 2010 is marked by continued limited consolidation of systems and services. The number of systems and facilities has been reduced, and those working within it find their day-to-day tasks much easier to perform. In 2010, the pilot of the flight from Chicago to Washington is focused on the aircraft's systems, that the information passed to the flight management system is in conformance with the needs of the operation, and that the aircraft is ready for a flight.

From the flight deck, the pilot logs onto a computer maintained by a commercial vendor and checks the terminal weather forecast for Chicago and Washington, and for significant weather between the two cities. The service providers computer also sends necessary aeronautical information, and takes the pilots intended route of flight for entry into the ATC computers.

The pilot then logs onto the ATC system, which recognizes the aircraft's identification numbers and produces a flight plan that makes the best use of the aircraft's performance capabilities, that is checked for weather, and authorizes a takeoff time. The ATC computer downlinks current and forecasted weather for the departure and destination airports and weather and winds aloft for points along the flight route authorized by Traffic Management. As a result of the sophistication of weather forecasting and processing, the pilot finds that the route presented is clear of severe weather, and the route is downloaded into the aircraft's flight management system.

Taxi instructions are issued over a datalink system, and the aircraft is cleared to move away from the ramp and toward the runway. Automated systems on the ground and in the flight deck provide to the pilot a conflict-free and unconstrained path to the runway. A clearance to take off is issued and the aircraft is off.

Movement is controlled in the same way as in 2005. The flight operates on the Washington route using the aircraft's flight management system, digitally linked to the ATC system. The aircraft speeds up or slows down to avoid conflict with other traffic that may actually be many miles down range, and the speed advisories or vector instructions are designed to keep the flight in conformance with the ATC systems strategic plan. The aircraft begins its descent at the prescribed point and arrives at the runway on schedule. The pilot taxis the aircraft to a parking place and shuts down.

B. INTERNATIONAL FLIGHT

In 2010, international flights are not controlled differently from domestic flights. Aircraft position information derived from satellite-based surveillance systems and spacing of aircraft is much more precise, permitting many more aircraft to operate in the international environment.

Data sharing has been in place for several years now. As the aircraft makes its way from Chicago to London, each nation within whose jurisdiction the trip will pass receives the same flight information as the U.S. system.

THE ATC PROCESS

The ATC system in 2010 is characterized by high levels of automation. This is backed up by information gathering and informed judgment by both the Airspace Managers (AM) and the pilot. Aircraft are equipped with fully automated datalink systems, and are now an integral part of the automation system, with the pilot a full partner in the role of maintaining separation in the sky.

Tracking of aircraft movement is done by satellites using both dependent and independent surveillance techniques. On-board systems linked to the satellites and to the ATC system perform the task of maintaining separation and spacing. Airspace Managers can see and communicate with every aircraft in the system. To make this possible, all IFR aircraft are now datalink-equipped, and IFR equipment is required in Class A Airspace, which has been lowered from Flight Level 180. This guarantees that every aircraft operating IFR can be identified and can identify other aircraft.

A. PREFLIGHT ACTIVITIES

By 2010, the functions of flight service are being consolidated into other facilities and functions. The decommissioning of flight service stations is under way. The principal function still under the jurisdiction of the FAA is in-flight services for VFR traffic. Most in-flight services are performed as a function originating in the ARTCC. Preflight briefing services are now performed entirely by commercial vendors. These vendors are linked to the ATC system computers, and are the distribution point of all meteorological and aeronautical information other than advisories provided by AMs to pilots. All preflight briefings not provided by airline dispatchers or military BASOPS are obtained through these commercial sources. Local airport weather also can be obtained from automated voice-response systems or by contacting an operator on the airport field via Unicom (CTAF).

The process of filing a flight intention remains the same as in the 2005 time frame. Information is passed from the pilot to the vendor, then on to the ATC system computers, and the flight is assigned a departure and arrival time and a route-to-fly by the Traffic Management computers. The pilot logs on to the ATC system prior to flight and receives weather advisories and a preliminary flight route prior to taxi.

B. THE CLEARANCE PROCESS

The clearance process remains the same as in the 2005 time frame as well. Most of the activity is accomplished over datalinks, with the pilot requesting a clearance and the ATC computers responding with a clearance and departure, cruise, and arrival instructions contained in the clearance message. The pilot checks the message and downloads the clearance directly into the flight management system. The automation of the clearance process has reduced the volume of talk on the radio channels, keeping them free for critical transmissions.

C. SURFACE MOVEMENT

Control of aircraft moving about the surface is conducted virtually the same as in the 2005 time frame. Ground controllers (GCMs) still have responsibility for the separation of aircraft on the ground, but automation enhancements increases the margin of safety for aircraft, as surveillance and tracking of movement on the surface is much more precise. While not yet sharing the responsibility for separation, pilots have on-board systems that provide valuable assistance to the GCM. Airports are also equipped with tracking radar (primary and secondary) and data transmitting systems that provide both pilots and GCMs with accurate information regarding the movement of all vehicles on the airport surface.

This time frame sees the use of Vertical Take Off and Landing (VTOL) aircraft operating between city pairs to and from downtown areas. This has an effect on the movement of aircraft on the surface to the extent that it has offloaded some of the ground congestion at major airports. VTOL operations are not yet in full proliferation. Some traffic in slower-moving light duty aircraft as well as short-haul commuter jets have been removed from the airport mix. It is expected that in the next five years more and more operations will move between downtown areas. This will potentially affect surface traffic volume, but the results to this date are minimal.

The other issue relative to VTOL operations is that of movement on the surface at downtown landing facilities. Vertiports are by design much smaller than airports, and the potential for an aircraft incursion must be considered. VTOL aircraft operate similarly to other aircraft when en route, but at some point break out of the traffic stream headed toward the airport for destination landing facilities located within large city boundaries. At co-located vertiports, VTOL aircraft will be handled as any other aircraft. The planning for these aircraft is no different than for any other IFR traffic operations. Additional terminal area concerns for ATC are minimal. Whatever control is necessary on the vertiport surface is done by the facility operator unless it is determined, for saftey reasons, that an Air Traffic presence is needed.

D. AIRBORNE PHASE

The control of movement in the airborne phase is very similar to the way it was in 2005, but with some changes. Separation of aircraft is now a shared function as all IFR aircraft have access to the same data as do the Airspace Managers (AM). AMs issue instructions to pilots based on necessary flight profile changes recommended either by the Traffic Management computers or AERA advisories. However, aircraft also have access to TM and AERA data, and the process of moving an aircraft to another flight route is a decision arrived at jointly between the pilot and the AM.

As the system now sees all operating aircraft, departing and arriving traffic is no longer tracked primarily by Airport Surveillance Radar systems. With the advent of satellite surveillance, every airport can operate as a full IFR facility, and satellite-based precision approaches are now routinely performed. Many airports have a GPS-type transmitter located on the airport surface providing the equivalent of a fourth satellite (for full differential GPS capability) for precision approaches down to the airport surface. Departure and arrival control func-

tions have transitioned into the ARTCC/MCF, and remaining TRACONs, with ground and local control remaining as the principal functions of the ATC personnel at the airport.

Advancements in collision avoidance systems make it possible for aircraft to maintain separation without AM intervention. Avionics not only provide dependent surveillance reports, but also receive datalink messages directly from the ATC automation system regarding the position of other aircraft. Aircraft have a visual display of other traffic in the area, taken from dependent surveillance reports, and with the link to the ATC computers, the other aircraft shown on the flight deck display are tagged with a full data block of information necessary for the pilot to proceed. The displayed information shows not only aircraft in the immediate vicinity, but their relative altitude, direction, and airspeed, expressed in time measurements. Pilot actions to avoid other traffic are taken after checking with an AM, who also gets conflict alert messages processed by the HCSR from AERA and ECAS data.

Arrival and departing traffic are handled similarly. Each aircraft is on an assigned route heading toward a specific fix, and the time-at-the-fix has been calculated ahead of time by the Traffic Management system. Arrival AMs vector and speed-control each aircraft to position them correctly in the arrival stream in preparation for final approach to the airport.

ATC SYSTEM METHODOLOGY

The system in 2010 sees the Airspace Manager as the strategic planner of the system. Data derived from commercial vendors is analyzed by the ETMS and constantly updated. Projections of the current and planned traffic is presented to ground and local controllers in the tower and AMs in the ARTCCs/TRACONs/MCFs. The data presented to the tower and ARTCC/TRACONs/MCF personnel represents the current best estimate of what the traffic will look like for a period of four to six hours. AMs preparing the strategic work plan for their shift can view an accurate representation of the way the shift will evolve, as almost all aircraft are participants in the 2010 system. Flight intentions are required in Class A Airspace, and the ETMS adjusts the work plan as new flight intentions are added to the system.

Using improved tools available in 2010, the AMs reduce the problem of increased demand on the system. The ETMS adjusts the entire system based on additions to the plan. The ETMS and the AM workplans are capable of maintaining constant pressure on runway thresholds to the point where aircraft can land between 30 and 45 seconds apart. Departures can be sequenced between arrivals on any runway. Optimum scheduling, cooperatively arrived at between the airlines and the FAA produces schedules that relieve the pressure on the gates and allow the airlines to operate more efficiently between city pairs. The efficiency is most evident at peak times, when the airport and airspace resources are utilized in a most efficient manner. Additionally, the increased use of vertical /VTOL operations to downtown landing sites relieves some of the traffic to major city airports at peak business times, further facilitating the efficient use of the large airports.

Weather still has an impact on the system, but the degree to which it affects operations has been reduced. Forecasting and tracking systems have reached a level of sophistication in 2010 that tactical severe weather—frontal movement and its associated phenomena—wind shear, microbursts, and high velocity gusting—present only minimal problems. These events are seen and tracked on sophisticated radar and satellite tracking systems, and alternate operational plans are made well in advance of their occurrence.

A. PREFLIGHT ACTIVITIES

Operationally, most preflight services have been consolidated into vendor-provided services. Preflight briefings are conducted entirely by user-accessed providers, such as the airline dispatchers, military BASOPS, and commercial vendors for independent operators. All the preflight functions associated with FAA Flight Service are vendor-provided. Filing of flight intentions is accomplished by the briefing provider. These services have been automated to the point where pilots can connect via personal computer and receive a complete briefing, including interpreted weather data presented in text and graphics. Those operators who do not have access to computers can receive the same information presented over the telephone through automated voice-response systems, and the information can be downloaded over the telephone lines in video format to be viewed in real-time on a connected video monitor or recorded on magnetic or digital tape or disc media for viewing at a later time.

Flight intentions are filed directly with the briefing providers, who are interconnected with the ATC system to upload flight intentions and download aeronautical and meteorological data necessary for briefing purposes. Additional information is also passed along to pilots upon request. These vendors maintain their own data bases concurrent with the ATC data bases for the purpose of flight following. At the time of filing, the briefing provider determines if the operator wishes to avail of search and rescue services in the event of non-closure. If an operator wants these services, the information is maintained in the data base, and the computers automatically provide follow-up. If an inquiry is made or the computer determines that a flight might not have been completed, notification is made to the DOD Search and Rescue center at Scott AFB in Illinois, and an investigation into the status of the flight is begun. The ATC system has been removed from this process completely by 2010.

Flight intentions may be filed by pilots intending to operate under VFR. However, in order to receive ATC services under the floor of Class A Airspace, the aircraft must be equipped with full IFR equipment, including datalink. Any flight plan filed into the ATC system is treated like a full IFR trip, and such flights are scheduled and tracked by the ATC system. All aircraft on flight plans are tracked by the AFSS NEXTGEN system at the AFSS inflight (IF) positions. IF specialists are alerted when a particular flight parameter is reached, such as zero airspeed, and search and rescue is initiated. AMs provide limited in-flight services to VFR operators, providing weather and aeronautical information as requested. In addition, vendor/providers of preflight services maintain their own inflight services as an add-on to preflight services.

B. THE CLEARANCE PROCESS

The clearance process remains the same as in 2005. Most of the activity is performed over datalinks, with pilots making requests via automation and the ATC computers responding with clearance, departure, cruise and arrival instructions contained in the clearance message. The involvement of the ATC system at this point is that clearances are copied to the towers and departure sectors so that the GCMs, LCs, and AMs can check and validate clearances against the information being processed by computer. In the event of deviations between a clearance message and the computer-generated plan—either at the tower or in the ARTCC, the airspace manager resolves the difference prior to the operation and makes the necessary adjustments, either to the workplan or to the clearance.

C. SURFACE MOVEMENT

The airport surface safety system is managed by an integrated ground automation system, the Surface Traffic Management System (STMS). STMS provides surface control managers a full suite of surveillance, automation and separation tools producing a control system that operates at maximum efficiency in all visibility conditions.

The process of automating taxi and takeoff clearances, begun in 2005, has advanced in methodology with the inclusion of new flight deckand tower display systems. The further refinement of the Enhanced Collision Avoidance (ECAS) system, and advent of Satellite-Based Independent Surveillance (SBIS) augment Automatic Dependent Surveillance (ADS), which is routinely applied in the domestic arena (ADS-2).

The accuracy of ADS provides data derived from dependent surveillance as the primary data input to the ground-based ATC automation of surface movement. Surface control automation takes the data from ADS systems, augmented by satellite data provided to the ATC computers directly from space, and integrates it with data derived from on-board ECAS systems and the ground-based sensors. This information is fed into the terminal automation system to produce a highly sophisticated control system that enables aircraft to move about the surface, from gate to runway and runway to gate with a minimum of intervention by ATC.

The automation systems ground controllers use to control the movement of traffic have reached a high level of sophistication, with voice recognition (VR) playing a significant role in ATC automation. The automation incorporates a VR system, the Automated Voice Recognition System (AVRS). AVRS transforms GCM commands into digital instructions both to the aircraft and to the automation. Ground controllers query the ATC computers by voice and the AVRS takes the request, processes it, and presents the information on the tower display. GCMs maintain watch out the windows, issuing instructions and commands to the voice comm system and into the automation.

Furthermore, GCMs recite standard sets of taxi instructions into the computer for storage in a queue with or without specific addresses. When an aircraft requests a clearance via datalink, the clearance is downloaded in data form directly into the aircraft's FMS. At the same time, the instructions are loaded into the tower automation system, and the ATC automation activates the appropriate light bars to guide the aircraft to the runway. If a tactical intervention is necessary, a GCM can announce the change verbally by calling a specific aircraft call sign. Not only does the aircraft get the change, but so does the automation. The VR system extends to the cockpit, so that a pilot can make a request verbally to an automated voice response system, and the ATC system recognizes the request and queues the adjustment up to await confirmation by the GCM. After the GCM approves the change, it is carried forth, making the necessary advisories to the aircraft FMS, the light bar guidance system, and the ATC automation.

Aircraft are equipped with an integrated display called a Cockpit Display of Traffic Information (CDTI). This is an integrated video display that takes aircraft position information provided to it from the various sources (ECAS and the ground-based sensor/transmitters) broadcasting information derived from the terminal automation system—including ADS, SBIS, local airport maps, and instructions issued by a GC to the ground-based light bar control system, and presents a integrated movement control picture to the pilot. The CDTI display is driven by a Cockpit Airport Surface Information Program (CASIP), a software enhancement to the terminal automation system. The CDTI serves as the ECAS display when the aircraft is airborne.

D. AIRBORNE PHASE

The methodology of controlling traffic in 2010 has remained stable in the years since 2005. The evolution of the ECAS system permits the ATC system to incorporate aircraft-t-aircraft separation as part of the automation. By 2005 regulatory action occurred to require pilots to follow ECAS resolution advisories (RA). This has become routine by 2010, primarily because the number of RAs occurring in a 24-hour period has decreased, and RAs occur with significant lead time—as much as five to six minutes in advance of a potential incursion. In the 2010 time

frame the airspace is virtually conflict-free, even with the reduced separation standards in place. The automation recognizes that aircraft may be 30 or 45 seconds apart but never be a threat to each other. This is the benefit of time-based protected airspace trajectory management that was in the formative stages in 2005. In 2010, time-based separation produces an airborne safety system using ETMS, AERA and ECAS data in all stages of flight, from departure to arrival.

Two automation systems have added efficiency and safety to the airborne automation system. The Automated Voice Recognition System (AVRS) identified and described in the surface movement description is also in the ARTCC/TRACON/MCF environment, giving AMs the same automated voice command capability as ground controllers. As for ground systems, the AVRS makes the appropriate changes to the ATC automation, facilitating instantaneous response of the automation to the decisions and actions of the Ams.

Also, in addition to domestic ADS (ADS-2), the system now incorporates a Domestic Satellite Communications system (DSCS), a high-capacity tactical data and voice communications system that relays verbally-issued control instructions from the controlling facility to aircraft at distances greater than can be achieved by VHF radio communications. This is of major benefit to the system during times when sector boundaries have been reconfigured by the DYSEC system. The AM might be watching traffic that is as much as 1000 miles away from the control facility. Further, the DSCS, in coordination with the AVRS, converts the voice command to a data stream that, upon acceptance, makes adjustments to the aircraft FMS and to the ATC automation.

These changes produce a fully integrated ATC system in which the aircraft is a part of the ATC automation system. In 2010, no movement instructions can be effected without full recognition and acceptance by both the AM and the pilot, but the capability for automated operation exists in this time frame.

E. VFR OPERATIONS

As in 2005, there is room for the VFR operator in 2010. The floor of Class A Airspace has been lowered, but the volume of VFR traffic has declined as well. More and more aircraft are equipped to fly in Class A Airspace, and choose to do so. Those who opt to remain VFR find all the services they need. Preflight briefings and flight planning are done through commercial vendors. Another activity once performed by the Automated Flight Service System, in-flight services, is now resident in the ARTCC/MCF. In-flight information is available for the VFR operator to provide weather advisories and PIREPs when necessary and to provide emergency service when required.

With the automation capabilities of the system, lost aircraft can be tracked quickly using satellite locator sensors that read transmissions from the locator beacon in a lost aircraft.

ATC CONTROLLER POSITIONS: FUNCTIONAL DESCRIPTIONS

The role of the controller in 2010 has evolved into that of a system manager. Automation has found its way into every phase of air traffic control, and the system managers are now almost completely strategic planners. The system is virtually error-free. The automation is "fail-soft," that is, the automation will continue to function for all aircraft in the sky in the event of a system failure. Every system has either built-in redundancy or the connectivity and flexibility to adjust to any failure.

Airspace managers have been provided further tools to bring the system closer to full automation. Airport automation has evolved to the Airport Surface Safety System, an integrated system combining the features of ASTA, TATCA, and TCCC with high levels of voice recognition and new, integrated displays that give surface control managers more capabilities than ever before.

Satellite communications, navigation and surveillance systems have evolved in 2010, so that the ATC system is fully integrated between space- and ground-based systems. The speed of data transfer and communications have made strategic planning for all operations a reality, and the surface control and airspace managers of this time frame have the tools to ensure safety in the system regardless of the volume.

The functional descriptions in this section describe the individual positions of operation and how they interface with each other.

TERMINAL FACILITIES

TOWER

AREA SUPERVISOR (AS)

The tower cab AS is responsible for overall tower cab operation. This includes management and direction of tower cab personnel, and observing, scanning and projecting the needs of the constantly changing airport operation

INPUTS:
- Visual observation of tower cab operations
- Flight DataProcessing (FDP)
- STARS, TCCC data input,
- Status information area
- Coordination from tower cab positions
- TRACON/MCF/Terminal Area Supervisor (AS)
- Area Manager (AM)
- System Automation

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, Field/ weather conditions, staffing and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination to pilots information concerning vehicle conditions that may affect operations
- Coordinate with tower cab positions, ARTCC/MCF, TTMU, AS and AM
- Ensure tower cab operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine tower cab positions
- Initiate action as input changes

SYSTEMS:
- CASIP, AVRS, STMS, ETMS, STARS, TCCC, ASTA, ITWS, ICSS, RVR, MLS, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, AWDS, crash phone system

TOWER

CAB COORDINATOR (CC)

The CC is primarily responsible for observing and scanning the active runways and airport traffic area/control zone to assist the LC. CC will coordinate for the LC and ensure procedures and flows are adhered to in the rapidly changing airport environment.

INPUTS:
- Receive requests for air traffic movement
- Visual observation of runways, taxiways, traffic pattern and airport traffic area/ control zone
- Flight Data Processing (FDP)
- STARS, TCCC data input
- Status information area
- Coordination from other tower cab and TRACON/MCF positions
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Observe Local Control operations and coordinate for the LCM
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, separation standards, pilot requests, facility procedures, field/weather conditions and aircraft performance.
- Review flight data
- Ensure dissemination of information to pilots, vehicle operators, other cab positions, and the supervisor, of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Coordinate for the LC with other tower cab and TRACON/MCF terminal positions
- Scan airport operations and assist LC with duties
- Report airport conditions
- Forward flight data
- Initiate action as input changes

SYSTEMS:
- ETMS, TCCC, STARS, ASTA, ITWS, ICSS, light guns, RVR, NAVAID panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, AWDS, crash phone system

TOWER

LOCAL CONTROL (LC)

The LC is primarily responsible for handling arriving and departing traffic at the airport. The area of responsibility includes the active runways and airport traffic area/control zone. It is a rapidly changing environment requiring constant evaluation of input and modification to existing plans. The LC position interfaces mainly with Ground Control (GC) and TRACON/ MCF arrival and departure positions.

INPUTS:
- Receive request for air traffic movement
- Visual Observation of Runways, taxiways, traffic pattern and airport traffic area/ control zone
- Departure/approach situation display
- Radios and Datalink communications
- STARS, TCCC data input
- Flight Data Processing (FDP)
- Enhanced Collision Avoidance System (ECAS) data
- Status information area
- Coordination from other tower cab and TRACON/MCF terminal positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)
- Runway incursion alerts

PROCESS:
- Analyze information to determine priority of duties
- Project and plan ATC service based upon traffic flows, traffic management, separation standards, pilot requests, facility procedures, field and weather conditions, and aircraft performance
- Obtain, review, and amend flight data
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and AS of conditions that may affect operations.
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Issue arrival, departure, airport traffic area/control zone transition instructions via radio, lights, and datalink
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab and TRACON/MCF terminal positions
- Disseminate to pilots, vehicle operators, other tower cab positions and AS information that may affect airport operations
- Initiate action as input changes

TOWER

LOCAL CONTROL (LC) continued

SYSTEMS:

- CASIP, AVRS, STMS, SBIS, ECAS, ETMS, TCCC, STARS, ASTA, Datalink, light controls, ITWS, ICSS, radios, light guns, RVR, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, AWDS, crash phone system, DASI, Wind instruments

TOWER

GROUND CONTROL (GC)

The GC is primarily responsible for directing aircraft to and from the runway. Additional duties include directing other aircraft/vehicular movement on the airport movement area and disseminating information to support operations (e.g. traffic, weather, equipment status, delays/flow etc,). It is a dynamic environment in which the GC must adjust traffic flows and evaluate new information.

INPUTS:
- Receive request for ground movement
- Visual observation of movement area
- Airport Surface Situation display
- Voice and Datalink communications
- Flight Data Processing
- STARS, TCCC data input
- Enhanced Collision Avoidance System (ECAS) data
- Status information area
- Coordination from other tower cab positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, pilot requests, facility procedures, field/weather conditions and aircraft performance
- Obtain, review, and amend flight data
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and the AS of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Issue ground movement instructions via voice, datalink or lights
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab positions
- Forward flight data
- Initiate action as input changes

SYSTEMS:
- CASIP, AVRS, STMS, ECAS, ETMS, STARS, TCCC, ASTA, Datalink, Light Controls, ITWS, radios, light guns, RVR, NAVAIDS panel, field lighting panel, coordination lights, LLWAS, 24-hour clock, AWDS, crash phone system

TOWER/TRACON/MCF

CLEARANCE DELIVERY (CD)

The CD position primarily issues departure clearances to pilots. The clearance is delivered to the pilot via datalink or on the radio. Additionally, weather, route, delay and other significant information may be relayed to pilots.

INPUTS:
- Requests for departure clearance
- Voice and datalink communications
- STARS/TCCC data input
- Flight Data Processing
- System automation
- Status information area
- Coordination from other tower cab positions
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:
- Upon receipt of flight plan/VFR departure information, ensure all required clearance items are received and recorded
- Forward clearance information for processing, queuing, and delivery
- Amend flight data as necessary
- Periodically review flight data for currency
- Monitor Tower Cab Automation System

OUTPUTS:
- Issue or transmit clearance to pilots
- Coordinate information with other tower cab positions
- Tower cab automation data

SYSTEMS:
- CASIP, STMS, AVRS, ETMS, STARS, ASTA, Datalink, ITWS, radios, AWDS, 24-hour clock

ARTCC/TRACON/MCF

AREA MANAGER (AM)

The Area Manager has the responsibility for the entire facility's shift operation. By projecting, planning, coordinating and strategizing with shift supervisors, the Area Manager facilitates the use of available resources to meet the demands of air traffic.

INPUTS:
- Area Supervisors
- Traffic Management Unit (TMU)
- Area Air Traffic Manager
- Tower AS and AM
- Flight Data Processing
- STARS/TCCC/HCSR data input
- Dynamic Sectorization (DYSEC) tool
- Facility Staff officers
- Airway Facility technicians (Automation specialists)
- National Weather Service
- Flight Service Stations
- AERA conflict and weather advisories
- Military Operations Specialist (MOS)
- System Engineer (SE)

PROCESS:
- Administrate shift operations
- Project and plan shift staffing, traffic flows, facility procedures, weather conditions, and sector configuration
- Analyze information to determine priority of duties
- Analyze, evaluate and update information to ensure effectiveness of operation

OUTPUTS:
- Ensure exchange of information with other ARTCC/MCF positions, TMU, AS, and Tower AMs that may affect operations
- Ensure adequate supervisory staffing
- Coordinate with adjacent ARTCC/MCF, AS, TMU, and AM
- Ensure ARTCC/MCF operations are in accordance with procedures, current flows and weather conditions

SYSTEMS:
- CASIP, STMS, DSCS, SBIS, DYSEC, ETMS, STARS, TCCC, Datalink, TATCA, WARP, AWPG, AERA, ICSS, LLWAS, RVR, Digital Altimeter Setting Indicator (DASI), ASR, ILS, MLS

ARTCC/TRACON/MCF

AREA SUPERVISOR (AS)

The AS is responsible for the operation of an area of specialization. Through planning, monitoring and evaluating operations, the AS will use available resources to accommodate traffic demands. It is a constantly changing environment where anticipating and communicating needs are as important as current operations.

INPUTS:
- Sector operations
- Flight Data Processing (FDP)
- STARS/TCCC/HCSR data input
- Dynamic Sectorization (DYSEC) tool
- Status information area
- Coordination with other AS positions
- Traffic Management Unit (TMU)
- Tower cab Area Supervisor (AS)
- Center Weather Service Unit (CWSU)
- Area Manager (AM)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/ weather conditions, staffing, and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination of information concerning conditions that may affect facility operations, TMU, and tower operations
- Coordinate with sector positions, other AS, TMU, AM, tower AS and AM
- Ensure sector operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine sector positions as needed
- Initiate action as input changes

SYSTEMS:
- CASIP, DSCS, SBIS, DYSEC, ETMS, STARS, HCSR, Air Route Surveillance Radar (ARSR), Voice and Datalink Communications, TATCA, TCCC, WARP, AWPG, ICSS

ARTCC/TRACON/MCF

RADAR/SURVEILLANCE AIRSPACE MANAGER (R)

The R position is designed according to the desired function—en route, arrival, departure, and satellite. The R responsible for each sector has defined airspace and can use a variety of techniques to accomplish the assigned tasks (e.g., vectoring, speed control. sequencing, altitude, lateral, diverging, and visual separation). The level of service and separation applied to the individual aircraft is dependent upon numerous factors including the pilot's request, type of flight plan, type of aircraft, avionics and equipment and weather.

Aircraft fly along a direct route assigned by the ETMS. When assigned routes need amending, aircraft are directed onto another route to avoid conflicts, adverse weather, special use airspace, obstructions and terrain. The sector environment is rapidly changing as input changes (e.g., aircraft, weather, pilot requests, traffic management). The R must continually evaluate current operations, conditions, and the effectiveness of the action plan. As new input is received, the R must be flexible, and rapidly incorporate the information into the action plan.

The en route position expedites the movement of traffic through the sector, maintains separation, and sequences aircraft toward arrival fixes, when necessary.
The arrival position(s) primarily sequences aircraft delivered from adjacent sectors or VFR "pop-up" aircraft to the destination airport. Service may be provided to more than one runway at one or more airports.

The departure position(s) primarily delivers departing aircraft from one or more airports to the appropriate en route sector, in accordance with established procedures.
The satellite position(s) normally provides arrival and departure service for secondary or military airports. Generally these aircraft are incorporated into the primary airport flow of traffic.

INPUTS:
- STARS/HCSR/TCCC (AERA, TATCA)
- Pilot requests, PIREPS and SIGMETS
- DSR displays
- Manual and automated handoffs
- Voice and datalink communications
- Flight Data Processing (FDP)
- Computer system advisories and commands
- Enhanced Collision Avoidance System (ECAS)
- Status information area
- Coordination with other sector positions, AS, AM, and adjacent facilities
- Traffic Management Unit (TMU)
- Area Supervisor (AS)

ARTCC/TRACON/MCF

RADAR/SURVEILLANCE AIRSPACE MANAGER (R) continued

PROCESS:

- Prepare and monitor automation equipment for settings and optimum performance
- Correlate flight data and surveillance display information
- Manage flight data: scan, analyze, amend, transfer and file
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft types and performance characteristics, requests) and evaluate additional factors (e.g., weather, equipment status, flow control) and develop an action plan
- Continuously evaluate the effectiveness of the plan and adjust as necessary

OUTPUTS:

- Issue control instructions, safety alerts, advisories and information to pilots
- Initiate control instructions and ensure separation
- Initiate manual and automated handoffs
- Disseminate weather information
- Make entries into DSR/HCSR/STARS
- Coordinate with tower cab, other ARTCC/TRACON/MCF sector positions and adjacent ATC facilities

SYSTEMS:

- DSCS, SBIS, AVRS, ETMS, DSR, HCSR, TATCA, ICSS, radios, Datalink, 24-hour clock, WARP/AWPG, DEDS, STARS, COTS color displays, RADS

ARTCC/TRACON/MCF

ASSOCIATE OR HANDOFF POSITION (RA)

The RA is responsible for providing assistance to the R position as necessary to ensure continued smooth operation of the sector. The RA accepts or initiates manual and automated handoffs, manages electronic flight data for the sector, and informs the R of all actions taken. Most sector tasks can be accomplished by the RA, thereby allowing the R controller to focus on the efficient flow and separation of aircraft.

INPUTS:
- DSR display
- Manual and automated handoffs
- Voice and datalink communications
- Flight Data Processing (FDP)
- Enhanced Collision Avoidance System (ECAS)
- Status information area
- Coordination from towers, other sector positions and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor (AS)
- STARS, TCCC, HCSR data input

PROCESS:
- Correlate flight data and display information
- Scan, analyze, transfer and file flight data
- Amend flight data as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type and performance characteristics, requests) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the R's action plan

OUTPUTS:
- Ensure orderly flow of traffic and separation of aircraft
- Ensure adherence to procedures and flow restrictions
- Assist R airspace manager in implementing action plan
- Initiate manual and automated handoffs
- Make entries into DSR/HCSR/STARS/TCCC computer system
- Coordinate with tower cab, other sector positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- DSCS, SBIS, AVRS, ECAS, HCSR, STARS, ETMS, TATCA, ICSS, 24-hour clock, AWDS

ARTCC/TRACON/MCF

FLIGHT DATA AIRSPACE MANAGER (FD)

The FD position is responsible for performing inter- and intra-facility coordination on traffic actions, and accomplishes any other functions that will assist the Radar team in meeting situational objectives. The FD advises the RA of any action taken.

INPUTS:
- Radar display
- Manual and automated handoffs
- Voice and Datalink communications
- Flight Data Processing (FDP)
- Enhanced Collision Avoidance System (ECAS)
- Status information area
- Coordination from other radar and/or manual positions and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor in Charge (ASIC)

PROCESS:
- Correlate flight data and radar display information
- Scan, analyze, transfer, and update flight data
- Amend flight data as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type, aircraft performance, requests) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the R airspace manager's action plan

OUTPUTS:
- Ensure safe and orderly traffic flow
- Ensure adherence to procedures and traffic management initiatives
- Assist Radar controller in implementing action plan
- Initiate manual and automated handoffs
- Make DSR/HCSR entries
- Coordinate with other radar and non-radar positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- DSCS, SBIS, AVRS, ECAS, HCSR, STARS, DSR, radio and telephone equipment, Datalink

ARTCC/TRACON/MCF

FLIGHT WATCH (FW)

The Flight Watch position is a specialized air/ground position within the facility that has been relocated from the Flight Service Stations. FW services primarily—but is not limited to—VFR aircraft. Service is provided on unique VHF radio frequencies (122.0 nationwide between FL 6,000 and 17,000 ft. MSL). Discrete frequencies are used for high altitude service. The service provided is entitled En Route Flight Advisory Service (EFAS). EFAS service is limited to "near-real-time" weather information, and is specifically intended for aircraft in the en route phase of flight. A primary function of EFAS is the solicitation and exchange of pilot weather reports (PIREPS) among aircraft. EFAS specialists are pilot weather briefers who have received additional specialized training and certification in the use and interpretation of weather radar and weather satellite data.

All information and service provided is in accordance with procedural handbooks, FAA orders, and facility directives.

INPUTS:
- Self briefings
- Pilots
- NWS (reports, charts, etc.)
- Adjacent facility positions
- Adjacent control facilities
- Center Weather Service Unit

PROCESS:
- Receive, analyze and respond to pilot requests for en route weather information
- Solicit reports from pilots (PIREPS) concerning en route conditions
- Compare PIREPS to NWS forecasts and advisories of hazardous conditions to validate the accuracy of the forecast information
- Provide to pilots the most current information available, tailored to a specific altitude and route of flight

OUTPUTS:
- En route flight advisories
- PIREPS
- Record of aircraft contacted via aircraft identification
- Relay of reported conditions (PIREPS) to CWSU and NWS forecasters

SYSTEMS:
- DSR, STARS, ICSS, discrete frequency outlets, WARP/AWPG, CWSU weather graphics, Geostationary Orbiting Environmental Satellite (GOES) imagery, weather radar displays, NEXTGEN

AUTOMATED FLIGHT SERVICE STATION (AFSS)

INFLIGHT (IF)

The inflight position provides air/ground communication with VFR aircraft. Communication may be of a routine or an emergency nature. The position is staffed with certified pilot weather briefers. Briefers are expected to be familiar with current and forecast weather conditions while they are on duty. They are also required to maintain detailed current knowledge of the topographical and other physical features of the facility's area of responsibility. Routine services provided at the IF position include weather advisories, position reporting, flight following, flight plan filing, activation, revision, and closure. Emergency services are provided in the form of orientation of lost aircraft.

Inflight positions are located in both the AFSS/FSSs and in the ARTCC/TRACONs/MCF

INPUTS:
- Pilots
- National Weather Service (NWS)
- National Flight Data Center/U.S. NOTAM Office (NFDC/USNS)
- Operational Database Management System (ODMS)
- Other Facility Positions
- Adjacent control facilities
- Airport management/fixed base operators
- Charts and printed aeronautical information

PROCESS:
- Receive, analyze and respond to pilot requests for service
- Copy flight plan information
- Correctly format and transmit flight plan data

OUTPUTS:
- Emergency services to aircraft in flight
- Inflight weather briefings
- Flight plans entered into HCSR
- Record of briefing via aircraft identification or pilot name

SYSTEMS:
- DSCS, SBIS, AVRS, HCSR, STARS, DSR, WARP, ITWS, AWPG, ETMS, NEXTGEN, ICSS

AUTOMATED FLIGHT SERVICE STATION (AFSS)

FLIGHT DATA (FD)

Flight Data is an internal/external communication position within the FSS/AFSS. It is the focal point for messages such as flight intention requests, flight movement and notification data, and administrative message traffic. Search and Rescue (SAR) activities are also initiated from this position on aircraft that become overdue.

INPUTS:
- In flight position
- Flight intention requests
- Flight plan activation/cancellation
- Search and Rescue (SAR) initiation
- Other FSS/AFSS facilities
- Requests for arrival information
- Administrative messages

PROCESS:
- Receive flight intention requests and other movement messages from IF position.
- Properly format flight intention requests and other pertinent data for transmission
- Initiate and respond to SAR messages in a timely manner based on established criteria and procedures
- Perform SAR duties as required
- Format and transmit administrative messages

OUTPUT:
- Administrative messages
- Flight closure/cancellation data to ATC facility
- Transmit flight intention requests, flight movement notification messages and administrative message traffic
- Search and rescue notification to SAR function of DoD

SYSTEMS:
- DSCS, NEXTGEN, ICSS

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO) — ATCSCC

NTMOs gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives for their area of responsibility.

INPUTS:

- Official Airline Guide (OAG)
- HCSR flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Departure Delivery Rate (DDR)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- ARTCC/MCF and terminal traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS),
- International ATC systems

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO) continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- ETMS, STARS, CVARS, WARP, AWG, ODMS, Aircraft Situation Display (ASD), specialists' workstations, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

National Operations Manager (NOM) - ATCSCC

Area Managers gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives.

INPUTS:
- Official Airline Guide (OAG)
- HCSR flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Departure Delivery Rate (DDR)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- ARTCC/MCF and terminal traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS),
- International ATC systems

PROCESS:
- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

National Operations Manager (NOM) - ATCSCC - continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- DSCS, SBIS, DYSEC, ETMS, STARS, AWPG, WARP, ODMS, Aircraft Situation Display (ASD), Apollo workstations, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (TMS) — ATCSCC

TMSs/NOMs gather all the pertinent information relative to current and projected future operations, and develop tentative TM plans to balance demand with capacity; initiate and implement TM plans with other facilities/TMUs, supervisors and control specialists and the ATCSCC; maintain awareness of capacity reductions throughout the NAS; document delay information; evaluate effectiveness of TM initiatives and make necessary adjustments.

TMSs disseminate TM initiative information to users and TMUs via ATCSCC advisories and records delay information. NOMs coordinate the efforts of TMSs into a coordinated NAS Traffic Management Plan.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- HCSR/STARS flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Arrival Acceptance Rate (AAR) and Departure Delivery Rate (DDR)
- WARP, ITWS, AWPG, CWFSU
- Coordination with other ATC facilities
- ATCSCC Operations Center
- Central Altitude Reservation Function (CARF) users (airlines, military, general aviation)
- ETMS, SAMS

PROCESS:
- Input current/forecasted capacities, i.e., Departure delivery Rates, Airport Arrival Rates, OALT, Feeder fix rates

OUTPUTS:
- Traffic Management Initiatives:
  - A. Traffic stops
  - B. Exemptions from TM initiatives
- Coordination with:
  - A. NOMs and TMSs/TMCs to implement traffic management initiatives and flight reroutes
  - B. Traffic Management Units (TMU)/TMCs to maintain awareness of current and anticipated conditions
  - C. Users, to inform them of local/national TM initiatives and advise of current and anticipated delays and airspace/airport conditions

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (ATCSCC) continued

SYSTEMS:

- DSCS, SBIS, ETMS, STARS, WARP, AWPG, ODMS, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (STMC) — EN ROUTE

STMCs are responsible for assessing the capacity and demand for airspace and airports within their facility's area of responsibility; developing and administering traffic management initiatives including arrival and departure metering, en route spacing, ground delays, and severe weather avoidance routes; providing intra- and inter-center coordination on military aircraft missions and airspace usage; disseminating weather information to center personnel and to other air traffic facilities in their area of responsibility; and assigning work within the Traffic Management Unit to ensure the most effective use of resources.

INPUTS:

- Official Airline Guide (OAG)
- HCSR flight plan data
- En route radar
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- En route Terminal traffic management personnel
- Air Traffic Control System Command Center (ATCSCC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- National Flight Data Center (NFDC)

PROCESS:

- Use inputs to gather information about the status of the airspace and airports within the Center's boundaries. Considerations include weather, system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Coordinate and disseminate information concerning the status of the NAS, weather, traffic management initiatives, and military airspace and mission requirements to personnel within the facility, air traffic facilities with adjacent airspace, and the ATCSCC
- Establish priorities and assign work to TMCs to achieve maximum efficiency and utilization of operations personnel
- Monitor and evaluate traffic management initiatives to ensure effectiveness.

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (STMC) — EN ROUTE

OUTPUTS:

- Utilizes available resources to ensure balanced traffic flows and the maximum utilization of airspace
- Establishes departure, en route, and arrival fix rates
- Coordinates weather, traffic management, and other information pertaining to the efficient operation of the NAS to concerned personnel

SYSTEMS:

- DSCS, SBIS, ETMS; HCSR, DSR, WARP/AWPG; Specialists' workstations; interphone, dedicated long-line, and commercial telephones; walkie-talkie; Special Use Airspace Management System

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) — TOWER

Tower TMCs gather all necessary information and develop tentative TM plans to balance demand with capacity; negotiate tentative TM plans with terminal/en route TMC/TMUs, supervisors, control specialists, and the ATCSCC; maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives and make necessary adjustments; disseminate TM initiatives to supervisory/control personnel, approach controllers, and parent TMU; and forward delay information to parent TMU.

INPUTS:
- TCCC
- HCSR flight plan data
- Engineered Performance Standards (EPS)
- Weather data (WARP, ITWS, AWPG, CWSU)
- Traffic Management Unit (TMU) — (ARTCC-MCF)
- Air Traffic Control System Command Center (ATCSCC)
- Users (Airlines, Military, General Aviation)
- Aircraft movement (visual)
- Airport manager
- AMASS, ASTA, TATCA (TMA advisor), ITWS/AWPG

PROCESS:
- Gather information about terminal/en route sectors
- Assess current and forecasted capacities at the airport
- Input data to ETMS and maintain current status

OUTPUTS:
- Traffic Management Initiatives (strategic/tactical):
  - A. Airport arrival Rates (AAR)
  - B. Departure Delivery Rates (DDR)
  - C. Initial flight reroutes
  - D. Traffic stops
- Coordination with:
  - A. SATCs/ATCSs (internal) to change AARs/DDRs and flight reroutes
  - B. Traffic Management Unit (TMU)/TMCs with parent terminal facilities to maintain awareness of current and anticipated conditions.
  - C. ATCSCC to advise of current and anticipated airport delays and airspace/airport conditions

SYSTEMS:
- STMS, CASIP, DSCS, ETMS, STARS, TATCA, AMASS, ASTA, TCCC, WARP, AWPG, interphone, long-line and commercial telephone

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) — ARTCC/TRACON/MCF

TMCs gather all necessary information and develop TM plans to balance demand with capacity; input and maintain OALTs in ETMS, input appropriate departure, feeder fix and arrival rates, and coordinate output with other facilities and TMUs, supervisors, control specialists and the ATCSCC. They maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives; and make necessary adjustments to disseminate TM initiatives to supervisory and control personnel. This includes towers, approach control sectors, and other TMUs via the ATCSCC. TMCs also forward delay information to the ATCSCC.

INPUTS:
- Official Airline Guide (OAG)
- Terminal and en route radar
- HCSR Flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Weather data (WARP, ITWS, AWPG, CWSU)
- ATCSs and SATCSs, (towers, TRACONs, ARTCCs)
- Users (airlines, military, general aviation)
- Airport Arrival Rates (AAR) and Departure Delivery Rates
- TATCA (TMA Advisor)
- ETMS

PROCESS:
- Gather information for airports and en route sectors within their ARTCC to assess current and forecasted demand and capacities
- Develop or recommend Traffic Management initiatives necessary to balance demand with capacity
- Input OALT into ETMS, keep current.

OUTPUTS:
- Traffic Management initiatives (strategic and tactical)
  - A. Current and projected OALTs
  - B. Arrival fix rate
  - C. Traffic Stops
- Coordination with:
  - A. SATCSs and ATCSs (internal) to initiate restrictions, implement traffic management initiatives and flight reroutes
  - B. Traffic Management Units (TMU/TMCs in adjacent ARTCC/MCF and terminal facilities to maintain awareness of current and anticipated conditions and capacities

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (ARTCC/TRACON/MCF) continued

C. ATCSCC to request national TM initiatives and advise of current and anticipated delays and airspace and airport capacities

SYSTEMS:

- DSCS, SBIS, HCSR, STARS, DSR, ETMS, TATCA, WARP, ITWS, AWPG, interphone, long-line and commercial telephone,

ATC TECHNOLOGY AND SUPPORT INTERFACES

ATC AUTOMATION

AUTOMATED VOICE RECOGNITION SYSTEM (AVRS)

Interfaces ARTCC/TRACON/MCF/LCF pilot controller communications systems to ATC computer systems enabling analog voice to digital datalink ATC command transmissions.

INPUTS:
- Pilots' analog audio
- Controllers' analog audio

PROCESS:
- Process analogue information and convert to digital information
- Convert digitized audio data to Data-link format information

OUTPUT:
- Digitized audio information

INTERFACED SYSTEMS:
- TCCC, Datalink, HCSR, STMS, CASIP, DSCS, CDTI

ATC AUTOMATION

COCKPIT AIRPORT SURFACE INFORMATION PROGRAM (CASIP)

CASIP interfaces MCF/LCF automation systems to cockpit avionics to provide cockpit display of airport surface features and traffic to enable CAT III airport surface traffic control.

INPUTS:
- HCSR
- TCCC
- STMS
- Datalink

PROCESS:
- Combines several sources and types of data, and formats it for transmission via datalink

OUTPUT:
- Data stream of information to enable the display of pertinent data regarding airport traffic and features

INTERFACED SYSTEMS:
- SBIS, AMASS, ASTA, HCSR, TCCC, STMS

ATC AUTOMATION

COCKPIT DISPLAY OF TRAFFIC INFORMATION (CDTI)

INPUTS:
- Aircraft Position Information

PROCESS:
- Select Data For Display

OUTPUTS:
- Aircraft Position Information

INTERFACED SYSTEMS:
- ECAS, DADS, HCSR, TATCA, SBIS, ASTA, AMASS, ASSS

ATC AUTOMATION

SURFACE TRAFFIC MANAGEMENT SYSTEM (STMS)

STMS is designed to automatically detect airport surface conflicts thru datalink provide control instructions to aircraft that insure the safe, orderly flow of ground air traffic.

INPUTS:
- TCCC
- AMASS
- ASTA
- Aircraft positional data
- Airport operational configuration information
- HCSR
- Aircraft flight plan data
- Traffic management information

PROCESS:
- Receive aircraft position data
- Receive aircraft flight plan data
- Analyze and process data for conflicts
- Generate conflict resolution data
- Track aircraft movements

OUTPUTS:
- Situation display data in control tower
- Commands to control managers to resolve conflicts
- Commands to datalink-equipped aircraft to prevent conflicts

INTERFACED SYSTEMS:
- AMASS, ASTA, HCSR, TCCC, Datalink, AVRS, CDTI, DADS, CASIP, DSCS

COMMUNICATIONS

DOMESTIC SATELLITE COMMUNICATION SYSTEM (DSCS)

DSCS is a high capacity datalink and voice ATC tactical (ATC control instructions) communications systems.

INPUTS:
- Pilot and controller voice and datalink

PROCESS:
- Transmit and receive

OUTPUT:
- Pilot and controller voice and datalink data with total coverage—no blind spots

INTERFACED SYSTEMS:
- Datalink, Voice circuits

SURVEILLANCE

DOMESTIC AUTOMATIC DEPENDENT SURVEILLANCE (DADS)

omestic Automatic Dependent Surveillance is a function for use by air traffic services in hich aircraft automatically transmit, via a datalink, information derived from on-board avigation systems. The data includes three dimensional position and time. An ADS-based TC system includes the capability to exchange messages between the pilot and the controller ia datalink and by voice for emergency and non-routine communications.

INPUTS:

- On-board navigation systems
- Other Systems (see below)

PROCESS:

- Make determination of exact position in the airspace
- Make selectable interval position reports via satellite communications

OUTPUTS:

- ADS surveillance capability
- Two-way pilot-controller datalink communication
- Improved Human Computer Interface (HCI) for message composition and transmission

INTERFACED SYSTEMS:

- ODAPS with ADS capability, avionics with ADS function, satellites to relay transmissions between aircraft and ground/earth stations, ground/earth stations to communicate messages between ATC facilities and the satellites.

SURVEILLANCE

SATELLITE-BASED INDEPENDENT SURVEILLANCE (SBIS)

INPUTS:
- Aircraft position information

PROCESS:
- Detect aircraft

OUTPUT:
- Transmit information about detected aircraft to ground-based ATC automation systems

INTERFACED SYSTEMS:
- HCSR, TCCC, STMS, DSR, ASTA, ETMS, SBIS, Datalink

ATC FLIGHT SCENARIOS

COMMERCIAL CARRIER (DOMESTIC SERVICE) FROM/TO AIRPORTS WITH A CONTROL TOWER

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Pilot in command obtains briefing from aircraft dispatcher, who authorizes flight.	
2. Verify IFR flight plan and notify changes to air traffic as required. [2000: ETMS incorporates flight plan program/air carrier computer interface program].	
3. Contacts ground control/clearance delivery prior to engine start. [2000: Logs onto ATC for clearance prior to engine start].	
	4. Issues engine start time, taxi or clearance information, departure control frequency,and beacon code.
5. After receiving clearance, contacts ground control for taxi clearance if not previously provided. [2010: Follows instructions on STMS].	
7. Acknowledges and follows taxi instructions. [2000: Views information on cockpit CRT and acknowledges].	6. Issues taxi instructions.
8. Contacts local control for clearance to take off.	
	9. Issues departure information and takeoff clearance.
	10. After takeoff, instructs pilot to contact departure controller (TRACON/MCF).
11. Flies specific departure route, climbing to assigned altitude, and contacts departure control as directed. [2000: Some TRACONs replaced by MCF].	
	12. Provides air traffic control service from point of handoff to enroute controller ~~(ARTCC).~~ [2000: TRACON/MCF].

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	13. Transfers radio communications and control responsibility to enroute controller and instructs pilot to contact the next facility, by name, on a specified frequency. Repeated as required from sector to sector.
14. Contacts enroute controller and reports altitude.	
	15. Confirms radar contact and issues control instructions as required.
16. Adheres to assigned route and altitudes.	
	17. When aircraft is nearing destination, a clearance time is specified — including route, altitude information, and instructions on further communications. [2000: Routine communications via datalink, including "top of descent."
	18. Transfers radio communications and control responsibility to approach controller ~~(TRACON)~~. [2000: TRACON/MCF]
	19. Instructs pilot to contact approach control on a specific frequency.
20. Contacts approach controller, confirms position and altitude, and advised of any approach requirements or requests.	
	21. Clears aircraft for approach, issues special instructions/radar vectors where appropriate. Instructs pilot to contact tower. [2000: Information developed by TATCA].
22. Follows specific approach procedures and contacts tower when instructed.	
	23. Acknowledges initial contact and issues landing instructions or clearance.
	24. Instructs aircraft when to turn off runway and contact ground control.
25. Exits runway without delay. Change to ground control frequency when instructed by tower.	
	26. Ground control issues specific instructions to direct pilot to gate area.

Note: ~~Flight crew and air traffic control actions are subject to traffic management action or initiatives, which are taken in response to air traffic demand (and in excess of capacity) to direct aircraft to avoid severe weather. The Air Traffic Control System Command Center (ATCSCC) transmits advisories to airline dispatch offices concerning the status of the national management initiatives. These initiatives in response to excess demand frequently utilize delay departure times to smooth the flow of traffic and to avoid costly airborne holding. Initiatives designed for severe weather avoidance usually result in a non-standard route of flight.~~ **[2000: Traffic plan now directed by ETMS/AERA. Optimum routings will be generated by ETMS if no specific route of flight is requested. ETMS manages all weather traffic changes through AERA].**

TRAFFIC MANAGEMENT AIR CARRIER FLIGHT FROM ATLANTA (ATL) TO CHICAGO O'HARE (ORD)

***Note**: This scenario is invalid beginning in 2000. The ETMS coordinates data and early warnings from AERA concerning the thunderstorm. The ETMSdatalinks information to flights while rerouting traffic accordingly.*

~~Early in the morning, traffic management specialists (TMS) at the Air Traffic Control Systems Command Center (ATCSCC) receive a weather briefing from National Weather Service (NWS) personnel located at the Central Flow Weather Service Unit (CFWSU). They are told that weather at Chicago's O'Hare International (ORD) will experience low ceilings, reduced visibility and rain showers. Also, thunderstorm activity is expected to occur along a cold front extending from southwest Tennessee to northeast Georgia. The thunderstorms are predicted to be most numerous in the area north of Atlanta, GA.~~

~~At the same time, traffic management specialists in the Chicago and Atlanta Air Route Traffic Control Center Traffic Management Units (ARTCC TMUs) are receiving similar briefings from NWS personnel located in the Center Weather Service Units (CWSU) at their facilities. The TMS' and supervisors at all three facilities are beginning to consider the impact that this adverse weather will have upon air traffic operations, and what actions will be required to mitigate that impact.~~

~~Later in the morning, the National Traffic Management Officer (NTMO) at the ATCSCC conducts one of two daily telephone conference (TELCON) briefings with Traffic Management personnel from each of the ARTCCs and the larger airport air traffic facilities, and representatives of the major airline dispatch offices. The briefing begins with a summary of the known and expected constraints on the National Airspace System (NAS) such as adverse weather, airport construction activity, and other factors, and evolves into a discussion of probable results or traffic management actions that may be required. During this briefing, the airline dispatch offices are made aware that traffic management actions, or initiatives, may be required for aircraft flying to ORD and for aircraft flying on routes that normally traverse the area where thunderstorms are predicted to exist.~~

~~Specialists at the Atlanta ARTCC TMU have decided to plan for possible reroutes around sever weather if thunderstorms close normal routes. They coordinate this information with the ATL approach control (TRACON) and tower (ATCT), and with the Severe Weather and National Route Management (NRM) specialist at the ATCSCC. The NRM specialist sends a message to the airline dispatch offices advising that flights to ATL, or through the area north of Atlanta can expect to be rerouted around areas of severe weather.~~

~~Meanwhile, the TMS responsible for the central portion of the country is considering the situation at ORD. This will require increased spacing between aircraft, which will reduce the arrival capacity of the airport. In addition, the rain will leave runways wet, thus reducing braking traction. So, instead of being able to land aircraft on three runways at the same time, only two runways will be available for arrivals. Given these conditions, the specialist calculates the airport's arrival capacity.~~

~~The Specialists then accesses a computer database that stores records of all regularly scheduled flights to determine the number of aircraft scheduled to arrive at ORD will exceed the available capacity. If nothing is done to manage this situation, the result will be aircraft stacked in holding patterns over the airport waiting their turn to land. This would significantly increase controller workload, waste fuel and reduce equitable access to the airspace for other aircraft.~~

~~The ATCSCC central area specialist, having determined that a problem exists, decides to conduct a conference call with the Chicago ARTCC TMU and the ORD TRACON TMU, to determine a course of action. Another check is made with the meteorologists at the CFWSU and the Chicago CWSU, and they agree that there will be low ceilings and rain all day at ORD. Specialists at ORD TRACON confirm that they will only be able to land on two runways. All concerned facilities agree that the arrival capacity will be 65 aircraft per hour. A check of the flight schedule data base shows that the hourly demand will indeed exceed the 65 aircraft arrival rate. A national traffic management initiative to limit the arrival demand to 65 is agreed to by all. The method used to control demand will be a ground delay program. The ground delay program will assign each scheduled flight a delayed departure time that is calculated to achieve a 65 flight-per hour arrival rate at ORD. This results in the delays being taken on the ground rather than in holding patterns over the airport.~~

~~The ATCSCC specialist makes one more telephone call before implementing the ground delay program. These calls are to the airline dispatch offices responsible for many of the flights going to and from ORD. Their purpose is to seek an opinion of the weather and its effect on operations, from the perspective of the carrier's meteorologists and dispatchers. They concur with the NWS forecasts and agree that conditions justify a ground delay program. The specialist then discusses these events with the NTMO and receives approval to implement a ground delay program at a rate of 65 arrivals each hour.~~

~~The ATCSCC specialist then runs a program that assigns each flight going to ORD a controlled departure time (CDT). Each CDT is based on controlling the departure time of each flight. The arrival times of these flights are adjusted so that 65 flights will arrive, spread evenly throughout each hour. A list of CDTs for aircraft departing each ARTCCs airport is sent to that ARTCC and a list of CDTs for airline flights is sent to that airline. Also, an advisory is sent to all affected air traffic facilities and to all affected airline dispatch offices describing the reasons for and the details of the program.~~

~~The ABC airline dispatch office, in preparing for flight number 123 from ATL to ORD, is aware of the CDT assigned to this flight and the possibility of being rerouted around the severe weather north of Atlanta. These considerations are discussed with the flight crew during the preflight briefing. A flight plan is filed by the dispatch office and is routed, via computer network, to the Atlanta ARTCCs Host Computer. The Host Computer is interfaced with the traffic management computer used by the ATCSCC, and the CDT is automatically assigned to the flight plan. The CDT will appear on the flight plan when it prints out at Atlanta ARTCC, and at ATL tower and TRACON. Thus, the specialist in the tower issuing clearances knows that this flight is not authorized to depart before the CDT.~~

~~By this time, as forecast, a line of thunderstorms has developed north of Atlanta. Several aircraft have already deviated from their filed route of flight to avoid the storm, and the gaps through which they are penetrating the line are closing. Atlanta ARTCC TMU has instructed ATL tower to issue revised routings to those flight whose routes from Atlanta are to the north. Atlanta ARTCC TMU then contacts the ATCSCC so that alternate routes can be coordinated with adjacent ARTCCs, coordinates the routes, and then sends a message to the airline dispatch office advising of the reroute activity.~~

~~As the CDT for ABC 123 nears, the flight crew calls the tower for their clearance. They are advised of the severe weather north toward ORD. Flight ABC 123 departs ATL on its CDT, and enjoys a smooth flight to ORD. It lands without having deviated from its route or incurring any airborne delays.~~

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITH CONTROL TOWERS

[2010: Inflight positions are located in both the AFSS / FSSs and in the ARTCC / MCF].

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Requests flight briefing announces intention ~~to file flight plan in person or by telephone with AFSS~~. [2010: Pilot files flight intentions with vendor].	
	2. ~~Flight service~~ [2010: Vendor] provides weather and route briefing, accepts filed flight intentions, and transmits pertinent flight data to the appropriate ARTCC/MCF/TRACON. [2000: Some TRACONs replaced by MCF] for processing and entry into the automated system.
3. Contacts ground control/clearance delivery prior to engine start.	
	4. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne.
5. Acknowledges and follows ATC instructions.	
6. Requests that ATC cancel IFR flight plan while airborne, or, within 30 minutes after landing closes IFR flight with ~~flight service~~ [2010: ARTCC/MCF/TRACON].	

NOTE: [2000: Datalink available for GA] [2005: "Flight intentions" replace "flight plans"] .General aviation aircraft are subject to the same traffic management initiatives that apply to scheduled air carrier flights. They are also subject to special traffic management initiatives due to excess demand at high density airports and in response to excess demand caused by special events (i.e., the Indianapolis 500, Kentucky Derby, Boston Marathon, etc. At high density airports, a reservation is required for general aircraft arrival and departure. Federal Aviation Regulations describe the rules and procedures used to fly to and from high density airports. Information concerning these programs is disseminated via a Notice to Airman (NOTAM) and the pilot will be made aware of responsibilities by the vendor during the preflight briefing or when the pilot files the flight plan.

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITHOUT CONTROL TOWERS

FLIGHT CREW ACTIONS

1. Requests weather and files flight intentions ~~via AFSS or~~ [2010: to vendor].

3. Advises ~~flight service~~ [2010: ARTCC/MCF/TRACON] and other operators at the airport when ready to taxi out for departure.

5. After receipt and acknowledgement of IFR clearance, advises ~~flight service~~ [2010: ARTCC/MCF/TRACON] prior to departure.

6. After takeoff, follows published IFR departure procedure, and contacts the designated ATC facility.

8. Acknowledges and follows ATC instructions.

9. When approximately 10 miles from destination airport, contacts local advisory frequency and announces intentions.

11. After landing, advised tie-in flight service station to close IFR flight with control facility [2010: ARTCC/MCF/TRACON].

AIR TRAFFIC CONTROL ACTIONS

2. ~~Flight service~~ [2010: Vendor] provides weather and route briefing and transmits pertinent flight data to the appropriate ~~ARTCC~~. [2000: now ARTCC/MCF/TRACON]

4. ~~Flight service~~ [2010: ARTCC/MCF/TRACON] relays ATC clearance, facility and frequency for control after departure, and provides airport weather and known traffic information.

7. Provides air traffic control service in the same manner as in air carrier operations while airborne.

10. When aircraft is nearing destination airport and direct communication and control is no longer required, issues clearance for the published instrument approach.

[2005: "Flight intentions" replace "flight plans." ECAS equipped aircraft could be cleared for successive approaches with shared separation responsibility provided by the pilot through ECAS].

TRANSOCEANIC FLIGHT

[2010: Advanced surveillance obviates this scenario because it is now global. Beginning in 2010, transoceanic traffic is processed the same as U.S. domestic IFR operations].

~~FLIGHT CREW ACTIONS~~

~~AIR TRAFFIC CONTROL ACTIONS~~

~~1. Advise to dispatcher of available routes. Coordinates route selection. Traffic advisories required. [2000: Coordinates route options via TMP].~~

~~2. Pilot in command obtains briefing from aircraft dispatcher, who files IFR flight plan in accordance with ICAO procedures and formats, and authorizes flight.~~

~~3. Issues engine start time, departure control frequency, beacon code, taxi and/or clearance information.~~

~~4. Reads back clearance to controller to ensure accuracy (readback is required per ICAO agreements).~~

~~5. After receiving clearance, contacts ground control for taxi clearance if not previously provided.~~

~~6. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne within domestic airspace.~~

~~7. As aircraft approaches oceanic airspace, contacts enroute controller, reports altitude, and requests oceanic clearance from the controller responsible for the first oceanic area on flight route (if oceanic clearance not previously received).~~

~~8. Confirms radar contact, and aircraft is sequenced on cleared route to meet required oceanic separation. [1995: No longer valid because of track advisories].~~

~~9. Issues oceanic clearance (if necessary) and control instructions.~~

~~10. Acknowledges receipt and reads back clearance to controller to ensure accuracy (required per ICAO agreements).~~

~~FLIGHT CREW ACTIONS~~	~~AIR TRAFFIC CONTROL ACTIONS~~
~~11. Adheres to assigned routes and altitudes.~~	
	~~12. Transfers control responsibility to appropriate oceanic sector.~~
	~~13. Coordinates transfer of control responsibility to receiving Flight Information Region.~~
~~14. Establishes communications [1995: Position reports are relayed by ADS] with the appropriate oceanic radio station for passing required position reports.~~	
	~~15. Coordinates transfer of control responsibility to receiving Flight Information Region (IFR) and passes transfer instructions to pilot throughout the oceanic radio station.~~

~~**NOTE:** Aircraft flying to or from overseas destinations are not normally subject to traffic management initiatives taken in response to excess demand at airports. There are, however, constraints on the oceanic route system that frequently require traffic management action. Radar coverage does not extend over most oceanic airspace, therefore, oceanic-radar separation procedures must be used. The increased separation requirements frequently result in demand in excess capacity. The Air Traffic Control System Command Center advises airline dispatch offices of potential delays due to this excess demand. [2005: ECAS equipped aircraft may benefit with reduced separation through shared operation].~~

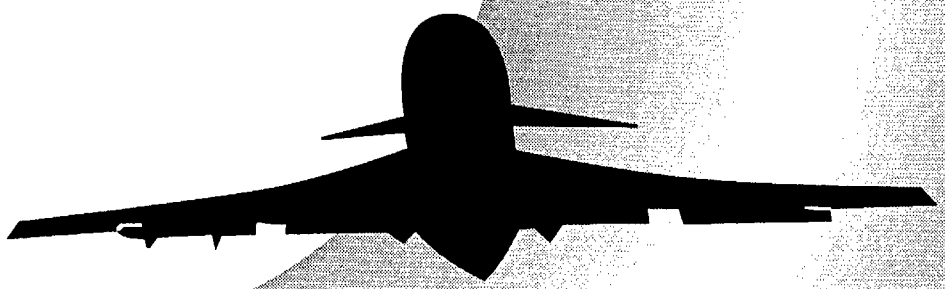
AFSS PROCESSING FOR VFR PILOT

[2010: Preflight activities now transferred to vendor. In flight activities now reside in ARTCC/MCF].

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
~~1. Calls the FAA 1-800-WX BRIEF telephone number at least 30 minutes prior to flight. Requests weather information and preflight briefing.~~	
	~~2. Call is handled by AFSS Preflight (PF) briefer standing by to relay information from Model 1 computer for data input and weather retrieval. PF also uses automated weather graphics system, which displays various weather maps.~~
	~~3. PF conducts standard weather briefing, including terminal area, enroute, and winds aloft observations and forecasts, etc.~~
~~4. Pilot decides weather is good for VFR flight, requests information about Notices to Airmen (NOTAMs).~~	
	~~5. PF relays local and distant NOTAMS that originate within the flight plan area, and FDC NOTAMS not formatted for the ACF computer.~~
~~7. Pilot files flight plan by reading specific aircraft data, characteristics, specific origin/destination trip information, etc.~~	
	~~8. FSS specialist checks and accepts flight plan, and files with Flight Service Data Processing System.~~

THE FAA AIR TRAFFIC SYSTEM
VISION OF THE FUTURE

2015



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A TRIP THROUGH THE ATC SYSTEM - 2015

A. DOMESTIC FLIGHT

Flying in the system in the year 2015 reveals the impact of two decades of new programs and technology. These advances bring dramatic change to the flight process in the system.

Upon learning there is to be a trip, the pilot obtains the necessary preflight weather briefing via automated systems which have replaced the telephone and briefer systems in the baseline. Filing a flight plan requires only a few minutes, with a personal computer interfacing with the air traffic control system. The ATC computer, already programmed with the pilots certification level and aircraft performance characteristics, responds to the pilots request and produces optimum trajectories from Chicago to Washington that are checked for weather, conflicts, and pilot preferences.

When the flight is ready to move, the pilot requests taxi instructions from the automation system, a flight plan is downloaded into the flight management system, and departure and arrival times are more closely defined. As the aircraft begins to taxi, a heads-up type display in the flight deck illuminates the aircraft's windshield and shows the runway complex. It indicates the aircraft's progress to the takeoff point. Progress is tracked to the main runway. Automation systems linked to the ATC computers keep track of aircraft moving about the surface and provide accurate positional data to the aircraft. A heads-up display on the control tower window tracks the progress of all aircraft on the ground, and the ground controller monitors the display, changing runway and traffic patterns with voice commands as necessary to the ATC system or directly to aircraft using state-of-the-art air/ground communications technologies.

The actual departure time is now used to calculate the most efficient trajectory considering all traffic, weather, and airspace restrictions. The flight takes the minimum time enroute, because the optimum route negotiated between the system and the pilot has considered projected weather along the route. Datalink systems carry pilot requests and queries to the ATC system and the systems responses. It also facilitates amended clearances and other information required to keep the pilot and the aircraft's flight management system fully aware of system requirements. Furthermore, improved management of the ATC system resource, effective use of trajectory projection, and precise modeling and prediction eliminate conflict in the system, and increase system efficiency.

B. INTERNATIONAL FLIGHT

The international flight in 2015 is identical to the domestic procedures as the digital datalink capability via satellite now helps plan and execute flight plans much more effectively to optimize all phases of oceanic flight.

THE ATC PROCESS

The Air Traffic Control process in 2015 is a culmination of advances in computer sophistication in all phases of control, with the ATC system providing various levels of advanced capability. Basic flight information, including briefings and flight planning, are conducted via voice response and PC interface. The more sophisticated operator of 2015 is capable of communicating with the system via computer-to-computer interface, on board datalink or video capability, and direct datalink with the flight management system. Basic information available from FAA and a wide variety of commercial sources include detailed satellite maps, NOTAM data, special-use airspace status and delay information.

A. PREFLIGHT ACTIVITIES

The preflight process is nearly unchanged from 2010, although the process is highly automated, with vendors providing route specific preflight briefing information upon request. The focus of the preflight briefing is on a go-no go decision. Weather information is trip-specific and hazardous conditions are presented graphically. Computer-based and automated voice-response systems present a visual picture of the weather along the proposed route, and the pilot is presented a clear understanding of how that weather will affect the proposed flight.

Upon making the decision to fly, the pilot notifies the vendor and receives a datalink compartment address in which all the necessary data for that flight will be available when the aircraft is ready. The vendor provides information to the Traffic Management computers and prepares a packet of information for the pilot.

At the airport, the pilot prepares the aircraft for flight. The pilot logs onto the ATC system and requests a download of the flight profile, weather data and IFR clearance. The information is displayed in the cockpit, checked for accuracy and for any new information, and then it is loaded directly into the flight management system.

B. THE CLEARANCE PROCESS

Clearance delivery is totally automated. Initial clearances are delivered to users via automation or by voice to the few users who are not equipped with datalink. Users access the system through integrated on-board systems or PC interface with navigation and communications systems on the aircraft.

C. SURFACE MOVEMENT

Control of surface movement has not significantly changed since 2010. Major airports use highly sophisticated systems to manage traffic. Push-back and taxi instructions are automatically transmitted to the aircraft based on operator requirements, availability of overhead airspace, airport traffic and congestion, and the arrival slot at destination airport. Routine

control instructions are automated and transmitted via datalink directly to the aircraft's FMS upon request. When ready, taxi and departure instructions are displayed in the flight deck, departure and arrival times are finalized, and taxi clearance and directions are issued, all via the automation systems.

As the aircraft moves toward the runway, movement data, ground clearances, and intersection crossings are communicated back and forth via datalink between the aircraft and the ATC computers to update and exchange data with the ATC system on the ground. This data is fed back to the pilot and is supplemented by visual and audio cues from the aircraft's flight management system and by external ground based indicator systems.

Smaller facilities use an automated safety net. This includes sensors and light bars to ensure safety. Ground systems separate ground traffic based on ADS data and ground-based sensors. Such technologies have become inexpensive and accessible, and now can be found at every airport with a control tower. Most non-towered airports have also installed the new ground systems, and aircraft systems that take advantage of the added value of satellites in ground movement have begun to appear in general aviation aircraft.

D. AIRBORNE PHASE

The local controller continues to be responsible for the separation of arrivals from departures. Local control positions have virtual reality technology that provides supplemental position data augmenting traffic location from various sources. Traffic management data is provided via a head up display. Communications are managed via a voice recognition system interfaced with datalink and an automatic-switching radio system. It provides direct communications between controller and pilot for voice communications, datalink, and control instructions to aircraft flight management systems. Updated meteorological and aeronautical data is available to datalink-equipped aircraft.

Enroute control facilities (ARTCCs/MCFs) manage all those functions not included in the tower cab. The system emphasis is on maximum utilization of runways through dynamic traffic pressure on runways. This pressure is provided by the system based on computer analysis of the ATC data bases to ensure that the enroute airspace is configured and managed to meet the goals of both the system and the users.

Oceanic separation criteria are identical to those in domestic airspace between aircraft, facilitated by ADS and datalink capability, satellite-based independent surveillance, and advanced collision avoidance equipment. Other operators, those not equipped with the minimum requirement of navigation and reporting equipment for minimum separation, operate using different separation standards based on capability and the demand on the system.

More general aviation pilots have converted to IFR to fly within the system. Weather forecasting is now an advanced science with the improvement beneficial to flight planning. For example, a highly accurate depiction of storm movement, frontal activity and visibility changes can be linked to flight plan models. This enables IFR pilots to achieve optimum performance. Datalink allows the pilot to update weather and airport availability information, and provides optimum reroute alternatives using scenarios based on a previously identified preference.

Enroute, aircraft follow each other using integrated ECAS, ADS and SBIS data to maintain separation. With the accuracy and dependability of automation, navigation and surveillance systems, responsibility for maintaining separation is shared between pilots and AMs. Airborne systems are highly reliable, and position data is accurate to less than one meter.

E. VFR OPERATIONS

VFR remains active, but the number of operations is reduced, and the way VFR pilots operate is changed. In 2015, no VFR is permitted within Class A Airspace, which extends down to 6,000 feet AGL. However, many of the enhancements to the IFR system are used by those who choose to operate under VFR, and the cost of that equipment has been reduced. Inflight services for VFR traffic is available from the ARTCCs/TRACONs/MCFs and from vendors who provide services to VFR operators. Search and rescue coordination is available upon request, through the automated system operated by the vendors and the DOD.

ATC SYSTEM METHODOLOGY

In 2015, technology has advanced to the point where full automation is feasible, but in 2015, Airspace Managers and pilots still participate in the decision-making process, if only to accept and assess the decisions made by the automation. Capacity, both on the ground and in the airspace has been significantly increased through the capabilities of automation. The system is capable of handling more traffic than demand requires, because aircraft and passenger throughput are much more efficient.

The users have identified and implemented efficient new methods of scheduling so demand on the airport resources is metered throughout the day. Vertical flight options operate regularly between city pairs, reducing the overall demand on the airports located near the major business centers, and the airspace is fully capable of handling the demand of air traffic.

The system is strategically managed, from gate to gate, and the automation knows precisely where every aircraft is at all times. Separation standards, significantly reduced through the use of time-based separation, permit aircraft to operate in closer proximity to each other. Surveillance and tracking is accurate to less than one meter, based on independent satellite "look-down" surveillance coordinated with airborne systems sharing information. Protected-volume trajectory management is a fact of ATC in 2015, and incursions are highly unlikely.

A. PREFLIGHT ACTIVITIES

In 2015, vendor services have expanded. Packaged preflight information that helps generate flight routes is widely available from commercial vendors. The specifics of routing to attain maximum efficiency is handled by a traffic management position. Data flow is automated and use datalink, computer interfaces and voice recognition technology to eliminate manual intervention. Personal computers allow a high degree of flexibility in preparing flight intention requests.

Pilots access the system via personal computer or via telephone to an automated voice response system to obtain a weather briefing. The data received can be verbal, textual, or graphic, depending on the interface used. Vendors provide data in a number of different formats, including digital video, and the resolution and clarity of weather graphics is remarkable. The pilot can make an initial query the night before the intended flight, and request periodic updates from the vendors computer throughout the night if the weather appears to be changing. The vendors computer responds with the updates at the requested times in the appropriate format requested by the pilot. Updates can be presented via modem uploaded to a computer at the pilot's location.

When the pilot decides to fly and indicates to the system a desired destination and departure time, the vendor's computer, already programmed with the pilot's certification number and aircraft performance characteristics, produces a direct route from departure airport to destination, route-specific weather information, NOTAMs, PIREPs, and files the pilot's flight intentions with Air Traffic Control. This information can be downloaded immediately into the pilots

computer or video recording system and stored for retrieval directly into the flight management system when the pilot gets to the airport.

Filing the flight intention requires only a few minutes. At that time, the request is entered into the global traffic management plan, and scheduled from take-off to landing, including departure and arrival times. The flight route, approved by the FAA, is returned to the pilot's personal computer through the vendor, and is stored for later retrieval into the FMS.

All flight plans are catalogued by the vendors computer for the purpose of effecting search and rescue (SAR). The information is shared with the SAR system at Scott AFB, and automatic flight checking determines if a flight is still in progress, if it has been completed, or if it is overdue. The process is completely automated, with a message of closure routed to the SAR system when the flight plan is canceled or closed.

B. THE CLEARANCE PROCESS

The clearance process remains substantially the same as in 2010. The process is fully automated for all except non-data-linked aircraft, who still receive their clearance by voice. There are far fewer non-equipped aircraft in 2015, however, due to the increased operational value and the relatively decreased cost of the equipment. Clearances are automatically queued by the ETMS for retrieval by pilots.

C. SURFACE MOVEMENT

The automation systems in place in 2010 continue to operate in 2015, with improvements in communications evident. The Voice Recognition (VR) systems introduced in the 2010 have been improved, and the system responds more quickly to commands. Voice Tower Electronic Communications (VTEC), is a software enhancement that expands the capabilities of the AVRS system introduced in 2010. VTEC integrates the VR function, automatic switching, datalink, and system management tools to permit tower controllers to function entirely in a voice environment. The system allows the use of voice to communicate to the aircraft and to the automation.

Most taxi instructions are formatted in packets and delivered upon request from the aircraft via datalink. Block times are closely adhered to, and aircraft move directly from the gate to the runway. They follow instructions entered directly into the aircraft's flight management system.

When taxi instructions are delivered, the surface guidance system is activated, and the aircraft moves directly to the runway. The system is now fully operational in all visibility conditions, a result of the incorporation of the Terminal Area Detection System (TADS), which interfaces and coordinates with the Surface Traffic Management System (STMS). TADS functions in much the same way as AERA does in the enroute environment, tracking the movement of aircraft and uses STMS projection data to predict potential incursions in advance. TADS automatically notifies the ground controller and the aircraft of the threat and takes the appropriate action to

program the airport guidance system to resolve the threat.

Traffic managers have a highly sophisticated display system in the tower, the Control Tower Display System (CTDS). CTDS is a multiple input system that consolidates the various input sources and formats, and provides tower control managers highly accurate, three-dimensional real-time position data on all aircraft in the field of vision. This system uses state-of-the-art display technology to allow data in various forms to be windowed and overlaid on a head up display projected on the tower window. The location of the information display is controllable so as not to interfere with the vision of controllers in VFR conditions, but can always be seen, independent of the ground controllers location in the tower.

The responsibility for the issuance of take off clearances still rests with the local controller, but the process is automated. The LC tracks the progress of aircraft on and approaching the runway, and monitors the status of the airport guidance system to ensure that takeoff clearances are adhered to by pilots and that departures are sequenced into the traffic flow. The TADS and STARS automation use time referencing as the primary separation criteria, and departures are sequenced between arrivals with precision.

D. AIRBORNE PHASE

Control in the airborne phase has evolved in 2015 to the point where Airspace Managers and pilots are full partners in the process to produce an interactive system that uses all the resources available to both for the purpose of moving the most traffic through the system most efficiently. The capacity of the system has been greatly enhanced, without affecting the way the users wish to do business.

Alternative approaches to resolving airspace demand are generated for each system problem. These alternatives are based on known or predicted system loading, available resources such as manpower, airspace, slots, weather, and the characteristics and needs of users. Alternative solutions are linked to the users for their input based on particular operating needs, and a joint decision is reached. However, the AM retains the responsibility to make the decision, and, if intervention is necessary, uses tactical tools such as vectoring and speed management to implement the change.

Departure/arrival AMs use computer-generated cues to achieve system goals. Through planning, aircraft actually sequence themselves prior to arrival, using information data-linked to them from the ATC automation systems. The instructions provide spacing for minimum separation and allow for the appropriate arrival/departure mix. Based on actual departure times, more accurate calculated enroute and arrival times are developed. Corrections are generated to meet these calculations, and aircraft are resequenced. Aircraft not fully equipped with automation systems can be factored and sequenced into the arrival stream based on computer-generated flight profiles. The computer algorithms use aircraft type data, arrival/departure demand, weather, overhead stream data, and user preference to determine AM cues. Pilots use the automated data, linked with data from other aircraft and satellite- and ground-based systems to optimize separation. Non-data-linked aircraft are provided the necessary instructions by controllers to stay in sequence and make the runway threshold on time.

Enroute, aircraft follow each other using integrated ECAS, ADS and SBIS data to maintain separation. With the accuracy and dependability of automation, navigation and surveillance systems, responsibility for maintaining separation is shared between pilots and AMs. Airborne systems are highly reliable, and position data is accurate to less than one meter.

E. VFR OPERATIONS

VFR remains active, but the number of operations is reduced, and the way VFR pilots operate is changed. In 2015, no VFR is permitted within Class A Airspace, which extends down to 6,000 feet AGL. However, many of the enhancements to the IFR system are used by those who choose to operate under VFR, and the cost of that equipment has been reduced. Inflight services for VFR traffic is available from the ARTCCs/TRACONs/MCFs and from vendors who provide services to VFR operators. Search and rescue coordination is available upon request, through the automated system operated by the vendors and the DOD.

ATC CONTROLLER POSITIONS: FUNCTIONAL DESCRIPTIONS

The functions of controllers in 2015 are almost fully automated, with their role being primarily strategic and to ensure that the automation is functioning properly. Three new systems have been added, the Control Tower Display System (CTDS), the Voice Tower Electronic Communications (VTEC) system, and the Terminal Area Detection System (TADS). These systems provide the airspace managers even further levels of automation, and bring the entire system closer to full automation. In addition, communications between the Air Traffic Control System Command Center (ATCSCC) have been enhanced by the ATCSCC diverse Communications System (ADCS), which is primarily a set of connectivity changes within the VSCS/HCSR, and the Defense Switch Network, a DOD system to which the ATC system is connected for sharing information about SUA usage and military usage of civil airspace.

The details of the functions of the system operators can be seen in the following pages.

TERMINAL FACILITIES

TOWER

AREA SUPERVISOR (AS)

The tower cab AS is responsible for overall tower cab operation. This includes management and direction of tower cab personnel, and observing, scanning and projecting the needs of the constantly changing airport operation

INPUTS:
- Visual observation of tower cab operations
- Flight Data Processing (FDP)
- STARS/TCCC data input
- Status information area
- Coordination from tower cab positions
- TRACON/Terminal Area Supervisor (AS)
- Area Manager (AM)
- System Automation
- System displays
- Voice data via Voice Tower Electronic Communications (VTEC)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/ weather conditions, staffing and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination to pilots information concerning vehicle conditions that may affect operations
- Coordinate with tower cab positions, MCF, TTMU, AS and AM
- Ensure tower cab operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine tower cab positions
- Initiate action as input changes

SYSTEMS:
- CTDS, VTEC, TADS, CASIP, AVRS, STMS, ETMS, STARS, TCCC, ASTA, ITWS, ICSS, MLS, 24-hour clock.

TOWER

CAB COORDINATOR (CC)

The CC is primarily responsible for observing and scanning the active runways and airport traffic area/control zone to assist the local controller. CC will coordinate for the LC and ensure procedures and flows are adhered to in the rapidly changing airport environment.

INPUTS:
- Receive requests for air traffic movement
- Visual observation of runways, taxiways, traffic pattern and airport traffic area/ control zone
- Flight Data Processing (FDP)
- STARS, TCCC data input
- Status information area
- Coordination from other tower cab and TRACON/MCF positions
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)
- Systems display information
- Voice data via voice recognition system

PROCESS:
- Observe Local Control operations and coordinate for the LC
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, separation standards, pilot requests, facility procedures, field/weather conditions and aircraft performance.
- Review flight data
- Ensure dissemination of information to pilots, vehicle operators, other cab positions, and the supervisor, of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Coordinate for the LC with other tower cab and TRACON/MCF terminal positions
- Scan airport operations and assist LC with duties
- Report airport conditions
- Forward electronic flight data
- Initiate action as input changes

SYSTEMS:
- CTDS, VTEC, TADS, ETMS, TCCC, STARS, ASTA, ITWS, ICSS, 24-hour clock.

TOWER

LOCAL CONTROL (LC)

The LC is primarily responsible for handling arriving and departing traffic at the airport. The area of responsibility includes the active runways and airport traffic area/control zone. It is a rapidly changing environment requiring constant evaluation of input and modification to existing plans. The LC position interfaces mainly with Ground Control Manager (GCM) and TRACON/MCF arrival and departure positions.

INPUTS:

- Receive request for air traffic movement
- Visual Observation of Runways, taxiways, traffic pattern and airport traffic area/ control zone
- Departure/approach situation display
- Control tower display system (CTDS)
- Radios and Datalink communications
- STARS, TCCC data input
- Flight Data Processing (FDP)
- Enhanced Collision Avoidance System (ECAS) data
- Status information area
- Coordination from other tower cab and TRACON/MCF terminal positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)
- Runway incursion alerts

PROCESS:

- Analyze information to determine priority of duties
- Project and plan ATC service based upon traffic flows, traffic management, separation standards, pilot requests, facility procedures, field and weather conditions, and aircraft performance
- Obtain, review, and amend flight data
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and AS of conditions that may affect operations.
- Analyze/evaluate effectiveness of plan

OUTPUTS:

- Issue arrival, departure, airport traffic area/control zone transition instructions via radio, lights, and datalink
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab and TRACON/MCFterminal positions
- Disseminate to pilots, vehicle operators, other tower cab positions and AS information that may affect airport operations
- Initiate action as input changes

TOWER

LOCAL CONTROL (LC) continued

SYSTEMS:

- CTDS, VTEC, TADS, CASIP, AVRS, STMS, SBIS, ECAS, ETMS, TCCC, STARS, ASTA, Datalink, light controls, ITWS, ICSS, radios, 24-hour clock, crash phone system

TOWER

GROUND CONTROL (GC)

The GC is primarily responsible for directing aircraft to and from the runway. Additional duties include directing other aircraft/vehicular movement on the airport movement area and disseminating information to support operations (e.g. traffic, weather, equipment status, delays/flow etc,). It is a dynamic environment in which the GC must adjust traffic flows and evaluate new information.

INPUTS:
- Receive request for ground movement
- Visual observation of movement area
- Control Tower Display System (CTDS)
- Voice and Datalink communications
- Flight Data Processing (FDP)
- STARS, TCCC data input
- Enhanced Collision Avoidance System (ECAS) data
- Status information area
- Coordination from other tower cab positions
- Terminal Traffic Management Unit (TTMU)
- Tower cab Area Supervisor (AS)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, pilot requests, facility procedures, field/weather conditions and aircraft performance
- Obtain, review, and amend electronic flight data
- Ensure dissemination of information to pilots, vehicle operators, other tower cab positions and the AS of conditions that may affect operations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Issue ground movement instructions via voice, datalink or lights
- Issue traffic information
- Report airport conditions
- Coordinate with other tower cab positions
- Forward flight data
- Initiate action as input changes

SYSTEMS:
- CTDS, VTEC, TADS, CASIP, AVRS, STMS, ECAS, ETMS, STARS, TCCC, ASTA, Datalink, Light Controls, ITWS, ICSS, crash phone system

TOWER/TRACON/MCF

CLEARANCE DELIVERY (CD)

The CD position primarily issues departure clearances to pilots. The clearance is delivered to the pilot via datalink or on the radio. Additionally, weather, route, delay and other significant information may be relayed to pilots. The clearance delivery function is fully automated except in towered LCFs that are not equipped with full automation and serve significant non-equipped VFR departure traffic.

INPUTS:
- Requests for departure clearance
- Voice and datalink communications
- Flight Data Processing (FDP)
- Status information area
- Coordination from other tower cab positions
- Terminal Traffic Management Unit (TTMU)
- Area Supervisor (AS)

PROCESS:

- Upon receipt of flight plan/VFR departure information, ensure all required clearance items are received and recorded
- Forward clearance information for processing, queuing, and delivery
- Amend flight data as necessary
- Periodically review flight data for currency
- Monitor Tower Cab Automation System

OUTPUTS:
- Issue or transmit clearance to pilots
- Coordinate information with other tower cab positions
- Tower cab automation data

SYSTEMS:
- ETMS, STARS, ASTA, Datalink, ITWS, VSCS, ICSS, radios, AWDS, 24-hour clock

ARTCC/TRACON/MCF

AREA MANAGER (AM)

The Area Manager has the responsibility for the entire facility's shift operation. By projecting, planning, coordinating and strategizing with shift supervisors, the Area Manager facilitates the use of available resources to meet the demands of air traffic.

INPUTS:
- Area Supervisors
- Traffic Management Unit (TMU)
- Area Air Traffic Manager
- Tower AS and AM
- Flight Data Processing (FDP)
- STARS/TCCC/HCSR data input
- Dynamic Sectorization (DYSEC) tool
- Facility Staff officers
- Airway Facility technicians (Automation specialists)
- National Weather Service
- AERA conflict and weather advisories
- Military Operations Specialist (MOS)
- System Engineer (SE)

PROCESS:
- Administrate shift operations
- Project and plan shift staffing, traffic flows, facility procedures, weather conditions, and sector configuration
- Analyze information to determine priority of duties
- Analyze, evaluate and update information to ensure effectiveness of operation

OUTPUTS:
- Ensure exchange of information with other ARTCC/MCF positions, TMU, AS, and Tower AMs that may affect operations
- Ensure adequate supervisory staffing
- Coordinate with adjacent ARTCC/MCF, AS, TMU, and AM
- Ensure ARTCC/MCF operations are in accordance with procedures, current flows and weather conditions

SYSTEMS:
- TADS, CASIP, STMS, DSCS, SBIS, DYSEC, ETMS, STARS, TCCC, Datalink, TATCA, ISSS, WARP, AWPG, AERA, VSCS, ILS, MLS

ARTCC/TRACON/MCF

AREA SUPERVISOR (AS)

The AS is responsible for the operation of a segment of the operation during his/her area of specialization. Through planning, monitoring and evaluating operations, the AS will use available resources to accommodate traffic demands. It is a constantly changing environment where anticipating and communicating needs are as important as current operations.

INPUTS:
- Sector operations
- Flight Data Processing (FDP)
- STARS/TCCC/HCSR data input
- Dynamic Sectorization (DYSEC) tool
- Status information area
- Coordination with other AS positions
- Traffic Management Unit (TMU)
- Tower cab Area Supervisor (AS)
- Defense Switch Network (DSN)
- Center Weather Service Unit (CWSU)
- Area Manager (AM)

PROCESS:
- Analyze information to determine priority of duties
- Project and plan traffic flows, traffic management, facility procedures, field/ weather conditions, staffing, and position configurations
- Analyze/evaluate effectiveness of plan

OUTPUTS:
- Ensure dissemination of information concerning conditions that may affect facility operations, TMU, and tower operations
- Coordinate with sector positions, other AS, TMU, AM, tower AS and AM
- Ensure sector operations are in accordance with procedures, current flows and weather conditions
- Ensure adequate staffing
- Combine/decombine sector positions as needed
- Initiate action as input changes

SYSTEMS:
- TADS, DSN, DYSEC, ETMS, STARS, DSR, HCSR, Voice and Datalink Communications, TATCA, TCCC, WARP, AWPG, VSCS

ARTCC/TRACON/MCF

RADAR/SURVEILLANCE AIRSPACE MANAGER (R)

The R position is designed according to the desired function—enroute, arrival, departure, and satellite. The R responsible for each sector has defined airspace and can use a variety of techniques to accomplish the assigned tasks (e.g., vectoring, speed control. sequencing, altitude, lateral, diverging, and visual separation). The level of service and separation applied to the individual aircraft is dependent upon numerous factors including the pilots request, type of flight plan, type of aircraft, avionics and equipment and weather.

Aircraft fly along a direct route assigned by the ETMS. When assigned routes need amending, aircraft are directed onto another route to avoid conflicts, adverse weather, special use airspace, obstructions and terrain. The sector environment is rapidly changing as input changes (e.g., aircraft, weather, pilot requests, traffic management). The R must continually evaluate current operations, conditions, and the effectiveness of the action plan. As new input is received, the R must be flexible, and rapidly incorporate the information into the action plan.

The enroute position expedites the movement of traffic through the sector, maintains separation, and sequences aircraft toward arrival fixes, when necessary. The arrival position(s) primarily sequences aircraft delivered from adjacent sectors or VFR pop-up aircraft to the destination airport. Service may be provided to more than one runway at one or more airports. The departure position(s) primarily delivers departing aircraft from one or more airports to the appropriate enroute sector, in accordance with established procedures. The satellite position(s) normally provides arrival and departure service for secondary or military airports. Generally these aircraft are incorporated into the primary airport flow of traffic.

INPUTS:

- STARS/HCSR/TCCC (AERA, TATCA)
- Pilot requests, PIREPS and SIGMETS
- DSR displays
- Manual and automated handoffs
- Voice and datalink communications
- Flight Data Processing (FDP)
- Computer system advisories and commands
- Enhanced Collision Avoidance System (ECAS)
- Status information area
- Coordination with other sector positions, AS, AM, and adjacent facilities
- Traffic Management Unit (TMU)
- Area Supervisor (AS)

ARTCC/TRACON/MCF

RADAR/SURVEILLANCE AIRSPACE MANAGER (R) continued

PROCESS:

- Prepare and monitor automation equipment for settings and optimum performance
- Correlate flight data and surveillance display information
- Manage flight data: scan, analyze, amend, transfer and file
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft types and performance characteristics, requests) and evaluate additional factors (e.g., weather, equipment status, flow control) and develop an action plan
- Continuously evaluate the effectiveness of the plan and adjust as necessary

OUTPUTS:

- Issue control instructions, safety alerts, advisories and information to pilots
- Initiate control instructions and ensure separation
- Initiate manual and automated handoffs
- Disseminate weather information
- Make entries into DSR/HCSR
- Coordinate with tower cab, other sectors/positions and adjacent ATC facilities

SYSTEMS:

- DSN, DSCS, SBIS, AVRS, ETMS, STARS, DSR, HCSR, TATCA, VSCS, radios, Datalink, 24-hour clock, WARP/AWPG, DEDS, COTS color displays, RADS

ARTCC/TRACON/MCF

ASSOCIATE OR HANDOFF POSITION (RA)

The RA is responsible for providing assistance to the R position as necessary to ensure continued smooth operation of the sector. The RA accepts or initiates manual and automated handoffs, manages electronic flight data for the sector, and informs the R of all actions taken. Most sector tasks can be accomplished by the RA, thereby allowing the R controller to focus on the efficient flow and separation of aircraft.

INPUTS:
- DSR display
- Manual and automate handoffs
- Voice and datalink communications
- Flight Data Processing (FDP)
- Enhanced Collision Avoidance System (ECAS)
- Status information area
- Coordination from towers, other sector positions and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor (AS)

PROCESS:
- Correlate flight data and display information
- Scan, analyze, transfer and file flight data
- Amend flight data as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type and performance characteristics, requests) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the R's action plan

OUTPUTS:
- Ensure orderly flow of traffic and separation of aircraft
- Ensure adherence to procedures and flow restrictions
- Assist R controller in implementing action plan
- Initiate manual and automated handoffs
- Make entries into DSR/HCSR/TCCC/STARS computer system
- Coordinate with tower cab, other sector positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- TADS, DSN, DSCS, SBIS, AVRS, ECAS, HCSR, ETMS, STARS, TATCA, VSCS, 24-hour clock

ARTCC/TRACON/MCF

FLIGHT DATA AIRSPACE MANAGER (FD)

The FD position is responsible for performing inter- and intra-facility coordination on traffic actions, and accomplishes any other functions that will assist the Radar team in meeting situational objectives. The FD advises the RA of any action taken. The FD also maintains data on VFR aircraft tracked or serviced by the Inflight specialist

INPUTS:
- Radar display
- Manual and automated handoffs
- Voice and Datalink communications
- Flight Data Processing (FDP)
- Enhanced Collision Avoidance System (ECAS)
- Status information area
- Coordination from other radar and/or manual positions and adjacent ATC facilities
- Traffic Management Unit (TMU)
- Area Supervisor in Charge (ASIC)

PROCESS:
- Correlate flight data and radar display information
- Scan, analyze, transfer, and update flight data
- Amend flight data as necessary
- Recognize, project and plan for sector workload
- Analyze traffic (e.g., volume, aircraft type, aircraft performance, requests) and evaluate additional factors (e.g., weather, equipment status, flow control)
- Monitor operations and continuously evaluate the effectiveness of the Radar airspace managers action plan

OUTPUTS:
- Ensure safe and orderly traffic flow
- Ensure adherence to procedures and traffic management initiatives
- Assist Radar controller in implementing action plan
- Initiate manual and automated handoffs
- Make DSR/HCSR entries
- Coordinate with other radar and non-radar positions and adjacent ATC facilities
- Initiate action as input changes

SYSTEMS:
- TADS, DSN, DSCS, SBIS, AVRS, ECAS, HCSR, DSR, VSCS, radio and telephone equipment, Datalink

ARTCC/TRACON/MCF

FLIGHT WATCH (FW)

The Flight Watch position is a specialized air/ground position within the facility that has been relocated from the Flight Service Stations. FW services primarilybut is not limited toVFR aircraft. Service is provided on unique VHF radio frequencies (122.0 nationwide between 6,000 and 17,000 ft. MSL). Discrete frequencies are used for high altitude service. The service provided is entitled Enroute Flight Advisory Service (EFAS). EFAS service is limited to near-real-time weather information, and is specifically intended for aircraft in the enroute phase of flight. A primary function of EFAS is the solicitation and exchange of pilot weather reports (PIREPS) among aircraft. EFAS specialists are pilot weather briefers who have received additional specialized training and certification in the use and interpretation of weather radar and weather satellite data.

All information and service provided is in accordance with procedural handbooks, FAA orders, and facility directives.

INPUTS:
- Self briefings
- Pilots
- NWS (reports, charts, etc.)
- Adjacent facility positions
- Adjacent control facilities
- Center Weather Service Unit

PROCESS:
- Receive, analyze and respond to pilot requests for enroute weather information
- Solicit reports from pilots (PIREPS) concerning enroute conditions
- Compare PIREPS to NWS forecasts and advisories of hazardous conditions to validate the accuracy of the forecast information
- Provide to pilots the most current information available, tailored to a specific altitude and route of flight

OUTPUTS:
- Enroute flight advisories
- PIREPS
- Record of aircraft contacted via aircraft identification
- Relay of reported conditions (PIREPS) to CWSU and NWS forecasters

SYSTEMS:
- DSR, VSCS, ICSS, discrete frequency outlets, WARP/AWPG, CWSU weather graphics, Geostationary Orbiting Environmental Satellite (GOES) imagery, weather radar displays, NEXTGEN

ARTCC/TRACON/MCF

INFLIGHT (IF)

The inflight position provides air/ground communication with VFR aircraft. Communication may be of a routine or an emergency nature. The position is staffed with certified pilot weather briefers. Briefers are expected to be familiar with current and forecast weather conditions while they are on duty. They are also required to maintain detailed current knowledge of the topographical and other physical features of the facility's area of responsibility. Routine services provided at the IF position include weather advisories, position reporting, flight following, flight plan filing, activation, revision, and closure. Emergency services are provided in the form of orientation of lost aircraft.

All inflight positions are located in the ARTCC/TRACON/MCF.

INPUTS:
- Pilots
- National Weather Service
- Operational Database Management System (ODMS)
- Other facility positions
- Adjacent control facilities
- Airport management/fixed base operators
- Charts and printed aeronautical information
- International ATC systems

PROCESS:
- Receive, analyze and respond to pilot requests for service
- Copy flight plan information
- Correctly format and transmit flight plan data

OUTPUTS:
- Emergency services to aircraft in flight
- Inflight weather briefings
- Flight plans entered into HCSR
- Record of briefing via aircraft identification or pilot name

SYSTEMS:
- DSCS, SBIS, AVRS, HCSR, DSR, WARP, ITWS, AWPG, ETMS, NEXTGEN, ICSS

TRAFFIC MANAGEMENT

NATIONAL TRAFFIC MANAGEMENT OFFICER (NTMO)

NTMOs gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives for their area of responsibility.

INPUTS:

- Official Airline Guide (OAG)
- HCSR/STARS flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Departure Delivery Rate (DDR)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- ARTCC/MCF and terminal traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS)
- International ATC systems

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Develop a system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operationUse Airspace Management System (SAMS)

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- ETMS, STARS, CVARS, WARP, AWG, ODMS, Aircraft Situation Display (ASD), specialists' workstations, long-line and commercial telephone, large screen displays, Special Use Airspace Management System (SAMS)

TRAFFIC MANAGEMENT

NATIONAL OPERATIONS MANAGER (NOM) - ATCSCC

National operations managers gather information from a variety of sources to determine the status of the NAS; analyze system constraints, traffic demand, and the capacities of airspace and airports; develop a strategy of traffic management initiatives to balance demand and capacity; supervise the implementation and management of initiatives, disseminate traffic management and delay information to users and field traffic management personnel; and monitor, evaluate, and critique the effectiveness of traffic management initiatives.

INPUTS:

- Official Airline Guide (OAG)
- HCSR flight plan data
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Departure Delivery Rate (DDR)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- ARTCC/MCF and terminal traffic management personnel
- FAA Washington Operations Center (WOC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)
- Operational Database Management System (ODMS),
- International ATC systems

PROCESS:

- Use inputs to gather information about the status of the NAS including system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Monitor the system-wide strategy of traffic management initiatives necessary to balance demand with capacity
- Coordinate and disseminate information concerning the status of the NAS and Traffic Management initiatives
- Establish priorities and assign work to Traffic Management Specialists (TMS) to achieve maximum efficiency and utilization of operations personnel
- Provide guidance and assistance to TMSs assigned to severe weather management
- Manages the day-to-day airport reservation operation

TRAFFIC MANAGEMENT

NATIONAL OPERATIONS MANAGER (NOM) - ATCSCC continued

OUTPUTS:

- Approves or disapproves traffic management initiatives
- Monitors, evaluates, and critiques the performance of approved Traffic Management initiatives and ETMS plans
- Approves or disapproves additional arrival and departure slots for airports in the airport reservation operation
- Conducts scheduled and special telephone conferences with users and regional and ATC facility traffic management personnel to inform them of local or national traffic management initiatives and to advise of current and anticipated delays and airspace/airport conditions

SYSTEMS:

- DSCS, SBIS, DYSEC, ETMS, STARS, AWPG, WARP, ODMS, specialists' workstations, long-line and commercial telephone, large screen displays, Defense Switch Network (DSN), ATSCSS Diverse Communications System (ADCS)

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (TMS) - ATCSCC

TMSs/NOMs gather all the pertinent information relative to current and projected future operations, and develop tentative TM plans to balance demand with capacity; initiate and implement TM plans with other facilities/TMUs, supervisors and control specialists and the ATCSCC; maintain awareness of capacity reductions throughout the NAS; document delay information; evaluate effectiveness of TM initiatives and make necessary adjustments.

TMSs disseminate TM initiative information to users and TMUs via ATCSCC advisories and records delay information. NOMs coordinate the efforts of TMSs into a coordinated NAS Traffic Management Plan.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- HCSR/STARS flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Arrival Acceptance Rate (AAR) and Departure Delivery Rate (DDR)
- WARP, ITWS, AWPG, CWFSU
- Coordination with other ATC facilities
- ATCSCC Operations Center
- Operational Database Management System (ODMS)
- Central Altitude Reservation Function (CARF) users (airlines, military, general aviation)
- ETMS, SAMS

PROCESS:
- Input current/forecasted capacities, i.e., Departure delivery Rates, Airport Arrival Rates, OALT, Feeder fix rates

OUTPUTS:
- Traffic Management Initiatives:
  - A. Traffic stops
  - B. Exemptions from TM initiatives
- Coordination with:
  - A. NOMs and TMSs/TMCs to implement traffic management initiatives and flight reroutes
  - B. Traffic Management Units (TMU)/TMCs to maintain awareness of current and anticipated conditions
  - C. Users, to inform them of local/national TM initiatives and advise of current and anticipated delays and airspace/airport conditions

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT SPECIALIST (TMS) - ATCSCC continued

SYSTEMS:

- DSCS, SBIS, ETMS, STARS, WARP, AWPG, ODMS, long-line and commercial telephone, large screen displays, DSN, ADCS

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR (STMC) - ENROUTE

STMCs are responsible for assessing the capacity and demand for airspace and airports within their facility's area of responsibility; developing and administering traffic management initiatives including arrival and departure metering, en route spacing, ground delays, and severe weather avoidance routes; providing intra- and inter-center coordination on military aircraft missions and airspace usage; disseminating weather information to center personnel and to other air traffic facilities in their area of responsibility; and assigning work within the Traffic Management Unit to ensure the most effective use of resources.

INPUTS:

- Official Airline Guide (OAG)
- HCSR flight plan data
- En route radar
- Aircraft Situational Display (ASD)
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Airport Arrival Acceptance Rate (AAR)
- Weather data (WARP, AWPG, CFWSU)
- Air Traffic Control facility personnel
- En route Terminal traffic management personnel
- Air Traffic Control System Command Center (ATCSCC)
- Central Altitude Reservation Function (CARF)
- Users (airlines, military, law enforcement, general aviation)

PROCESS:

- Use inputs to gather information about the status of the airspace and airports within the Centers boundaries. Considerations include weather, system constraints, airport capacities, traffic demand, and other conditions that could cause operational problems
- Coordinate and disseminate information concerning the status of the NAS, weather, traffic management initiatives, and military airspace and mission requirements to personnel within the facility, air traffic facilities with adjacent airspace, and the ATCSCC
- Establish priorities and assign work to TMCs to achieve maximum efficiency and utilization of operations personnel
- Monitor and evaluate traffic management initiatives to ensure effectiveness.

TRAFFIC MANAGEMENT

SUPERVISORY TRAFFIC MANAGEMENT COORDINATOR — ENROUTE continued

OUTPUTS:

- Utilizes available resources to ensure balanced traffic flows and the maximum utilization of airspace
- Establishes departure, en route, and arrival fix rates
- Coordinates weather, traffic management, and other information pertaining to the efficient operation of the NAS to concerned personnel

SYSTEMS:

- DSCS, SBIS, ETMS; HCSR, DSR, WARP/AWPG; specialists' workstations; interphone, dedicated long-line, and commercial telephones; DSN, ADCS

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) - TOWER

Tower TMCs gather all necessary information and develop tentative TM plans to balance demand with capacity; negotiate tentative TM plans with terminal/en route TMC/TMUs, supervisors, control specialists, and the ATCSCC; maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives and make necessary adjustments; disseminate TM initiatives to supervisory/control personnel, approach controllers, and parent TMU; and forward delay information to parent TMU.

INPUTS:
- TCCC
- STARS, HCSR flight plan data
- Engineered Performance Standards (EPS)
- Weather data (WARP, ITWS, AWPG, CWSU)
- Traffic Management Unit (TMU)
- Air Traffic Control System Command Center (ATCSCC)
- Users (Airlines, Military, General Aviation)
- Aircraft movement (visual)
- Airport manager
- AMASS, ASTA, TATCA (TMA advisor), ITWS/AWPG
- Operational Data Management System (ODMS)

PROCESS:
- Gather information about terminal/en route sectors
- Assess current and forecasted capacities at the airport
- Input data to ETMS and maintain current status

OUTPUTS:
- Traffic Management Initiatives (strategic/tactical):
  - A. Airport arrival Rates (AAR)
  - B. Departure Delivery Rates (DDR)
  - C. Initial flight reroutes
  - D. Traffic stops
- Coordination with:
  - A. SATCs/ATCSs (internal) to change AARs/DDRs and flight reroutes
  - B. Traffic Management Unit (TMU)/TMCs with parent terminal facilities to maintain awareness of current and anticipated conditions.
  - C. ATCSCC to advise of current and anticipated airport delays and airspace/airport conditions

SYSTEMS:
- TADS, CTDS, ASSS, CASIP, DSCS, ETMS, STARS, TATCA, ASTA, TCCC, WARP, AWPG, interphone, long-line and commercial telephone, DSN, ADCS

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) - ARTCC/TRACON/MCF

TMCs gather all necessary information and develop TM plans to balance demand with capacity; input and maintain OALTs in ETMS, input appropriate departure, feeder fix and arrival rates, and coordinate output with other facilities and TMUs, supervisors, control specialists and the ATCSCC. They maintain awareness of capacity reductions outside their area of responsibility; calculate delay information; evaluate effectiveness of TM initiatives; and make necessary adjustments to disseminate TM initiatives to supervisory and control personnel. This includes towers, approach control sectors, and other TMUs via the ATCSCC. TMCs also forward delay information to the ATCSCC.

INPUTS:
- Official Airline Guide (OAG)
- Aircraft Situation Display (ASD)
- Terminal and en route radar
- HCSR Flight plan data
- Operational Acceptable Levels of Traffic (OALT)
- Engineered Performance Standards (EPS)
- Weather data (WARP, ITWS, AWPG, CWSU)
- ATCSs and SATCSs, (towers, TRACONs, ARTCCs)
- Users (airlines, military, general aviation)
- Airport Arrival Rates (AAR) and Departure Delivery Rates
- TATCA (TMA Advisor)
- ETMS
- ODMS

PROCESS:
- Gather information for airports and en route sectors within their ARTCC to assess current and forecasted demand and capacities
- Develop or recommend Traffic Management initiatives necessary to balance demand with capacity
- Input OALT into ETMS, keep current.

OUTPUTS:
- Traffic Management initiatives (strategic and tactical)
  - A. Current and projected OALTs
  - B. Arrival fix rate
  - C. Traffic Stops
- Coordination with:
  - A. SATCSs and ATCSs (internal) to initiate restrictions, implement traffic management initiatives and flight reroutes
  - B. Traffic Management Units (TMU/TMCs in adjacent ARTCCs and tower facilities to maintain awareness of current and anticipated conditions and capacities

TRAFFIC MANAGEMENT

TRAFFIC MANAGEMENT COORDINATOR (TMC) - ARTCC/TRACON//MCF continued

C. ATCSCC to request national TM initiatives and advise of current and anticipated delays and airspace and airport capacities

SYSTEMS:

- DSCS, SBIS, HCSR, STARS, DSR, ETMS, ODMS, TATCA, WARP, ITWS, AWPG, interphone, commercial telephone, DSN, ADCS.

ATC TECHNOLOGY AND SUPPORT INTERFACES

ATC AUTOMATION

CONTROL TOWER DISPLAY SYSTEM (CTDS)

The CTDS is a multiple input system that consolidates the various input sources and formats and provides the tower cab controller real time, positionally accurate, three dimensional, data on the aircraft in his field of vision. This system will use state of the art technology to allow various forms of tabular. alert, and sensor data to be windowed and overlaid. Information display will be controlled via voice recognition and alert activation. Aircraft position will be displayed in such a way that the data is independent of the controllers position in the tower cab.

INPUTS:
- Airport Surveillance Radar (ASR)
- Mode S
- Datalink
- Terminal Area Detection System (TADS)
- ETMS
- Airport and Navigation System Status
- HCSR
- TCCC

PROCESS:
- Consolidate data
- Respond to alert
- Sense controller location
- Sense and respond to voice commands
- Generate display

OUTPUTS:
- Displays data in tower environment
- Selectable pages and windows
- System activated visual alerts
- Aural alarms

INTERFACED SYSTEMS:
- Voice Tower Electronic Communications (VTEC), ETMS, TCCC, HCSR

ATC AUTOMATION

VOICE TOWER ELECTRONIC COMMUNICATIONS (VTEC)

The Voice Tower Electronic Communications systems integrates switching, voice recognition, datalink, and system manager. This system will allows the use of voice to communicate to the aircraft via datalink and/or voice. It will also provide inter and intra facility communication, and management of the CTDS and CTEL systems.

INPUTS:
- ATCS and SATCS
- CTEL
- Control Tower Display System (CTDS)
- Terminal Area Detection System (TADS)
- ETMS
- HCSR
- TCCC

PROCESS:
- Receive and analyze controller input
- Determine output routing
- Convert voice to data for output
- Deliver appropriate output to correct system(s)

OUTPUTS:
- Datalink for direct output to aircraft
- Selected pages and windows on CTDS
- CTEL
- TCCC
- HCSR
- ETMS
- VSCS

INTERFACED SYSTEMS:
- Control Tower Display System (CTDS), ETMS, TCCC, HCSR

SURVEILLANCE

TERMINAL AREA DETECTION SYSTEM (TADS)

The Terminal Area Detection System will incorporate input from different sensors to provide the system with displayable location information. It will allow the controller to make the greatest use of visual, radar, ADS, infrared and other information to expedite the movement of airport traffic in the air and on the ground.

INPUTS:
- Airport Surveillance Radar (ASR)
- Mode S
- Datalink
- Infrared sensors
- ADS
- ASDE
- Weather Sensors
- HCSR

PROCESS:
- Collect sensor data
- Consolidate data
- Provide display Information based on input voice commands
- Provide alerts based on system performance

OUTPUTS:
- Consolidated output of sensor data to TCCC
- System activated visual alerts
- Aural alarms
- Information to HCSR

INTERFACED SYSTEMS:
- Voice Tower Electronic Communications (VTEC), ETMS, TCCC, HCSR

ATC FLIGHT SCENARIOS

COMMERCIAL CARRIER (DOMESTIC SERVICE) FROM/TO AIRPORTS WITH A CONTROL TOWER

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Pilot in command obtains briefing from aircraft dispatcher, who authorizes flight.	
2. Verify IFR flight plan and notify changes to air traffic as required. [2000: ETMS incorporates flight plan program/air carrier computer interface program].	
3. ~~Contacts ground control/clearance delivery prior to engine start.~~ [2000: Logs onto ATC for clearance prior to engine start].	
	4. Issues engine start time, taxi or clearance information, departure control frequency,and beacon code.
5. After receiving clearance, contacts ground control for taxi clearance if not previously provided. [2010: Follows instructions on STMS].	6. Issues taxi instructions.
7. Acknowledges and follows taxi instructions. [2000: Views information on cockpit CRT and acknowledges].	
8. Contacts local control for clearance to take off.	9. Issues departure information and takeoff clearance.
	10. After takeoff, instructs pilot to contact departure controller ~~(TRACON)~~. [2000: TRACON/MCF]
11. Flies specific departure route, climbing to assigned altitude, and contacts departure control as directed. [2000: TRACON replaced by MCF].	12. Provides air traffic control service from point of handoff to enroute controller ~~(ARTCC)~~. [2000: ARTCC/MCF].

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	13. Transfers radio communications and control responsibility to enroute controller and instructs pilot to contact the next facility, by name, on a specified frequency. Repeated as required from sector to sector.
14. Contacts enroute controller and reports altitude.	
	15. Confirms radar contact and issues control instructions as required.
16. Adheres to assigned route and altitudes.	
	17. When aircraft is nearing destination, a clearance time is specified — including route, altitude information, and instructions on further communications. [2000: Routine communications via datalink, including "top of descent"].
	18. Transfers radio communications and control responsibility to approach controller ~~(TRACON)~~. [2000: ARTCC/MCF/TRACON]
	19. Instructs pilot to contact approach control on a specific frequency.
20. Contacts approach controller, confirms position and altitude, and advised of any approach requirements or requests.	
	21. Clears aircraft for approach, issues special instructions/radar vectors where appropriate. Instructs pilot to contact tower. [2000: Information developed by TATCA].
22. Follows specific approach procedures and contacts tower when instructed.	
	23. Acknowledges initial contact and issues landing instructions or clearance.
	24. Instructs aircraft when to turn off runway and contact ground control.
25. Exits runway without delay. Change to ground control frequency when instructed by tower.	
	26. Ground control issues specific instructions to direct pilot to gate area.

~~**Note:** Flight crew and air traffic control actions are subject to traffic management action or initiatives, which are taken in response to air traffic demand (and in excess of capacity) to direct aircraft to avoid severe weather. The Air Traffic Control System Command Center (ATCSCC) transmits advisories to airline dispatch offices concerning the status of the national management initiatives. These initiatives in response to excess demand frequently utilize delay departure times to smooth the flow of traffic and to avoid costly airborne holding. Initiatives designed for severe weather avoidance usually result in a non-standard route of flight.~~ [2000: Traffic plan now directed by ETMS/AERA. Optimum routings will be generated by ETMS if no specific route of flight is requested. ETMS manages all weather traffic changes through AERA.]

TRAFFIC MANAGEMENT AIR CARRIER FLIGHT FROM ATLANTA (ATL) TO CHICAGO O'HARE (ORD)

Note: This scenario is invalid beginning in 2000. The ETMS processor coordinates data and early warnings from AERA concerning the thunderstorm. ETMS datalinks information to flights while rerouting traffic accordingly.

~~Early in the morning, traffic management specialists (TMS) at the Air Traffic Control Systems Command Center (ATCSCC) receive a weather briefing from National Weather Service (NWS) personnel located at the Central Flow Weather Service Unit (CFWSU). They are told that weather at Chicago's O'Hare International (ORD) will experience low ceilings, reduced visibility and rain showers. Also, thunderstorm activity is expected to occur along a cold front extending from southwest Tennessee to northeast Georgia. The thunderstorms are predicted to be most numerous in the area north of Atlanta, GA.~~

~~At the same time, traffic management specialists in the Chicago and Atlanta Air Route Traffic Control Center Traffic Management Units (ARTCC TMUs) are receiving similar briefings from NWS personnel located in the Center Weather Service Units (CWSU) at their facilities. The TMS' and supervisors at all three facilities are beginning to consider the impact that this adverse weather will have upon air traffic operations, and what actions will be required to mitigate that impact.~~

~~Later in the morning, the National Traffic Management Officer (NTMO) at the ATCSCC conducts one of two daily telephone conference (TELCON) briefings with Traffic Management personnel from each of the ARTCCs and the larger airport air traffic facilities, and representatives of the major airline dispatch offices. The briefing begins with a summary of the known and expected constraints on the National Airspace System (NAS) such as adverse weather, airport construction activity, and other factors, and evolves into a discussion of probable results or traffic management actions that may be required. During this briefing, the airline dispatch offices are made aware that traffic management actions, or initiatives, may be required for aircraft flying to ORD and for aircraft flying on routes that normally traverse the area where thunderstorms are predicted to exist.~~

~~Specialists at the Atlanta ARTCC TMU have decided to plan for possible reroutes around sever weather if thunderstorms close normal routes. They coordinate this information with the ATL approach control (TRACON) and tower (ATCT), and with the Severe Weather and National Route Management (NRM) specialist at the ATCSCC. The NRM specialist sends a message to the airline dispatch offices advising that flights to ATL, or through the area north of Atlanta can expect to be rerouted around areas of severe weather.~~

~~Meanwhile, the TMS responsible for the central portion of the country is considering the situation at ORD. This will require increased spacing between aircraft, which will reduce the arrival capacity of the airport. In addition, the rain will leave runways wet, thus reducing braking traction. So, instead of being able to land aircraft on three runways at the same time, only two runways will be available for arrivals. Given these conditions, the specialist calculates the airport's arrival capacity.~~

~~The Specialists then accesses a computer database that stores records of all regularly scheduled flights to determine the number of aircraft scheduled to arrive at ORD will exceed the available capacity. If nothing is done to manage this situation, the result will be aircraft stacked in holding patterns over the airport waiting their turn to land. This would significantly increase controller workload, waste fuel and reduce equitable access to the airspace for other aircraft.~~

~~The ATCSCC central area specialist, having determined that a problem exists, decides to conduct a conference call with the Chicago ARTCC TMU and the ORD TRACON TMU, to determine a course of action. Another check is made with the meteorologists at the CFWSU and the Chicago CWSU, and they agree that there will be low ceilings and rain all day at ORD. Specialists at ORD TRACON confirm that they will only be able to land on two runways. All concerned facilities agree that the arrival capacity will be 65 aircraft per hour. A check of the flight schedule data base shows that the hourly demand will indeed exceed the 65 aircraft arrival rate. A national traffic management initiative to limit the arrival demand to 65 is agreed to by all. The method used to control demand will be a ground delay program. The ground delay program will assign each scheduled flight a delayed departure time that is calculated to achieve a 65 flight-per hour arrival rate at ORD. This results in the delays being taken on the ground rather than in holding patterns over the airport.~~

~~The ATCSCC specialist makes one more telephone call before implementing the ground delay program. These calls are to the airline dispatch offices responsible for many of the flights going to and from ORD. Their purpose is to seek an opinion of the weather and its effect on operations, from the perspective of the carrier's meteorologists and dispatchers. They concur with the NWS forecasts and agree that conditions justify a ground delay program. The specialist then discusses these events with the NTMO and receives approval to implement a ground delay program at a rate of 65 arrivals each hour.~~

~~The ATCSCC specialist then runs a program that assigns each flight going to ORD a controlled departure time (CDT). Each CDT is based on controlling the departure time of each flight. The arrival times of these flights are adjusted so that 65 flights will arrive, spread evenly throughout each hour. A list of CDTs for aircraft departing each ARTCCs airport is sent to that ARTCC and a list of CDTs for airline flights is sent to that airline. Also, an advisory is sent to all affected air traffic facilities and to all affected airline dispatch offices describing the reasons for and the details of the program.~~

~~The ABC airline dispatch office, in preparing for flight number 123 from ATL to ORD, is aware of the CDT assigned to this flight and the possibility of being rerouted around the severe weather north of Atlanta. These considerations are discussed with the flight crew during the preflight briefing. A flight plan is filed by the dispatch office and is routed, via computer network, to the Atlanta ARTCCs Host Computer. The Host Computer is interfaced with the traffic management computer used by the ATCSCC, and the CDT is automatically assigned to the flight plan. The CDT will appear on the flight plan when it prints out at Atlanta ARTCC, and at ATL tower and TRACON. Thus, the specialist in the tower issuing clearances knows that this flight is not authorized to depart before the CDT.~~

~~By this time, as forecast, a line of thunderstorms has developed north of Atlanta. Several aircraft have already deviated from their filed route of flight to avoid the storm, and the gaps~~

~~through which they are penetrating the line are closing. Atlanta ARTCC TMU has instructed ATL tower to issue revised routings to those flight whose routes from Atlanta are to the north. Atlanta ARTCC TMU then contacts the ATCSCC so that alternate routes can be coordinated with adjacent ARTCCs, coordinates the routes, and then sends a message to the airline dispatch office advising of the reroute activity.~~

~~As the CDT for ABC 123 nears, the flight crew calls the tower for their clearance. They are advised of the severe weather north toward ORD. Flight ABC 123 departs ATL on its CDT, and enjoys a smooth flight to ORD. It lands without having deviated from its route or incurring any airborne delays.~~

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITH CONTROL TOWERS

FLIGHT CREW ACTIONS

1. Requests flight briefing ~~announces intention to file flight plan in person or by telephone with AFSS~~. [2010: Pilot files flight intentions with vendor].

3. Contacts ground control/clearance delivery prior to engine start.

5. Acknowledges and follows ATC instructions.

6. Requests that ATC cancel IFR flight plan while airborne, or, within 30 minutes after landing closes IFR flight with ~~flight service~~ **[2010: ARTCC/MCF/TRACON].**

AIR TRAFFIC CONTROL ACTIONS

2. ~~Flight service~~ [2010: Vendor] provides weather and route briefing, accepts filed flight intentions, and transmits pertinent flight data to the appropriate ARTCC [2000: ARTCC/ MCF/TRACON] for processing and entry into the automated system.

4. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne.

NOTE: [2000: Datalink available for GA] [2005: "Flight intentions" replace "flight plans"].General aviation aircraft are subject to the same traffic management initiatives that apply to scheduled air carrier flights. They are also subject to special traffic management initiatives due to excess demand at high density airports and in response to excess demand caused by special events (i.e., the Indianapolis 500, Kentucky Derby, Boston Marathon, etc. At high density airports, a reservation is required for general aircraft arrival and departure. Federal Aviation Regulations describe the rules and procedures used to fly to and from high density airports. Information concerning these programs is disseminated via a Notice to Airman (NOTAM) and the pilot will be made aware of responsibilities by the vendor during the preflight briefing or when the pilot files the flight plan.

GENERAL AVIATION IFR FLIGHT OPERATING FROM/TO AIRPORTS WITHOUT CONTROL TOWERS

FLIGHT CREW ACTIONS

1. Requests weather and files flight intentions ~~via AFSS~~ or [2010 vendor].

3. Advises flight service [2010: ARTCC/MCF/TRACON] and other operators at the airport when ready to taxi out for departure.

5. After receipt and acknowledgement of IFR clearance, advises ~~flight service~~ [2010: ARTCC/MCF/TRACON] prior to departure.

6. After takeoff, follows published IFR departure procedure, and contacts the designated ATC facility.

8. Acknowledges and follows ATC instructions.

9. When approximately 10 miles from destination airport, contacts local advisory frequency and announces intentions.

11. After landing, advised tie-in flight service station to close IFR flight with control facility [2010: ARTCC/MCF/TRACON].

AIR TRAFFIC CONTROL ACTIONS

2. ~~Flight service~~ [2010: Vendor] provides weather and route briefing and transmits pertinent flight data to the appropriate ARTCC. [2000: ARTCC/MCF/TRACON]

4. ~~Flight service~~ [2010: ARTCC/MCF/TRACON] relays ATC clearance, facility and frequency for control after departure, and provides airport weather and known traffic information.

7. Provides air traffic control service in the same manner as in air carrier operations while airborne.

10. When aircraft is nearing destination airport and direct communication and control is no longer required, issues clearance for the published instrument approach.

[2005: "Flight intentions" replace "flight plans." ECAS equipped aircraft could be cleared for successive approaches with shared separation responsibility provided by the pilot through ECAS].

TRANSOCEANIC FLIGHT

[2010: Advanced surveillance obviates this scenario because it is global in nature. Transoceanic traffic is now processed the same as U.S. domestic IFR operations].

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
	~~1. Advise to dispatcher of available routes. Coordinates route selection. Traffic advisories required. [2000: Coordinates route options via TMP].~~
~~2. Pilot in command obtains briefing from aircraft dispatcher, who files IFR flight plan in accordance with ICAO procedures and formats, and authorizes flight.~~	
	~~3. Issues engine start time, departure control frequency, beacon code, taxi and/or clearance information.~~
~~4. Reads back clearance to controller to ensure accuracy (readback is required per ICAO agreements).~~	
~~5. After receiving clearance, contacts ground control for taxi clearance if not previously provided.~~	
	~~6. Provides air traffic control service in the same manner as in air carrier operations, while moving about the surface at both departure and arrival airports, and while airborne within domestic airspace.~~
~~7. As aircraft approaches oceanic airspace, contacts enroute controller, reports altitude, and requests oceanic clearance from the controller responsible for the first oceanic area on flight route (if oceanic clearance not previously received).~~	
	~~8. Confirms radar contact, and aircraft is sequenced on cleared route to meet required oceanic separation. [1995: No longer valid because of track advisories].~~
~~9. Issues oceanic clearance (if necessary) and control instructions.~~	
~~10. Acknowledges receipt and reads back clearance to controller to ensure accuracy (required per ICAO agreements).~~	

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
~~11. Adheres to assigned routes and altitudes.~~	
	~~12. Transfers control responsibility to appropriate oceanic sector.~~
~~13. Coordinates transfer of control responsibility to receiving Flight Information Region.~~	
~~14. Establishes communications [1995: Position reports are relayed by ADS] with the appropriate oceanic radio station for passing required position reports.~~	
~~15. Coordinates transfer of control responsibility to receiving Flight Information Region (IFR) and passes transfer instructions to pilot throughout the oceanic radio station.~~	

~~**NOTE:** Aircraft flying to or from overseas destinations are not normally subject to traffic management initiatives taken in response to excess demand at airports. There are, however, constraints on the oceanic route system that frequently require traffic management action. Radar coverage does not extend over most oceanic airspace, therefore, oceanic-radar separation procedures must be used. The increased separation requirements frequently result in demand in excess capacity. The Air Traffic Control System Command Center advises airline dispatch offices of potential delays due to this excess demand. [2005: ECAS equipped aircraft may benefit with reduced separation through shared operation].~~

MILITARY AERIAL REFUELING AND TRAINING MISSION IN DOMESTIC AND SPECIAL USE AIRSPACE

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
1. Obtains from base operations a preflight weather and mission briefing, including scheduled refueling time for designated refueling track and call signs for participating aircraft.	
2. Files flight plan with BASOPS.	
3. Follows military air traffic guidance until making contact with civil ATC services after departure.	
	4. Confirms radar contact, assigns beacon code and issues control instructions as necessary in similar fashion to those provided to commercial aircraft.
5. Contacts enroute controller and reports altitude. Requests clearance to enter the refueling track.	
	6. Authorizes aerial refueling within the specified track at the flight plan altitude and requests receiver aircraft to declare position when three miles from tanker aircraft.
	7. Releases to tanker aircraft appropriate communications frequency no later than the designated Air Refueling Initial Point (ARIP).
8. Maintains two-way radio contact with ATC until established in the altitude block, then contacts tanker.	
9. Tanker advises ATC that Military Assumes Responsibility for Separation of Aircraft (MARSA) is in effect. During refueling operations all communication with ATC is conducted by the tanker aircraft.	
	10. Avoids issuing altitude or course changes without tanker concurrence.

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
11. Tanker coordinates route and altitude clearance for both the receiver and tanker, and established vertical separation prior to reaching the planned exit point.	
	12. Clears aircraft to depart the refueling track at a navigational reference point or egress fix.
13. Receiver contacts ATC and reports altitude, adheres to assigned airways, route and altitudes.	
	14. Provides ATC services until aircraft enters airspace dedicated to military training mission.
15. Aircraft completes training assignment and requests ATC clearance to reenter civil airspace and return to airport.	
	16. Provides ATC services in the same manner as provided to domestic carriers.

NOTE: The location and use times of aerial refueling tracks are established by Letters of Agreement between the scheduling military unit and the air traffic facility containing tract airspace. Normally, the military must provide advance notice of specific use times and aircraft call signs to the controlling air traffic facility. Also the using military unit may coordinate with the Central Altitude Reservation Function (CARF) for approval of an Altitude Reservation (ALTRV) to and from the aerial refueling track. CARF, located within the Air Traffic Control System Command Center in Washington, D.C. accomplishes advance coordination of the ALTRV mission requirements with all affected air traffic facilities. Thus, complex mission requirements or movement of large numbers of aircraft can be accomplished smoothly, and without impacting routine air traffic operations.

AFSS PROCESSING FOR VFR PILOT

[2010: Preflight activities now transferred to vendor. In flight activities now reside in ARTCC / MCF].

FLIGHT CREW ACTIONS	AIR TRAFFIC CONTROL ACTIONS
~~1. Calls the FAA 1-800-WX BRIEF telephone number at least 30 minutes prior to flight. Requests weather information and preflight briefing.~~	
	~~2. Call is handled by AFSS Preflight (PF) briefer standing by to relay information from Model 1 computer for data input and weather retrieval. PF also uses automated weather graphics system, which displays various weather maps.~~
	~~3. PF conducts standard weather briefing, including terminal area, enroute, and winds aloft observations and forecasts, etc.~~
~~4. Pilot decides weather is good for VFR flight, requests information about Notices to Airmen (NOTAMs).~~	
	~~5. PF relays local and distant NOTAMS that originate within the flight plan area, and FDC NOTAMS not formatted for the ACF computer.~~
~~7. Pilot files flight plan by reading specific aircraft data, characteristics, specific origin/ destination trip information, etc.~~	
	~~8. FSS specialist checks and accepts flight plan, and files with Flight Service Data Processing System.~~

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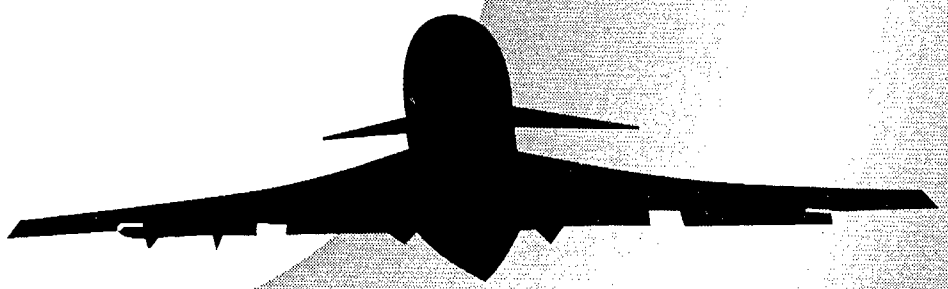

BEYOND 2015

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BEYOND 2015

The NAS of tomorrow will continue to evolve as new technology provides for increased aircraft capability, operator requirements and demand. Some of this technology includes concepts impossible to foresee in 1995. Yet there remains a prediction to be made based on knowledge of the evolving ATC system. As represented in the earlier chapters of this publication, air traffic control is moving toward a totally automated surveillance and communications system.

Aircraft flying the system beyond 2015 will remain similar to those in the baseline, but added to this mix will be hypersonic aircraft operating above FL 600 altitudes. Tomorrow's military aircraft will also put special demands on the system because of advanced stealth, high mach speed, and both increased altitude and low level capabilities used in training exercises.

All aircraft will be under surveillance by a system that shares its information with a centralized traffic management processor. This surveillance will allow knowledge of every aircraft.

To keep pace with technological advances, the future system will take advantage of modular components and system engineering that is more dynamic in its ability to use new technology. No longer will lengthy development times be required because proven off-the-shelf components will be deployed more rapidly.

Human factors will require air space managers to remain in the control equation. But as indicated in the outyears of this publication, the traditional ATC controller responsibilities will be dramatically impacted by automation.

This trend will continue beyond 2015 with the air fleet equipped with more advanced automated flight management and collision avoidance systems. Such automation will allow further reductions in separation while increasing system capacity. Precision approaches will be universally available because of state-of-art navigation systems and spacebased surveillance. With less need for control, however, the eventual displacement of the airspace manager by machines is foretold.

As this begins, the airspace manager will evolve into an ATC "Intervention Specialist." Human control will occur only by exception.

In the domestic future system, ATC facilities will consolidate with centralized operations. New technology will allow for perhaps as few as two or three mega facilities. These facilities will provide support that constantly views the entire NAS — handling both scheduled and non-scheduled requests for system access. They will also distribute the workload more evenly, while allowing for a reduction in staffing. System planning will consider weather data, aeronautical information, and airport and airspace capacity as factors in an integrated automation network.

Tomorrow's system will no longer be divided into sectors. Instead, the limited number of facilities will be responsible for very large, seamless airspace areas. In the event a rate occurrence does affect a particular facility and compromises its workload, the entire workload can easily be transferred to other facilities until the problem is corrected.

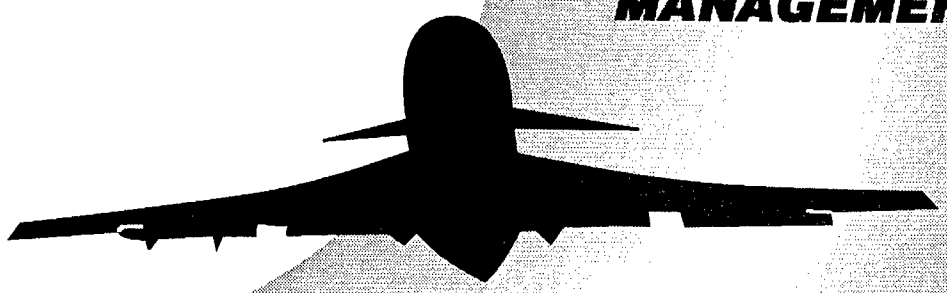
"Fail safe" communication, navigation and surveillance will all be based on redundant systems. Automation, technology and reliability will advance to the point where a problem, such as an operational "outage" is only a rare occurrence. In such a circumstance, the automated, artificially intelligent system will contain a self-alerting diagnostic and corrective system that eliminates need for an emergency response.

Beyond 2015, communications capability and reliability will allow an advanced state of development with links between the sources of control. Transmission sites will become redundant and multi-diverse to allow the switching from one to another on an instantaneous basis. This flexibility and control of the system by advanced automation will provide new capabilities to all aircraft flying in the NAS.

In a dramatic development, expanded use of long-range aircraft will bring international harmonization of global air traffic management. Aircraft flying at or above FL 600 will be controlled by a multi-nationally staffed, worldwide facility. Below FL 600, traffic management (flow control) information will be shared via a global network of computers. This effort of scale will allow a new age of global traffic management and revolutionize the system for the benefit of all those who fly.

THE FAA AIR TRAFFIC SYSTEM VISION OF THE FUTURE

APPENDIX A: TRAFFIC MANAGEMENT



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APPENDIX A

TRAFFIC MANAGEMENT

The Traffic Management System (TMS) mission is to balance National Air Space (NAS) system air traffic demand with system capacity to ensure maximum efficiency in the utilization of the NAS, thereby, producing a safe and expeditious flow of traffic while minimizing delays. The traffic management system consists of the Air Traffic Control System Command Center (ATCSCC), Air Route Traffic Control Center (ARTCC) and certain Terminal Radar Approach Control (TRACON) Traffic Management Units (TMU), and tower and TRACON Traffic Management Coordinators (TMC). Traffic management coordinators are air traffic controllers that accomplish the functions of the above mentioned elements.

The ATCSCCs role is to manage the flow of air traffic throughout the NAS to achieve the optimum use of the navigable airspace and to minimize the effect of air traffic delays on the system users (i.e., airlines, general aviation and military flights) without allowing any element to exceed its acceptable level of traffic or arrival/departure rate. This is accomplished by:

1) Monitoring key system components (i.e. navigational aids, airports, etc.) and national weather patterns for potential system impact;
2) Determining overall NAS capability on a continuing basis by interpreting the impact of component outages and adverse weather conditions;
3) Determining when the NAS capacity will be reduced to the extent that national traffic management programs might be necessary; and
4) Implementing national traffic management programs or initiating alternatives when national programs are not appropriate.

The TMUs and terminal traffic management coordinator's role is to balance traffic flows within their areas of responsibility including arrival, departure and tower en route traffic. This is accomplished by:

1) Developing and implementing traffic management initiatives and monitoring and coordinating the effect of national programs within their specific area of responsibility;
2) Implementing flow restrictions requested by adjacent facilities; and
3) Utilizing available resources to ensure balanced traffic flows and maximum utilization of airports and airspace.

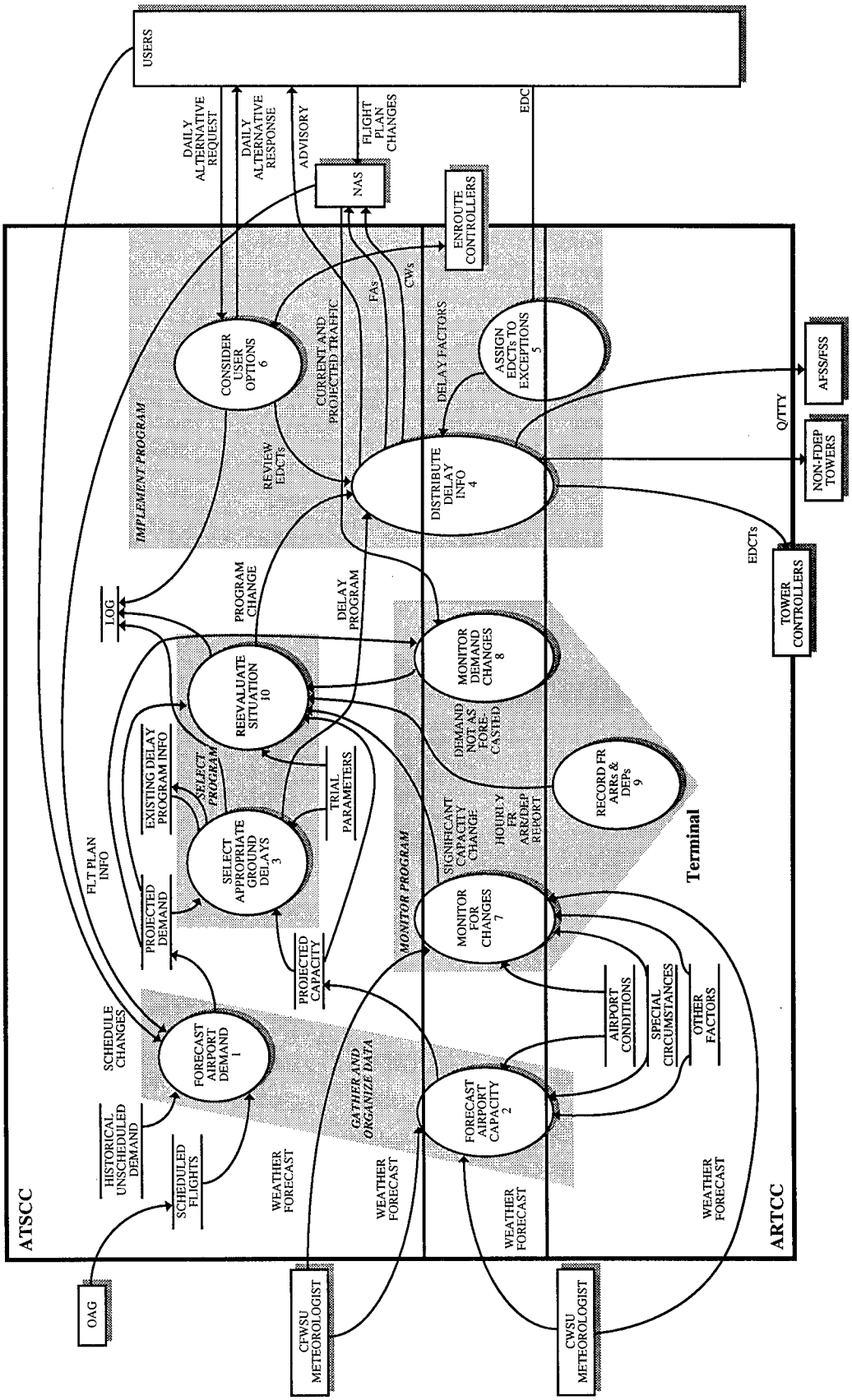
Traffic management initiatives are utilized to limit the volume of traffic allowed into or out of an airport or airspace. In rare occasions, these initiatives are used to favor the traffic of one area of the NAS over another to ensure the safe, orderly and expeditious operation of all the NAS traffic. The most common initiatives are: mile-in-trail/ minute-in- trail restrictions, traffic reroutes, ground delay programs and ground stops. Mile/minute-in-trail restrictions are implemented to increase the distance between successive aircraft to limit the number of or increase the time between aircraft arrivals, departures or en route operations. This is the least disruptive traffic management initiative and least accurate. Traffic reroutes are utilized to move traffic away from impacted airspace or direct them to areas of lesser demand. This initiative is primarily utilized to avoid significant weather and/or move arrival/departure traffic to fixes

with lower demand. Ground delay programs are used to delay traffic at their departure airport when capacity is expected to be reduced at the arrival airport. Ground delay programs are the primary tool for limiting the number of arrivals at an airport that is significantly impacted by bad weather or is anticipated to have limited runway availability. The program is well organized and provides users with limited flexibility to manage the negative consequences to their individual operations. Ground stops are utilized as a last resort measure which hold aircraft on the ground for varying time periods to immediately reduce the number of aircraft allowed to enter the NAS. Normally ground stops are instituted for unusual or unforeseen situations such as runway closures, aircraft accidents or weather conditions that are worse that forecast.

Traffic management initiatives may be implemented singularly or in combination to provide the least disruptive impact while providing the volume of traffic that matches the capacity of the NAS or any of its elements. Typically these initiatives are implemented by individual traffic management units or coordinators for specific time periods or circumstances. Due to user schedules certain restrictions are implemented daily for traffic demand that exceeds the capacity an airport or surrounding airspace. These are called static restrictions and are the exception rather than the rule. Dynamic initiatives are implemented on an irregular basis for specific situations. All of the traffic management initiatives, ground delay programs, are developed and implemented based on the expertise of the traffic management coordinators. Ground delay programs are computer generated and are based on information maintained on scheduled airline operations and other aircraft flight plan information available at the time of implementation.

Traffic management coordinators utilize two computerized systems to assess system demand and monitor traffic movement and severe weather development. A computer system is located at Atlantic City, New Jersey that maintains information on scheduled airline operations as well as flight plan information that is received from ARTCC computers throughout the NAS.

TRAFFIC MANAGEMENT GROUND DELAY PROGRAM PROCESS



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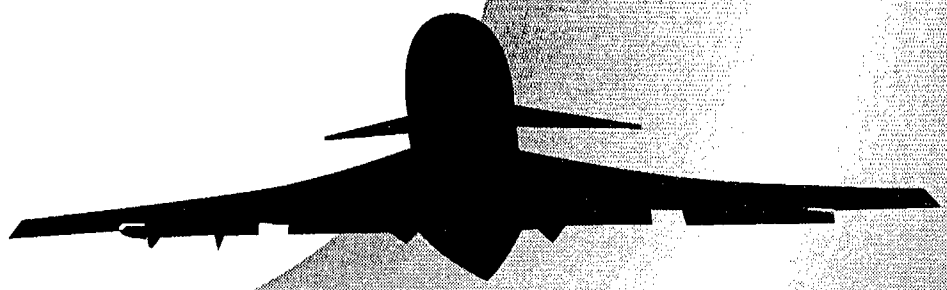
APPENDIX B: AIRSPACE



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APPENDIX B

AIRSPACE

Airports, large and small, feed airplanes into the National Airspace System, or NAS. To understand the NAS, think of the United States as viewed from above. All the flyable airspace above the United States is known as U.S. airspace, or our National Airspace. The federal system designed to monitor and control airborne activity within U.S. airspace.

U.S. airspace is separated into two parts, terminal airspace and en route airspace. Terminal airspace is that area around the nations airports. En route airspace is the large blanket of navigable airspace that covers the nation, in which pilots en route from one destination to another fly. A pilot on a flight from Chicago to Washington begins the flight in a Chicago terminal area, transitions to en route airspace once it leaves the Chicago area, and re-enters terminal airspace on descent into Washington.

As a departing aircraft nears the boundary of the terminal area, the terminal controller hands the aircraft off to a controller at the en route air traffic control facility, known as an Air Route Traffic Control Center (ARTCC), generally referred to as a
Center.

The process of transitioning from one Center to another, and from the Center to the terminal area control facility is seamless, with the computers generating information to the controllers about every flight long before the flight arrives.

To get some idea how airspace is used within the NAS, a flight scenario takes the reader through the system at the baseline, 1995 level.

AIR TRAFFIC CONTROL

Not all aircraft operating within the U.S. Air Traffic Control system are operating under Instrument Flight Rules, (a set of operating procedures that are defined by the Federal Aviation Regulations). VFR (Visual Flight Rules) aircraft also operate in the system. All IFR operations, however, are conducted under the watch and control of air traffic controllers in terminal area or en route facilities.

TERMINAL AIRSPACE

To understand terminal airspace, view each of the nations_ largest airports as the bottom of an imaginary cylinder. Although each airports terminal cylinder is specially configured to conform to local geographical features, a typical terminal area is approximately sixty miles in diameter, and extends upward from the ground to a specified altitude, which depends on the type and size of the airport within the control area.

There may be more than one airport within that terminal airspace; they may be controlled or uncontrolled, but uncontrolled, they will not have a tower. The primary areas of control within

terminal airspace are the ground (the airport itself) and the airspace around the airport. Thus, air traffic control in terminal airspace is divided into two segments: tower control, which controls movement on the ground and in the immediate area—normally five to seven miles, and arrival/departure control, which directs airborne activity within terminal airspace flying toward or away from the airport. Control in this airspace is handled by a Terminal Radar Control facility, known as a TRACON.

The airspace controlled from the TRACON is handled by arrival and departure positions, which control manageable-sized portions of the airspace—each with a controller or team of controllers to watch over air traffic within their area. Arrival and departure positions are normally segregated so that aircraft operating in climbing or descending configurations are kept in separate areas of the airspace.

EN ROUTE AIRSPACE

En route airspace is the large mass of airspace covering the terminal areas, and extending all the way up to the performance limits of civil aircraft. There is no specified bottom to en route airspace as the area at lower altitudes between terminal areas are considered en route airspace because aircraft may be en route at any altitude.

Each Center region is divided into layers and sectors, to give some order to the way air traffic control is accomplished. There are low altitude and high altitude sectors. Aircraft passing through low altitude en route sectors are often climbing or descending through the airspace, while aircraft traversing high altitude sectors generally are more often close to their cruising altitude.

CONTROLLED AIRSPACE

The U.S. Airspace is divided into several different categories, and are subject to different rules and regulations. The airspace categories are designated as a Class D, Class C, Class B area, transition area, control area, continental control area, and Class A within which some or all aircraft may be subject to air traffic control. (Refer to AIM, FAR Part 71)

1. Class D Airspace (formerly Control Zone/CZ) — Controlled airspace which extends upward from the surface of the earth and terminates at the base of the continental control area. Class D airspace that do not underlie the continental control area have no upper limit. Class D airspace may include one or more airports and is normally a circular area of 5 statute miles in radius with extensions where necessary to include instrument approach and departure paths.

2. Class C Airspace (formerly Airport Radar Service Area/ARSA) — Regulatory airspace surrounding designated airports wherein ATC provides radar vectoring and sequencing on a full-time basis for all IFR and VFR aircraft. The service provided in Class C airspace includes: IFR/IFR - standard IFR separation; - IFR/VFR traffic advisories and conflict resolution; and VFR/VFR - traffic advisories and, as appropriate, safety alerts. The AIM contains an

explanation of Class C airspace. Class C airspace is depicted on VFR aeronautical charts.

3. Class B Airspace (formerly Terminal Control Area/TCA) — Controlled airspace extending upward from the surface or higher to specified altitudes, within which all aircraft are subject to operating rules and pilot and equipment requirements specified in FAR Part 91. Class B airspace is depicted on Sectional, World Aeronautical, En Route Low Altitude, DOD FLIP and Terminal Area charts.

4. Transition Area — Controlled airspace extending upward from 700 feet or more above the surface of the earth when designated in conjunction with an airport for which an approved instrument approach procedure has been prescribed, or from 1,200 feet or more above the surface of the earth when designated in conjunction with airway route structures or segments. Unless otherwise limited, transition areas terminate at the base of the overlying controlled airspace. Transition areas are designed to contain IFR operations in controlled airspace during portions of the terminal operation and while transiting between the terminal and en route environment.

5. Control Area — Airspace designated as Colored Federal airways, VOR Federal airways, control areas associated with jet routes outside the continental control area (FAR 71.163), additional control areas (FAR 71.163), control area extensions (FAR 71.165) and area low routes. Control areas do not include the continental control area, but unless otherwise designated, they do not include the airspace between a segment of a main VOR Federal airway and its associated alternate segments with the vertical extent of the area corresponding to the vertical extent of the related segment of the main airway. The vertical extent of the airspace extends upward from 700 feet above the surface (until designated from 1,200 feet above the surface or from at least 300 feet below the MEA, whichever is higher) to the base of the continental control area.

6. Continental Control Area/CCA — Airspace at and above 14,500 feet within the 48 contiguous states including the District of Columbia and Alaska south of latitude 68 00' N., excluding the Alaska peninsula west of 160 00' W. It does not include airspace less than 1500 feet above terrain and prohibited and restricted areas (except certain specified restricted areas).

7. Class A Airspace (formerly Positive Control Area/PCA) — Airspace designated in FAR, Part 71 within which there is positive control of aircraft. Flight in PCA is normally conducted under instrument flight rules. Class A airspace is designated throughout most of the conterminous United States and its vertical extent is from 18,000 feet MSL to and including flight level 600. In Alaska Class A airspace does not include the airspace less than 1,500 feet above the surface of the earth nor the airspace over the Alaska Peninsula west of longitude 160 W. Rules for operating in Class A airspace are found in FARs 91.97 and 91.24.

SPECIAL USE AIRSPACE

Special Use Airspace is another category of airspace that exists within the NAS. Special use airspace refers to several categories of airspace that are set aside for a variety of different purposes (usually military), such as the airspace over some military bases, air defense warning zones, military aviation training areas, missile testing ranges, special security zones—examples are the airspace directly over the White House, the Presidents retreat at Camp David, Maryland and a range of other special considerations. Special use airspace is clearly defined on aeronautical charts, and the rules for civil aviation regarding different classes of special use airspace are clearly defined as well.

Classifications of Special Use Airspace are as follows:

1. Prohibited Area — prohibited areas contain airspace of defined dimensions identified by an area on the surface of the earth within which the flight of aircraft is prohibited. Such areas are established for security or other reasons associated with the national welfare. These areas are published in the Federal Register and are depicted on aeronautical charts.

2. Restricted Area — restricted areas contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not part of those activities or both. Restricted areas denote the existence of unusual, often invisible hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. Restricted airspace is depicted on the en route chart appropriate for use at the altitude or flight level being flown. For joint-use restricted areas, the name of the controlling agency is shown on these charts.

3. Warning Area — warning areas are airspace which may contain hazards to nonparticipating aircraft in international airspace. Warning areas are established beyond the 3 mile limit. Though the activities conducted within warning areas may be as hazardous as those in restricted areas, warning areas cannot be legally designated as restricted areas because they are over international waters. Penetration of warning areas during periods of activity may be hazardous to the aircraft and its occupants.

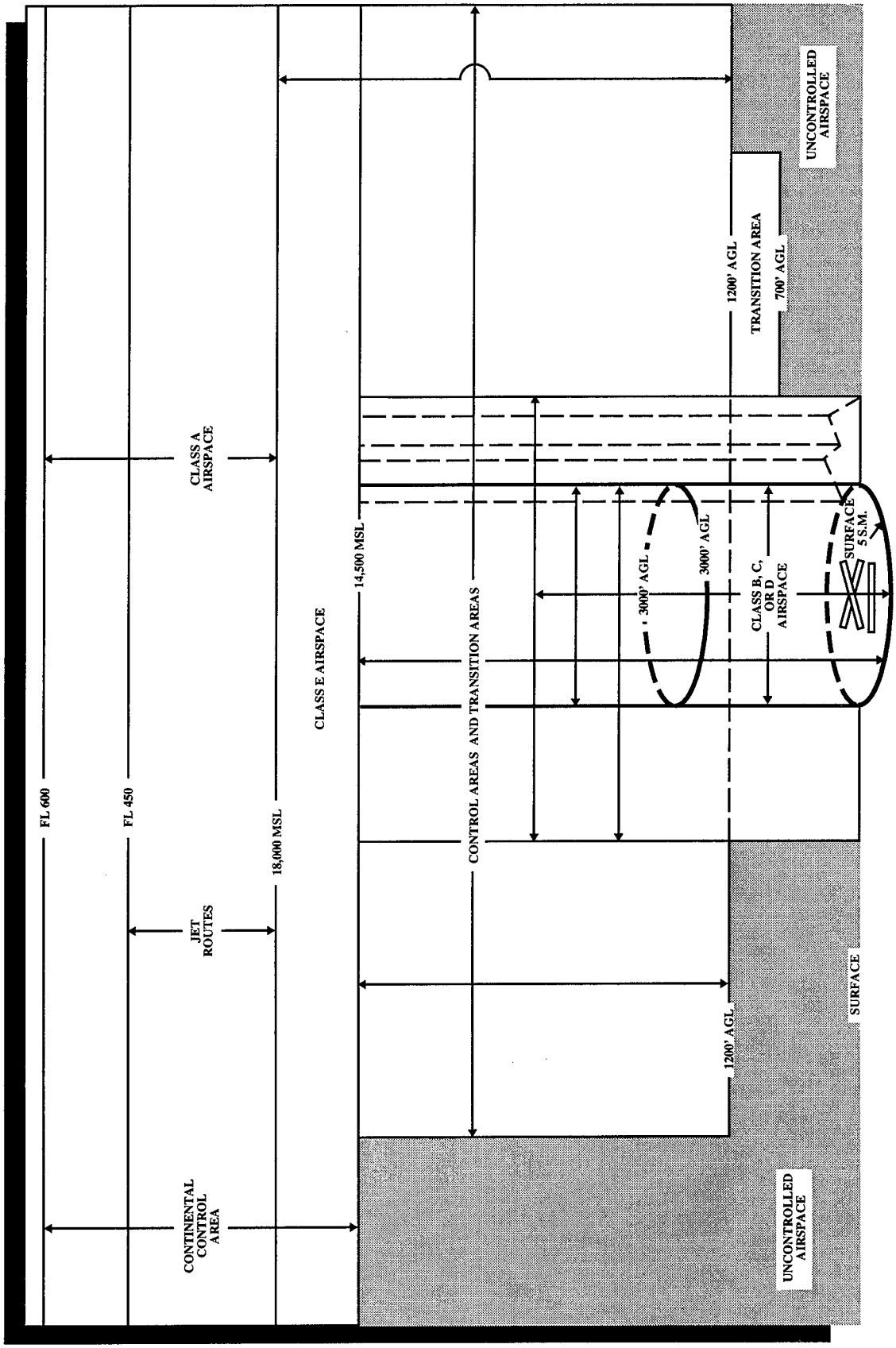
4. Military Operations Areas/MOA — MOAs consist of airspace of defined vertical and lateral limits established for the purpose of separating certain military training activities from IFR traffic. Whenever a MOA is being used,

non participating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict non participating IFR traffic. MOA's are depicted on Sectional, VFR Terminal, Area and Low Altitude En Route Charts. Most training activities necessitate acrobatic or abrupt flight maneuvers. Military pilots conducting flight in Department of Defense aircraft within a designated and active military operations area are exempt from the provisions of FAR-91 which prohibit acrobatic flight within Federal airways and control zones.

5. Alert Areas — Alert areas are depicted on aeronautical charts to inform non participating pilots of area that may contain a high volume of pilot training or an unusual type of aerial activity. Pilots of participating aircraft as well as pilots transiting the area are equally responsible for collision avoidance within Alert Areas.

6. Controlled Firing Areas — Controlled firing areas contain activities which, if not conducted in a controlled environment, could be hazardous to nonparticipating aircraft. The distinguishing feature of the controlled firing area, as compared to other special use airspace, is that its activities are suspended immediately when spotter aircraft, radar, or ground lookout positions indicate an aircraft might be approaching the area. There is no need to chart Controlled Firing Areas since they do not cause non participating aircraft to change to alter flight paths.

TYPICAL U.S. AIRSPACE CONFIGURATION



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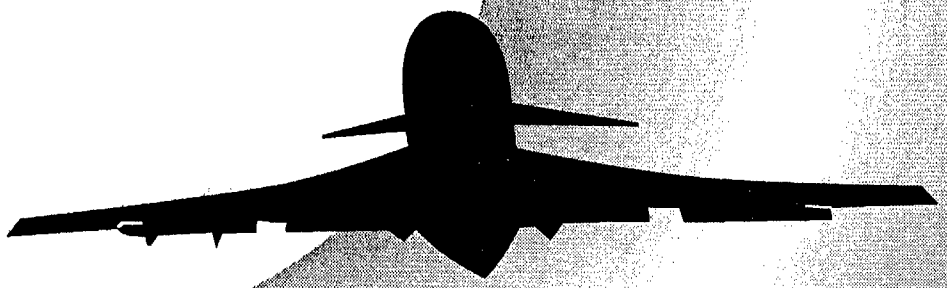

APPENDIX C: ACRONYM LIST

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APPENDIX C

ACRONYMS

A

A&E ..... Airport and Environmental
A/N ..... Alphanumeric
AAM ..... Associate Airspace Manager
AAR ..... Arrival Acceptance Rate
AAAS ..... Automated Airport Advisory System
AAIS ..... Automated Airport Information System
AATM ..... Assistant Air Traffic Manager
AMSS ..... Aeronautical Mobile Satellite System
ACARS ..... ARINC Communications Addressing and Reporting System
ACE ..... ASOS Controller Equipment
ACIDS ..... Aircraft Identifications
ADAS ..... AWOS Data Acquisition System/Demonstration Project
ADIZ ..... Air Defense Identification Zone
ADL ..... Aeronautical Datalink
ADS ..... Automatic Dependent Surveillance
AERA ..... Automated Enroute Air Traffic Control
AES ..... Aircraft Earth Stations
AF ..... Airways Facilities (Division)
AFS ..... FAA Flight Standards Service
AFSS ..... Automated Flight Service Station
AFTN ..... Aeronautical Fixed Telecommunications Network
AGICS ..... Air/Ground Interphone Communication System
AIRS ..... Airport Information Retrieval System
AIS ..... Aeronautical Information System
AIU ..... Airport Interface Unit
ALS ..... Approach Lighting System
AMASS ..... Airport Movement Area Safety System
AM ..... Airspace Manager
AM ..... Area Manager
AMA ..... Assistant Manager for Automation
AMIC ..... Area Manager in Charge
AMIS ..... Aircraft Management Information System
AMP ..... Aircraft Management Program
AOAS ..... Advanced Oceanic Automation System
ARAC ..... Airport Radar Approach Control
ARD ..... Alert and Resolution Display
ARINC ..... Aeronautical Radio, Inc.
ARO ..... Airport Reservation Office
ARSA ..... Airport Radar Service Area
ARSR ..... Air Route Surveillance Radar
ARTCC ..... Air Route Traffic Control Center

ARTS ..... Automated Radar Terminal System
ASA ..... Aircraft Separation Assurance
AS ..... Area Supervisor
ASD ..... Aircraft Situation Display
ASDE ..... Airport Surface Detection Equipment
ASIC ..... Area Supervisor in Charge
ASR ..... Airport Surveillance Radar
ASTA ..... Airport Surface Traffic Automation
ASTC ..... Airport Surface Traffic Control
ASOS ..... Automated Surface Observation System
ATA ..... Air Traffic Assistant
ATC ..... Air Traffic Control
ATCCC ..... Air Traffic Control Command Center
ATCRBS ..... Air Traffic Control Radar Beacon System
ATCSCC ..... Air Traffic Control System Command Center
ATCS ..... Air Traffic Control Specialist
ATCT ..... Airport Traffic Control Tower
ATIS ..... Automated Terminal Information System
ATMS ..... Advanced Traffic Management System
ATN ..... Automated Telecommunications Network
ATOMS ..... Air Traffic Operations Management System
AUS ..... Automation Specialist
AUTOVON ..... Automated Voice Network
AVARS ..... Automated Voice Airport Reservation System
AVRS ..... Automated Voice Recognition System
AWANS ..... Aviation Weather and NOTAM System
AWDS ..... Aviation Weather Display System
AWIPS-90 ..... Advanced Weather Interactive Processing System for the 90's
AWIS ..... Airport Weather Information System
AWOS ..... Automatic Weather Observating System
AWP ..... Aviation Weather Processor
AWPG ..... Aviation Weather Products Generator

B

BANS ..... BRITE Alphanumeric System (Subsystem)
BASOPS ..... Base of Operations (Military)
BC ..... Broadcast (FSS Position or Function)
BRITE ..... Bright Radar Indicator Tower Equipment
BUEC ..... Backup Emergency Communications

C

CA ..... Conflict Alert
CADA ..... Converging Approach Display Aid
CARF ..... Central Altitude Reservation Function
CASIP ..... Cockpit Airport Surveillance Information Program

CC ..... Cab Coordinator
CD ..... Clearance Delivery
CDC ..... Computer Display Channel
CDR ..... Critical Data Recording
CDTI ..... Cockpit Display of Tower Information
CELCOM ..... Cellular Communications System
CENRAP ..... Center ARTS Radar Processing
CERAP ..... Combined Center/Radar Approach Control
CFCN ..... Communications Facilities Consolidation Network
CFWSU ..... Central Flow Weather Service Unit
CHI ..... Computer Human Interface
CIP ..... Capital Investment Plan
CIU ..... Common Interface Unit
CNSP ..... Consolidated NOTAM System Processor
CONUS ..... Contiguous United States
COTS ..... Commercial Off-The-Shelf
CRA ..... Conflict Resolution Advisory
CRD ..... Computer Readout Device
CRDA ..... Converging Runway Display Aid
CRT ..... Cathode Ray Tube
CTAF ..... Common Traffic Advisory Frequency
CTAS ..... Center/TRACON Automation System
CTDS ..... Cockpit Tower Display System
CTEL ..... Cellular Telecommunications System
CUE ..... Computer Update Equipment
CWP ..... Central Weather Processor
CWSU ..... Center Weather Service Unit

D

DA ..... Descent Advisory
DADS ..... Domestic Automatic Dependent Surveillance
DARC ..... Direct Access Radar Channel
DART ..... Data Analysis and Reduction Tool
DASI ..... Digital Altimeter Setting Indicator
DATIS ..... Digital Airport Traffic Information System
DBRITE ..... Digital Bright Radar Indicator Tower Equipment
DCC ..... Display Channel Complex
DCCR ..... Display Channel Complex Replacement
DCIA ..... Dependent Converging Instrument Approaches
DDC ..... Direct Data Communications
DDR ..... Departure Delivery Rate
DDS ..... Direct Dependent Surveillance
DEDS ..... Data Entry Display Subsystem (ARTS III)
DEN ..... Denver (TRACON)
DF ..... Direction Finder
DFW ..... Dalls/Fort Worth

DL ..... Data Link
DLP ..... Datalink Processor
DMAAC ..... Defense Mapping Agency Aeronautical Center
DME ..... Distance Measuring Equipment
DME/P ..... Precision Distance Measuring Equipment
DOC ..... Department of Commerce
DOD ..... Department of Defense
DOT ..... Department of Transportation
DOTS ..... Dynamic Ocean Track System
DPU ..... Data Processing Unit
DSC ..... Data System Coordinator (ARTCC)
DSCS ..... Domestic Satellite Communication System
DSEDM ..... Departure Sequencing Engineering Development Model
DSN ..... Defense Switch Network
DSP ..... Departure Sequencing Program
DSR ..... Display System Replacement
DSS ..... Data Systems Specialist
DUATS ..... Direct User Access Terminal System

E

EARTS ..... Enroute Automated Radar Tracking System
ECAS ..... Enhanced Collision Avoidance System
EDARC ..... Enhanced Direct Access Radar Channel
EFAS ..... Enroute Flight Advisory Service
EFD ..... Electronic Flight Data
ELT ..... Emergency Locator Transmitter
EMSAW ..... Enroute Minimum Safe Altitude Warning
EPIRB ..... Emergency Position Indicator Radio Beacon
EPS ..... Engineered Performance Standards
E-SCAN ..... Electronically Scanned (Parallel Runway Surveillance System)
ETA ..... Estimated Time of Arrival
ETD ..... Estimated Time of Departure
ETE ..... Estimated Time Enroute
ETMS ..... Enhanced Traffic Management System
ETVS ..... Enhanced Terminal Voice System

F

F&E ..... Facilities and Equipment
FAA ..... Federal Aviation Administration
FAAAC ..... FAA Aeronautical Center
FAATC ..... FAA Technical Center
FAR ..... Federal Aviation Regulations
FAS ..... Full Aera Services
FAST ..... Final Approach Spacing Tool
FBO ..... Fixed Base Operator

FD ..... Flight Data
FDAD ..... Full Digital ARTS Display
FDED ..... Flight Data Entry and Display
FDEP ..... Flight Data Entry and Printout
FDIO ..... Flight Data Input/Output
FDP ..... Flight Data Processing
FDPR ..... Flight Data Processing Replacement
FIR ..... Flight Information Region
FIS ..... Flight Information Services
FL ..... Flight Level
FMA ..... Final Monitor Aid
FMS ..... Flight Management System
FS ..... Flight Standards
FSAS ..... Flight Service Automation System
FSDPS ..... Flight Service Data Processing System
FSS ..... Flight Service Station
FT ..... Terminal Forecast
FTMI ..... Flight Management System/Traffic Management System Integration
FW ..... Flight Watch
FWSU ..... Facility Weather Service Unit
FY ..... Fiscal Year

G

GC ..... Ground Control
GDB ..... Ghost Data Block
GES ..... Ground Earth Station
GFS ..... Gridded Forecast System
GH ..... Gate Hold (Tower Function)
GOES ..... Geostationary Orbiting Environmental Satellite
GPS ..... Global Positioning System
GUI ..... Graphic User Interface

H

HARS ..... High Altitude Route System
HID ..... Host Interface Device
HIWAS ..... Hazardous Inflight Weather Advisory Service
HCS ..... Host Computer System
HP ..... Hewlett-Packard

I

IAS ..... Initial Aera Services
IBAG ..... Interface Buffer Adapter Generator
ICAO ..... International Civil Aviation Organization
ICSS ..... Integrated Communications Switching System

IDCU ..... Informational Display and Control Unit
IDS ..... Information Display System
IF ..... In Flight
IFC ..... In Flight Consolidation
IFCN ..... Interfacility Communications Network
IFR ..... Instrument Flight Rules
IFSS ..... International Flight Service Station
ILS ..... Instrument Landing System
IMC ..... Instrument Meteorological Conditions
IOT ..... Input/Output Teletype
ISSS ..... Initial Sector Suite System
ITS ..... Integrated Tower System
ITWS ..... Integrated Terminal Weather System

J

JPL ..... Jet Propulsion Laboratory

K

KIAS ..... Knots of Indicated Airspeed
KVDT ..... Keyboard Video Display Terminal

L

LABS ..... Leased Service A and B
LAN ..... Local Area Network
LC ..... Local Control
LCF ..... Local Control Facility
LCN ..... Local Communication Network
LDIN ..... Lead-in Lighting System
LDRCL ..... Low Density Radio Communications Link
LED ..... Light-Emitting Diode
LFME ..... Local Flow Management Enhancements
LINCS ..... Leased Interfacility NAS Communications System(s)
LLWAS ..... Low Level Wind Shear Alerting System
LOFF ..... Loran-C Offshore Flight Following
LORAN-C ..... Long-Range Aid to Navigation

M

M1FC ..... Model 1 Full Capacity
MA ..... Monitor Alert
MARSA ..... Military authority Assumes Responsibility for Separation of Aircraft
MCF ..... Metroplex Control Facility
MCI ..... Mode C Intruder
MLS ..... Microwave Landing System

MOA ..... Military Operating Area
MODE S ..... Mode Select
MNPR ..... Minimum Navigation Performance Requirements
MOPS ..... Minimum Operational Standards
MOS ..... Military Operations Specialist
MPS ..... Maintenance Processor (System (Subsystem)
MSAW ..... Minimum Safe Altitude Warning
MSL ..... Mean Sea Level
MWP ..... Meteorological Weather Processor

N

NADIN ..... National Airspace Data Interchange Network
NAS ..... National Airspace System
NASA ..... National Aeronautics and Space Administration
NASNET ..... National Airspace System Network
NATCOM ..... National Communications Center
NAVAID ..... Navigational Aid
NDI ..... Non Developmental Item
NEXRAD ..... Next Generation Weather Radar
NFDC ..... National Flight Data Center
NMCC ..... National Maintenance Coordination Center
NMCE ..... Network Management and Control Equipment
NMPS ..... National Maintenance Processor System
NO ..... NOTAM (Flight Service Station Function)
NOAA ..... National Oceanographic and Atmospheric Administration
NODA ..... NAS Operational Data Archive
NORAD ..... North America Air Defense Command
NOS ..... National Ocean Service
NOTAM ..... Notice to Airmen
NRKM ..... Non-Radar Keyboard Multiplexer
NRM ..... National Route Management Specialist (ATCSCC)
NSSF ..... National System Support Facility
NTAP ..... National Track Analysis Program
NTMO ..... National Traffic Management Officer
NWS ..... National Weather Service
NYT ..... New York TRACON

O

OAG ..... Official Airline Guide
OALT ..... Operational Acceptance Level of Traffic
OAS ..... Oceanic Advanced Systems
OCS ..... Oceanic Communication System
ODALS ..... Omnidirectional Approach Lighting System
ODAPS ..... Oceanic Display and Planning System
ODL ..... Oceanic Data Link

ODMS ..... Operational Data Management System
OE/AAA ..... Obstruction Evaluation and Airport/Airspace Analysis
OEDP ..... Operational Error Detection Program
OFDPS ..... Offshore Flight Data Processing System
ORD ..... Operational Readiness Date
Operational Requirements Document
OTFP ..... Operational Traffic Flow Planning

P

PAM ..... Peripheral Adapter Module
PAMRI ..... Peripheral Adapter Module Replacement Item
PAPI ..... Precision Approach Path Indicator
PAR ..... Preferential Arrival Routing
PATWAS ..... Pilot Automatic Telephone Weather Answering Service
PDAR ..... Preferential Departure/Arrival Routing
PDC ..... Predeparture Clearance
PDR ..... Preferential Departure Routing
PEM ..... Positional Entry Module
PF ..... Pre Flight (Flight Service Station Function)
PIREP ..... Pilot Report
PPI ..... Pre-planned Product Improvement
PPS ..... Precise Positioning Service
PRM ..... Precision Runway Monitor
PSN ..... Packet-Switched Network
PUPS ..... Principle User Processor Subsystem
PVD ..... Plan View Display

Q

QAK ..... Quick-Action Keyboard
QF ..... Flight Plan Readout Request Message (NAS)
QZ ..... Assigned Altitude Message (NAS)

R

R ..... Radar Controller
R&D ..... Research and Development
RA ..... Radar Associate Controller
RA ..... Resolution Advisory
RADS ..... Radar Alphanumeric Display System
RANK ..... Replacement Alphanumeric keyboard
RBDE ..... Radar Bright Display Equipment
RBDER ..... Radar Bright Display Equipment Replacement
RC ..... Radar Coordinator
RCE ..... Radio Control Equipment
RCL ..... Radio Communications Link

RCSU ..... Remote Control Status Unit
RCU ..... Remote Control Unit
RDA ..... Radar Data Acquisition
RDP ..... Radar Data Processing
REU ..... Remote Control Status Unit Electronics Unit
RFP ..... Request for Proposal
RKM ..... Radar Keyboard Multiplexer
RLIM ..... Runway Light Intensity Monitor
RM1FC ..... Model 1 Full Cpacity Replacement
RMM ..... Remote Maintenance Monitoring
RMMC ..... Remote Maintenance Monitoring System
RMS ..... Remote Monitoring System (Subsystem)
RO ..... Regional Office
RPG ..... Radar Products Generator
RRCS ..... Remote Radio Control System
RRWDS ..... Remote Radar Weather Display System
RVR ..... Runway Visual Range
RWP ..... Real-Time Weather Processor

S

S9 ..... ASR-9 Radar Status
SA ..... Surface Area (Weather) Observation
SAF ..... Satellite ARTS Facility
SAM ..... Surveillance Airspace Manager
SAMS ..... Special Use Airspace Management System
SAO ..... Surface Area Observation
SBIS ..... Satellite-based Independent Surveillance
SC ..... System Console
SCD ..... Satellite Clearance Delivery
SCIP ..... System Control Interface Processor
SCT ..... Southern California TRACON
SE ..... Systems Engineer
SID ..... Standard Instrument Departure
SIE ..... Sensor Interface Electronics
SIGMET ..... Significant Meteorological Event
SPS ..... Standard Positioning Service
SSCC ..... System Support Computer Complex
SSF ..... System Support Facility
SSL ..... System Support Laboratory
STAR ..... Standard Terminal Arrival Route
STARS ..... Standalone TRACON Automation Replacement System
STMC ..... Supervisory Traffic Management Coordinator
STMS ..... Surface Traffic Management System
STOL ..... Short Takeoff and Landing
SUA ..... Special Use Airspace
SVFR ..... Special Visual Flight Rules

T

TADS ..... Terminal Area Display System
TATCA ..... Terminal Air Traffic Control Automation
TBD ..... To Be Defined
TBS ..... To Be Scheduled
TCAS ..... Traffic Alert and Collision Avoidance System
TCCC ..... Tower Control Computer Complex
TCS ..... Terminal Communications System
TDLS ..... Tower Data Link Services
TDWR ..... Terminal Doppler Weather Radar
TECS ..... Tower Enroute Control Service
TFM ..... Traffic Flow Management
TGP ..... Tower Gateway Processor
TIBS ..... Telephone Information Briefing System
TIDS ..... Tower Information Display System
TIU ..... ATCA Interface Unit
TM ..... Traffic Management
TMA ..... Traffic Management Advisor
TMC ..... Traffic Management Coordinator
TMS ..... Traffic Management System
TMU ..... Traffic Management Unit
TP ..... Telecommunications Processor
TTMU ..... Terminal Traffic Management Unit
TRACON ..... Terminal Radar Approach Control
TSC ..... Transportation Systems Center
TWEB ..... Transcribed Weather Broadcast

U

USNOF ..... United States NOTAM Office
USNS ..... United States NOTAM Service

V

VASI ..... Visual Approach Slope Indicator
VECP ..... Value Engineering Change Proposal
VFR ..... Visual Flight Rules
VHF/DF ..... Very High Frequency Direction Finder
VMC ..... Visual Meteorological Conditions
VR ..... Voice Recognition
VRS ..... Voice Response System
VSCS ..... Voice Switching and Control System
VTEC ..... Voice Tower Electronic Communications

W

WAN ..... Wide Area Network
WARP ..... Weather and Radar Processor
WS ..... Workstation
WMSC ..... Weather Message Switching Center
WMSCR ..... Weather Message Switching Center Replacement
WOC ..... Washington Operations Center (FAA)
WR ..... Weather Request
WSP ..... Weather Surveillance Processor

X

XPDR ..... Transponder

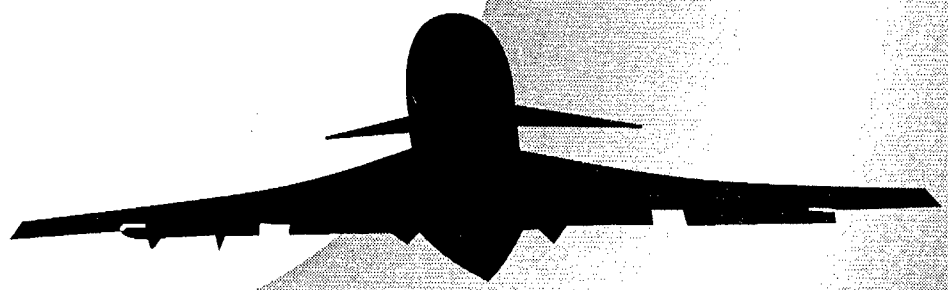
Y

Z

ZAN ..... Anchorage ARTCC
ZOA ..... Oakland Air Route Traffic Control Center
ZNY ..... New York Air Route Traffic Control Center

THE FAA AIR TRAFFIC SYSTEM
VISION OF THE FUTURE

APPENDIX D: GLOSSARY



U.S. Department of
Transportation
**Federal Aviation
Administration**

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APPENDIX D

GLOSSARY

The following terms are defined for the purpose of clarifying their meaning. This unofficial glossary was compiled to provide a common understanding of terms related to the National Airspace System (NAS). The terms contained in this glossary are primarily defined in an operational sense, and are applicable to users, operators and maintainers of the NAS. Those terms most frequently used in pilot/controller communications are printed in bold.

Acknowledge

(1) A response to a request, without further commitment, as to what action will be taken.

(2) A query from a controller meaning "let me know that you have received my message."

active flight plan

All flights for which an actual departure time has been entered, whether the flight originates inside or outside the control area.

adjacent center

A center whose area is adjacent to that of the center being discussed.

advise intentions

Control instructions meaning, "tell me what you plan to do."

advisory

(1) Advice and information provided to assist pilots in the safe conduct of flight and aircraft movement.

(2) A message given to the pilot containing information relevant to collision avoidance.

advisory frequency

The appropriate frequency to be used for local Airport Advisory Service.

aeronautical and meteorological data

Any combination of aeronautical and weather information.

aeronautical chart

A map used in air navigation containing all or part of the following: Topographic features, hazards and obstructions, navigation aids, navigation routes, designated airspace, and airports.

aeronautical information

Aeronautical information generally refers to NOTAMs, but may consist of any of the following: (a) information concerning the establishment, condition or change in any component of the NAS (e.g., airports, NAVAIDs); (b) information regarding the boundaries and effective times of restricted or special use airspace; (c) information regarding preferred or fuel efficient routes; or (d) traffic management information.

air carrier

(1) An aircraft certified by the FAA for the purpose of carrying persons or goods for hire on an established airway. (2) All civil aviation activities certificated in accordance with FAR Parts 121, 123, 127, and 135. (3) Any citizen of the United States who undertakes, whether directly or indirectly or by lease or any other arrangement, to engage in air transportation.

1. air taxi — An air carrier certificated in accordance with FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally, such operations involve the operation of small aircraft "for hire" for specific trips.

2. air travel club — An operator certified in accordance with FAR Part 123 to engage in the carriage of members who are qualified for that carriage by payment of an assessment, dues, membership fees, or other similar remittance.

3. all-cargo carrier — An air carrier certificated in accordance with FAR Part 121 to provide scheduled air freight, express, and mail transportation over specified routes, as well as the conduct of non-scheduled operations which may include passengers.

4. charter air carrier — An air carrier holding a certificate of public convenience and necessity authorizing it to engage in charter air transportation.

5. commercial air carriers — An air carrier certificated in accordance with FAR Parts 121 or 127 to conduct scheduled services on specified routes. These air carriers may also provide non-scheduled or charter services as a secondary operation. Four carrier groupings have been designated for statistical and financial data aggregation and analysis.

a. majors — Air carriers with annual operating revenues greater than $1 billion.

b. nationals — Air carriers with annual operating revenues of between $100 million and $1 billion.

c. large regional — Air carriers with annual operating revenues

6. commuter air carrier — An air carrier certificated in accordance with FAR Part 135 which operates with a maximum of 60 seats, and provides at least five scheduled round trips per week between two or more points, or caries mail.

7. foreign flag air carrier — An air carrier other than a U. S. flag air carrier in international air transportation. "Foreign air carrier" is a more inclusive term than "foreign flag air carrier," presumably including those non-U. S. air carriers operating solely within their own domestic boundaries. In practice, the two terms are used interchangeably.

8. supplemental air carrier — An air carrier certificated in accordance with FAR Part 121, and providing non-scheduled or supplemental carriage of passengers or cargo, or both, in air transportation. They are also referred to as non-scheduled or charter air carriers.

Air Defense Identification Zone/ADIZ

The area of airspace over land or water, extending upward from the surface, within which the ready identification, the location, and the control of aircraft are required in the interest of national security.

1. Domestic Air Defense Identification Zone — An ADIZ within the United States along an international boundary of the United States.

2. Coastal Air Defense Zone — An ADIZ over the coastal waters of the United States.

3. Distant Early Warning Identification Zone/DEWIZ — An ADIZ over the coastal waters of the State of Alaska.

ADIZ locations and operating and flight plan requirements for civil aircraft operations are specified in FAR Part 99. (Refer to AIM)

air-filed flight plan

A flight plan filed by an aircraft which is already airborne and operating under VFR conditions.

air navigation facility

Any facility used in, available for use in, or designated for use in, aid of air navigation, including landing areas, lights, any apparatus or equipment for disseminating weather information, for signaling, for radio-directional finding, or for radio or other electrical communication, and any other structure or mechanism having a similar purpose for guiding or controlling flight in he air or the landing and takeoff of aircraft.

Air Route Traffic Control Center/ARTCC

A facility established to provide air traffic control service to aircraft operating on instrument flight rules (IFR) flight plans within controlled airspace, and principally during the en route phase of flight. When equipment capabilities and controller workload permit, certain advisory/ assistance services may be provided to aircraft flying under visual flight rules (VFR).

air traffic

Aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas.

air traffic clearance/ATC clearance

An authorization by air traffic control, for the purpose of preventing collision between known aircraft, for an aircraft to proceed under specified traffic conditions within controlled airspace.
air traffic control/ATC

(1) A service operated by appropriate authority to promote the safe, orderly and expeditious flow of air traffic.

(2) A generic term for a joint civil-military system for controlling traffic within a specified area.

Air Traffic Control Command Center/ATCCC

An Air Traffic Operations Service facility consisting of four operational units.

1. Traffic Management (TM) Function — Responsible for coordination and approval of all major inter-center flow control restrictions on a system basis in order to obtain maximum utilization of the airspace.

2. Central Altitude Reservation Function/CARF — Responsible for coordinating, planning, and approving special user requirements under the altitude reservation/ALTRV. See altitude reservation.

3. Airport Reservation Office/ARO — Responsible for approving IFR flights at designated high density traffic airports (John F. Kennedy, LaGuardia, O'Hare, and Washington National) during specified hours. (Refer to FAR Part 93 and Airport/Facility Directory)

4. ATC Contingency Command Post — A facility which enables the FAA to manage the ATC system when significant portions of the system's capabilities have been lost or are threatened.

5. ATCCC specialist — Traffic management specialist resident at the air traffic control command center who coordinates with local traffic management specialists at ARTCC's and manages flow control operations.

<u>air traffic control facility</u>

A facility that provides air traffic control service.

<u>air traffic control service</u>

A service provided for the purpose of promoting the safe, orderly, and expeditious flow of air traffic including airport, approach, and en route air traffic control service.

<u>Air Traffic Control Radar Beacon System/ATCRBS</u>

A secondary surveillance radar system having ground-based interrogators and airborne transponders capable of operation on Modes A and C.

<u>Air Traffic Control Specialist/ATCS</u>

A duly authorized person providing air traffic control service.

<u>air traffic control system</u>

All components, human and otherwise, of a system providing ATC service.

<u>aircraft movement areas</u>

Those areas which encompass the runways, taxiways and other areas of the airport utilized for taxiing, takeoff and landing of aircraft, excluding aprons and parking areas.

aircraft operations

The airborne movement of aircraft in controlled or non-controlled airport terminal areas, and counts at en route fixes or other points where counts can be made. There are two types of operations: local and itinerant.

Airman's Meteorological Information/AIRMET

In flight weather advisories issued only to amend the area forecast concerning weather phenomena which are of operational interest to all aircraft and potentially hazardous to aircraft having limited capability because of lack of equipment, instrumentation, or pilot qualifications. AIRMETs concern weather of less severity than that covered by SIGMETs or Convective SIGMETs. AIRMETs cover moderate icing, moderate turbulence, sustained winds of 30 knots or more at the surface, widespread areas of ceilings less than 1,000 feet and/or visibility less than 3 miles, and extensive mountain obscurement.

airport

An area on land or water that is used or intended to be used for the landing and takeoff of aircraft and any appurtenant areas which are used, or intended for use for buildings and facilities located thereon.

1. major — An airport facility which handles a high volume of IFR air traffic.

2. satellite — An airport facility in which a low volume of IFR air traffic is handled, and which is near a major airport.

3. air carrier airport — An existing public airport regularly served, or a new airport which will be regularly served by a certificated air carrier (other than a supplemental air carrier).

4. commuter service airport — An air carrier airport which is regularly served by one or more air carriers (certificated under section 401 of the FAA Act) at which not less than 2,500 passengers were enplaned in the aggregate by all such carriers during the preceding calendar year.

5. general aviation airport — A public airport, which is not an air carrier airport, used primarily for general aviation operations.

6. reliever airport — A general aviation airport designated as having the primary function of relieving congestion (by diverting general aviation traffic) at an air carrier airport.

airport acceptance rate/AAR

The maximum number of aircraft which can land at an given airport for a given time period, usually specified in aircraft per hour. This dynamic input parameter specifies the number of arriving aircraft which an airport or airspace can accept from the ARTCC per hour. The AAR is used to calculate the desired interval between successive arrival aircraft.

airport advisory area

The area within ten miles of an airport without a control tower or where the tow is not in operation, and on which a Flight Service Station is located. See airport advisory service.

Airport Advisory Service/AAS

A service provided by flight service stations located at airports not serviced by a control tower. This service consists of providing information to arriving and departing aircraft concerning wind direction and speed, favored runway, altimeter setting, pertinent known traffic, pertinent known field conditions, airport taxi routes and traffic patterns, and authorized instrument approach procedures. This information is advisory in nature and does not constitute an ATC clearance.

airport operator

Any person(s) having the operational control of an airport.

airport reservation negotiations

The communications, via telephone, between ATC Command Center personnel and an airline dispatch office, military base operations or FSS personnel concerning airport reservations. This negotiation process may result in a shifting of allocations. See airport reservation request.

airport reservation request

A request for the allocation of a time-slot at a high density airport.

airport reservation response

The response to an airport reservation request (approval or rejection of the requested time-slot at a high density airport).

Airport Traffic Control Tower/ATCT

A terminal facility which through the use of air/ground communications, visual signaling, and other devices, provides air traffic control (ATC) services to airborne

aircraft operating in the vicinity of an airport and to aircraft operating on the movement area.

airspace

The earth's layer of surrounding air, from the surface to at least 70,000 feet.

airway/federal airway

(1) A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

(2) An abbreviation for a sequence of fixes defining an air route which is used when filing flight plans. A named, adapted route defined as a series of adapted fixes and junctions.

altitude reservation/ALTRV

Airspace utilization under prescribed conditions, normally employed for the mass movement of aircraft or other special user requirements which cannot otherwise be accomplished. ALTRV's are provided by the central altitude reservation function (CARF). Although predominantly military in nature, ALTRVs may be obtained by other organizations.

altitude restriction

An altitude or altitudes, stated in the order flown, which are to be maintained until reaching a specific point or time. Altitude restrictions may be issued by ATC due to traffic, terrain, or other airspace considerations.

approach clearance

Authorization by ATC for a pilot to conduct an instrument approach for which a clearance and other pertinent information is provided in the approach clearance when required.

approach control

The control process which delivers aircraft to the final approach course or landing system properly spaced for their landing. This process is also called final spacing control.

approach control area/approach control air space

One or more contiguous fix posting areas controlled by an approach control facility. Approach control air space may overlie or underlie air space controlled by ARTCC sectors or adjacent approach control facilities.

approach control facility

An air traffic control facility exercising control within a delegated block of air space and providing approach control service.

approach control service

Air traffic control service, provided by an approach control facility for arriving and departing VFR/IFR aircraft and on occasion, en route aircraft. At some airports not served by an approach control facility, the ARTCC provides limited approach control service.

approach fix

The fix form or over which final approach (IFR) to an airport is executed.

approach gate

An imaginary point used within ATC as a basis for vectoring aircraft to the final approach course. The gate is established along the final approach course 1 mile from the outer marker (or the fix used in lieu of the outer marker) on the side away from the airport for precision approaches and 1 mile from the final approach on the side away from the airport for non-precision approaches. In either case when measured along the final approach course, the gate is no closer than 5 miles from the landing threshold.

apron/ramp

A defined area on an airport or heliport intended to accommodate aircraft for purposes of loading or unloading passengers or cargo, refueling, parking, or maintenance. With regard to seaplanes, a ramp is used for access to the apron from the water.

ARINC (Aeronautical Radio Incorporated)

An independent corporation which provides high speed data and radio communication services to it its subscribers.

arrival sector

An operational control sector containing one or more meter fixes.

ARTCC

See Air Route Traffic Control Center.

ATC instructions

Directives issued by air traffic control for the purpose of requiring a pilot to take specific actions; e.g., "Turn left heading two five zero," "Go around," "Clear the runway."

Automated Flight Service Station/AFSS

A station that provides interactive alphanumeric and graphic work stations for the flight service specialists.

Automatic Terminal Information Service/ATIS

The continuous broadcast of recorded non-control information in selected high activity terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information; e. g., "Los Angeles information Alpha. One three zero Coordinated Universal Time. Weather, measured ceiling two thousand overcast, visibility three, haze, smoke, temperature seven one, dew point five seven, wind two five zero at five, altimeter two niner niner six, ILS Runway Two Five Left approach in use, Runway Two Five Right closed, advise you have Alpha."

automatic altitude reporting

That function of a transponder which responds to Mode C interrogations by transmitting the aircraft's altitude in 100 foot increments.

brief

When one controller gives concise preparatory information concerning all sector activities to another controller.

call sign

The unique identification of an aircraft or air traffic facility. For aircraft it is the identification as filed in the flight plan and for a facility it is the facility name followed by it's type or function (i.e. Washington Center, Boston Departure).

center

An Air Route Traffic Control Center (ARTCC), and/or that geographical area for which an ARTCC has air traffic control responsibility and which is defined in adaptation. The air space within a center area is sub-divided into fix posting areas that may be controlled by sectors within the center or delegated to approach control facilities. Center air space may overlie or underlie the adapted air space of an adjacent center or an approach control facility.

Center Radar Approach Control/CERAP

A combined air route traffic control center and terminal radar approach control facility.

Central Altitude Reservation Function/CARF

An Air Traffic Service facility established to conduct the volume of coordination, planning and approval of special user requirements under the altitude reservation concept.

Class "A" Airspace

Exists above 18,000 feet in the northeastern portion of the United States and above 24,000 feet in the remainder of the country. In Class A airspace all aircraft are under IFR control and the ATC system provides separation service between all aircraft. Only IFR operations, with the required increased level of avionics and pilot proficiency (IFR rating), are allowed at these altitudes.

clearance

(1) An authorization by air traffic control, for the purpose of preventing collision between known aircraft, for an aircraft to proceed under specified traffic conditions within controlled airspace. See ATC instructions.

(2) A determination by an official and specified authority that an individual is considered trustworthy to have access to any and all classified information within a designated classification category for which he/she may have a need-to-know.

1. clearance limit — The fix, point, or location to which an aircraft is cleared when issued an air traffic clearance.

2. clearance void if not off by (time) — Used by ATC to advise an aircraft that the departure clearance is automatically cancelled if takeoff is not made prior to a specified time. The pilot must obtain a new clearance or cancel his IFR flight plan if not off by the specified time.

3. cleared as filed — Means the aircraft is cleared to proceed in accordance with the route of flight filed in the flight plan. This clearance does not include the altitude, SID, or SID Transition.

4. cleared for (type of) approach — ATC authorization for an aircraft to execute a specific instrument approach procedure to an airport; e.g., "Cleared for ILS Runway Three Six Approach."

5. cleared for approach — ATC authorization for an aircraft to execute any standard or special instrument approach procedure for that airport. Normally, an aircraft will be cleared for a specific instrument approach procedure.

6. cleared for takeoff — ATC authorization for an aircraft to depart. It is predicated on known traffic and known physical airport conditions.

7. cleared through — ATC authorization for an aircraft to make intermediate stops at specified airports without refiling a flight plan while en route to the clearance limit.
8. cleared to land — ATC authorization for an aircraft to land. It is predicated on known traffic and known physical airport conditions.

Combined Center-RAPCON/CERAP

An air traffic facility which combines the functions of an ARTCC and a radar approach control facility.

combining/de-combining

Adapting to traffic loading. At least two sectors, but usually not more than three sectors, are combined when converting from day to night watches. This is a short termed operational rearrangement of sectors and does not involve any change in wiring to the positions.

Common Traffic Advisory Frequency/CTAF

A frequency designed for the purpose of carrying out airport advisory practices while operating to or from an uncontrolled airport. The CTAF may be a UNICOM, Multicom FSS, or tower frequency and is identified in appropriate aeronautical publications.

conflict

The recognition of the predicated loss of separation minima.

1. conflict alert — A function of certain air traffic control automated systems designed to alert controllers of an existing or pending situations recognized by the program parameters that require immediate attention/action.

2. conflict detection — A function which provides an indication of an imminent air collision.

3. conflict resolution — The resolution of potential conflicts between IFR aircraft and VFR aircraft that are radar identified and in communication with ATC by ensuring that radar targets do not touch. Pertinent traffic advisories shall be issued when this procedure is applied. Note: This separation procedure will not be provided utilizing fully digitized radar systems.

conformance

An agreement check between two quantities. An example is the time agreement between a reported time of arrival for a fix and the stored fix time for the same fix.

controlled departure time/CDT

A departure time, usually including a ground delay, assigned to an aircraft as part of an arrival flow program. CDTs are computed for individual aircraft and are used as a means to spread demand for a particular NAS resource over a longer time period in order to alleviate a condition where demand is predicted to be significantly in excess of capacity.

data block

The symbology displayed adjacent to a tracked aircraft target on a PVD, containing aircraft position symbols, leader, velocity vector and the alphanumeric data associated with the aircraft, e.g., aircraft identification, assigned altitude, Mode C altitude, computer number, BEACON code, attention bars, and special condition indicators.

1. data block, full — The symbology displayed adjacent to a tracked aircraft target on a PVD, containing (subject to field filtering) aircraft position symbol, leader, velocity vector and the alphanumeric data associated with the aircraft.

2. data block, limited — A seven character block of data displayed on the R-Controller's PVD. To display uncorrelated emergency, radio failure beacon data blocks, beacon code readout data blocks, or Mode C intruder data.

datalink

Any communication channel or circuit used to transmit data from a sensor to a computer, a readout device, or a storage device. Electronic equipment for automatic transmission of information in digital form.

DBRITE

A vertical display mounted in an ATCT cab, which is used by air traffic personnel to assist them in the control of aircraft. The display operates in an ambient light environment.

departure control

(1) A function of an approach control facility providing air traffic control service for departing IFR and, under certain conditions, VFR aircraft.

(2) ATC operational position which is responsible for the control of departing aircraft from shortly after takeoff until their handoff to the en route system.

Emergency Locator Transmitter/ELT

A radio transmitter attached to the aircraft structure which operates from its own power source on 121.5 MHz and 243.0 MHz. The device aids in locating aircraft by radiating a downward sweep audio tone, 2-4 times per second. It is designed to function without human action after an accident.

enroute

One of three phases of flight services (terminal, en route, oceanic). En route service is provided outside of terminal airspace and is exclusive of oceanic control.

Enroute Flight Advisory Service (EFAS)/flight watch — A service specifically designed to provide, upon pilot request, timely weather information pertinent to his type of flight, and altitude. The FSS's providing this service are listed in the Airport/Facility Directory.

estimated departure clearance time/EDCT

A ground delay assigned to an aircraft arriving at an airport during an arrival flow program. EDCTs are assigned to aircraft which have not been given control departure times (CDTs) and are an average of the delays assigned through the CDTs. The runway release time assigned by the CFCF, ARTCC, or terminal facility is shown as an EDCT on the flight progress strip; i.e., EDCT 1815.

expected departure clearance time/EDCT

The runway release time assigned to an aircraft in a controlled departure time program and shown on the flight progress strip as an EDCT.

fail-safe

(1) The system functional capability which provides for uninterrupted operation following component failures with remaining capacity sufficient to continue performance of all required tasks without derogation.

(2) The automatic termination and protection of programs or other processing operations when a hardware or software failure is detected in a computer system.

(3) A procedure whereby redundant elements of each type of equipment is installed at a facility to allow uninterrupted service whenever a single element fails.

fail-soft

(1) The concept of providing a limited system functional capability following a system failure after the minimum fail-safe condition. System capability in which

operations continue, but with some degradation in capacity, when a failure has occurred.

(2) The selective termination of affected non-essential processing when a hardware or software failure is detected in a computer system.

fast file

A system whereby a pilot files a flight plan via telephone that is tape recorded and then transcribed for transmission to the appropriate air traffic facility. Locations having a fast file capability are contained in the Airport/Facilities Directory.

Federal Airways

There are two categories of federal airways: High altitude and low altitude. Each Federal Airway is based on route segments that extends from one navigational aid or intersection to another navigational aid (or through several navigational aids or intersections) specified for that airway. Federal Airways normally include the primary airspace within parallel boundary lines 4 NM each side of a centerline, and a secondary area of 2 NM either side of the primary area. Each airway segment has a changeover point approximately half way between the two navigational aids which is normally less than 51 miles from either of the navigational aids defining that segment. Normally, the low altitude airways are designated from 1,200 feet above ground level up to 17,999 feet. The high altitude or jet airways are designated at or above 18,000 feet.

filed

Used in conjunction with flight plans, meaning a flight plan has been submitted to ATC.

1. filed flight plan — A set of characters stored as a result of initial input of an FP or SP message, in the form as received by this computer and modified as necessary by: one or more accepted Amendment (AM messages), program-inserted transitions to types 2 and 4 coded routes, SIDs and STARs or program-inserted incomplete route data. Characters entered and recognized as device control, correction, or deletion characters are not included in the filed flight route.

2. filed route — Alphanumeric route data filed in a flight plan. The filed route contains fixes, airways, and pre-filed route identifiers.

3. filed segment — Two fixes, filed or implied, and the route between them.

fix

(1) A geographical position determined by visual reference to the surface, by reference to one or more radio NAVAIDs, by celestial plotting, or by another navigational device.

(2) A geographical point expressed in latitude and longitude (which are converted to system coordinates). The fix is stored and uniquely identified in adaptation. A fix is both an aid for navigation and a reference point for control purposes.

(3) The geographical position of an aircraft for a specified time, established by reference to navigational aids or celestial plot.

flight data

Flight plans, flight plan amendments and flight progress reports (including arrivals and departures where appropriate).

Flight Data Entry and Printout/FDEP

Equipment for a remote location which contains, as a minimum, a Digital Communications Control Unit (DCCU). an alphanumeric keyboard and a flight strip printer. Its interface with the Central Computer Complex is via FDEP adapters located in the PAM.

flight follow

To provide advice and information to assist pilots in the conduct of a flight not otherwise controlled, including the tracking of that flight on a situation display.

flight management system

An aircraft on-board computerized management system which integrates vertical and lateral flight path control.

flight plan

(1) The combination of an altitude profile with a horizontal track.

(2) Specified information relating to an intended flight of an aircraft which is furnished to the appropriate airspace management agency (filed either verbally or in writing with an air traffic control facility, military base operations, or FSS). It is stored in the computer.

flight intentions

The intent of a pilot in command to file a flight plan.

Flight Service Station/FSS

Air traffic facilities which provide pilot briefing, en route communications and VFR search and rescue services, assist lost aircraft and aircraft in emergency situations, relay ATC clearances, originate Notices to Airmen, broadcast aviation

weather and NAS information, receive and process IFR flight plans and monitor radio air navigation facilities (NAVAIDs). In addition, at selected locations, FSSs provide en route flight advisory service (Flight Watch), take weather observations, issue airport advisories, and advise Customs and Immigration of transborder flights.

flight strip

A printed record of specific flight data relating to aircraft position and a time at specific fixes along its route.

flight watch

A shortened term for use in air-ground contacts to identify the flight service station providing En Route Flight Advisory Service; e.g., "Oakland Flight Watch." (See En Route Flight Advisory Service)

FSS

See Flight Service Station.

gate hold procedures

Procedures at selected airports to hold aircraft at the gate or other ground location whenever departure delays exceed or are anticipated to exceed 15 minutes. The sequence for departure will be maintained in accordance with initial call-up unless modified by flow control restrictions. Pilots should monitor the ground control/ clearance delivery frequency for engine start-up advisories or new proposed start time if the delay changes.

general aviation/GA

All civil aviation activity except that of air carriers certificated in accordance with FAR Part 121, 123, 127, and 135. The type of aircraft used in general aviation activities cover a wide spectrum from corporate multi-engine jet aircraft piloted by professional crews to amateur-built single engine piston aerobiotic aircraft, balloons and dirigibles.

handoff

That action whereby identification of, radio communications with and, unless otherwise specified, control responsibility for an aircraft is transferred from one controller to another without interruption of radar surveillance.

in-flight weather briefing

A weather briefing that could be a continuous broadcast of a recorded route-specific weather message, or pertinent route of flight weather information transmitted

from a NAS facility, flight service specialist, or, possibly, a controller to an airborne user.

instrument flight rules/IFR

Flight in which the ATC system assures collision avoidance between aircraft operating in accordance with IFR and CVR in Positive Controlled Airspace. When operating outside Positive Control Airspace, pilot responsibility with respect to collision avoidance differs according to flight weather conditions.

instrument meteorological conditions/IMC

Meteorological conditions expressed in terms of visibility, distance form cloud, and ceiling less than the minima specified for visual meteorological conditions.

inter-phone

Communications between controllers within an ARTCC and stations remote from the ARTCC.

local control

This is the control process which is responsible for the control of the runway surfaces. It takes control of arrival aircraft about three to five miles from touchdown, clears them to land, and issues takeoff clearances to departures.

maintain

(1) Concerning altitude/flight level, the term means to remain at the altitude/ flight level specified. The phrase "climb and" or "descend and" normally precedes "maintain" and the altitude assignment; e.g., "descend and maintain 5,000." (2) Concerning other ATC instructions, the term is used in its literal sense; e.g., maintain VFR.

meteorological data

Refers to changes in alphanumeric information such as surface observations, winds and temperatures aloft, altimeter settings etc., entered into the HCS or ACCC by controllers and forwarded to the CWP as amendments.

metering

A method of time-regulating arrival traffic flow into a terminal area so as not to exceed a predetermined terminal acceptance rate.

microburst

A down draft induced, diverging, horizontal flow near the surface, whose initial dimension is less than 4 km, and whose differential velocity is greater than 10 m/s.

military authority assumes responsibility for separation of aircraft/MARSA

A condition whereby the military services involved assume responsibility for separation between participating military aircraft in the ATC system. It is used only for required IFR operations which are specified in letters of agreement or other appropriate FAA or military documents.

minimum safe altitude warning/MSAW

A function of the ARTS III computer that aids the controller by alerting him when a tracked Mode C- equipped aircraft is below or is predicted by the computer to go below a predetermined minimum safe altitude.

missed approach

A runway approach that must be aborted as a result of problems such as insufficient aircraft spacing, excessive cross-track on approach velocity, or insufficient forward visibility.

movement area

The runways, taxiways, and other areas of an airport which are utilized for taxiing, take-off, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports/heliports with a tower, specific approval for entry onto the movement area must be obtained from ATC.

National Airspace System/NAS

The system of air navigation and air traffic control encompassing communication facilities, air navigation facilities, airways, controlled airspace, special use airspace, and flight procedures authorized by Federal Aviation Regulations (FAR) for domestic and international aviation.

National Flight Data Center/NFDC

A facility established by FAA to operate a central aeronautical information service for the collection, validation, and dissemination of aeronautical data in support of the activities of government, industry, and the aviation community.

navigable airspace

Airspace at and above the minimum flight altitudes prescribed in the FARs including airspace needed for safe takeoff and landing.

Navigation Aid(s)/NAVAID(s)

Any external means of assisting pilots in the calculation and display of airplane present position, velocity vector and related data, i.e., track angle, ground speed, drift angle, etc., as an aid to dead reckoning or position determination.

near-midair collision/NMAC

An incident associated with the operation of an aircraft in which a possibility of collision occurs as the result of a proximity of less than 500 feet to another aircraft, or a report is received from a pilot or a flight crew member stating that a collision hazard existed between two or more aircraft.

Notice to Airmen/NOTAM

A notice identified either as a NOTAM or AIRAD containing information concerning the establishment, condition, or change to any components of (or hazard in) the National Airspace System, the timely knowledge of which is essential to personnel concerned with flight operations.

Notices to Airmen publication

A publication designed primarily as a pilot's operational manual containing current NOTAM information considered essential to the safety of flight as well as supplemental data to other aeronautical publications.

oceanic route(s)

Routes generally depicted on position reporting charts to facilitate flight planning and position reporting while conducting flight in ICAO oceanic control areas.

Official Airline Guide/OAG

A commercial product which contains commercial air carrier schedules, usually provided digitally four times a month to the TMP. These data provide a basis for estimation of future airspace demand.

pilot briefing

A service provided by the Flight Service Station to assist pilots in flight planning. Briefing items may include weather information, NOTAM's military activities, flow control information, and other items as requested.

Pilots Automatic Telephone Weather Answering Service/PATWAS

A continuous telephone recording containing current and forecast weather information for pilots.

PIREP (pilot weather report)

A report initiated by a pilot concerning meteorological phenomena encountered by the in flight aircraft or other pertinent aeronautical information.

plan view display/PVD

A cathode ray tube display that presents, on enroute controller workstations, digitized video alphanumerics and special symbols representing the movement of aircraft.

preferential routes

Preferential routes (PDRs, PARs, and PDARs) are adapted in ARTCC computers to accomplish inter/intra facility controller coordination and to assure that flight data is posted at the proper control positions.

1. preferential arrival route/PAR — (1) An adapted arrival route, program-induced to override, with a route amendment, a filed route from an adapted transition fix or arrival line to one or more adapted airports. (2) A specific arrival route from an appropriate en route point to an airport or terminal area. It may be included in a standard terminal arrival/STAR or preferred IFR route. The abbreviation PAR is used primarily within the ARTCC and should not be confused with the abbreviation for Precision Approach Radar.

2. preferential departure-arrival route/PDAR — (1) An adapted departure route and arrival route for airport to airport processing. In effect, the combination of a PDR and a PAR. (2) A route between two terminals which are within or immediately adjacent to one ARTCC's area. PDARs are not synonymous with preferred IFR routes but may be listed as such as they do accomplish essentially the same purpose.

3. preferential departure route/PDR — (1) An adapted departure route, program-induced to override with a route amendment, a filed route from one or more adapted airports to an adapted transition fix or departure line. (2) A specific departure route from an airport or terminal area to an en route point where there is no further need for flow control. It may be in a standard instrument departure or a preferred IFR route.

preferred routes

Routes established between busier airports to increase system efficiency and capacity.

pre-filed flight plan

A flight plan on file in an FAA facility to provide for point-to-point operations of a recurring nature or quick reaction deployment missions. This type flight plan will

normally include permanent type data, such as route, with a special mission designation when required.

pre-flight briefing

Voice/data information provided to the pilot including various weather, NOTAM, traffic flow, and flight plan information.

published route

A route for which an IFR altitude has been established and published; e.g., Federal Airways, Jet Routes, Area Navigation Routes, Specified Direct Routes.

Radar Approach Control Facility/RAPCON

An air traffic facility, located at a U.S. Air Force base, utilizing surveillance and, normally, precision approach radar and air/ground communications equipment to provide approach control services to aircraft arriving, departing or transiting the airspace controlled by the facility. The facility may be operated by the FAA or USAF and services may be provided to both civil and military airports.

read back

A term which means "repeat my message back to me."

resolution advisory

A collision avoidance system display indication given to the pilot recommending a maneuver to increase vertical separation relative to an intruding aircraft. Positive, negative and vertical speed limit/VSL advisories constitute the resolution advisories. A resolution advisory is also classified as corrective or preventive.

re-sectorization

The splitting or rearrangements of geographic sectors including sector stratification. This is usually the result of rearrangement of center boundaries, shifting of traffic load geographically, implementation of major system changes such as the Long Range Radar Program, NAS Stage A, or similar items. This term is strictly a paper re-sectoring and in itself does not involve position or console changes.

runway

A defined rectangular area on a land airport prepared for the landing and takeoff run of aircraft along its length. Runways are normally numbered in relation to their magnetic direction rounded off to the nearest 10°; e.g., Runway 01, Runway 25.

satellite airport

(1) An airport that is associated with another airport and uses all of the airport-adapted data of the airport it is associated with except for name, location, and the satellite FDEP name, if any.

(2) In many instances a community is served by several airports, one of which serves a significant volume of air carrier and/or high performance military aircraft, while the others serve general aviation aircraft. These latter airports are "satellite airports".

search and rescue/SAR

(1) Employment of available personnel and facilities in rendering aid to persons and property in distress.

(2) A service which seeks missing aircraft and assists those found to be in need of assistance. It is a cooperative effort using the facilities and services of available Federal, state and local agencies. The U.S. Coast Guard is responsible for coordination of search and rescue for the Maritime Region, and the U.S. Air Force is responsible for search and rescue for Inland Region. Information pertinent to search and rescue can be passed through any air traffic facility or be transmitted directly to the Rescue Coordination Center by telephone.

sector

An FAA sector is a geographic area limited to altitude, assigned to a controller to exercise control and advisory responsibilities.

separation

Spacing of aircraft to achieve their safe and orderly movement in flight and while landing and taking off.

sequencing

The generic term including both scheduling and spacing of aircraft along a common path. The process of ordering the aircraft in the schedule. Sequencing is normally either first come, first served or by speed class. The term "sequencing" is sometimes loosely used to include the arrival control process.

short take off and landing/STOL aircraft

An aircraft which, at some weight within its approved operating weight, is capable of operating from a short runway in compliance with applicable STOL characteristics, airworthiness, operations, noise and pollution standards.

short take off and landing/STOL runway

A runway specifically designated and marked for STOL operations.

significant meteorological information/SIGMET/WA

A weather advisory (WA) issued concerning weather significant to the safety of all aircraft. SIGMET advisories cover severe and extreme turbulence, severe icing and widespread dust or sand storms that reduce visibility to less than 3 miles.

spacing

The separation of aircraft in a series of a predetermined distance or time criteria. See sequencing.

special VFR conditions/special VFR minimum weather conditions

Weather conditions in a control zone which are less than basic VFR weather conditions and which permit flight under Visual Flight Rules.

1. special VFR operations — Aircraft operating in accordance with clearances within control zones in weather conditions less than the basic VFR weather minima. Such operations must be requested by the pilot and approved by ATC.

specialist

A person authorized to provide air traffic control service. The individual that interacts directly with the sub-systems that comprise the NAS (e.g. air traffic controller, flight service station specialist, traffic management specialist, air traffic supervisor, weather specialist,
etc.).

standard instrument departure/SID

A preplanned coded air traffic control IFR departure routing, pre-printed for pilot use in graphic and textual or textual form only. A departure route identified by a unique name, originating at one or more airports and ending at a specific adapted fix, called an exit fix. A SID may have a transition route adapted with it.

standard terminal arrival route/STAR

A preplanned coded air traffic control IFR arrival routing, pre-printed for pilot use graphic and textual or textual form only. An arrival route identified by a unique name, originating at a specific adapted airport.

station keeping

Capability of an aircraft to maintain a particular position in space relative to other aircraft near and around it. Station keeping helps maintain order in a structured aircraft population, as in military formation or pattern flying, and can do the same in high density landing and take-off conditions at busy civilian airports, or en route in transatlantic air lanes.

taxi

The movement of an aircraft under its own power on the surface of an airport .

telecommunications

Any transmission, emission or reception of signs, signals, writing, images, sound or other information by wire, radio, visual or any electromagnetic system.

Telephone Information Briefing Service (TIBS)

A continuous recording of meteorological and/or aeronautical information.

Terminal Radar Approach Control/TRACON

An air traffic control facility using radar and air ground communications to provide approach control services to aircraft arriving, departing or transiting the airspace controlled by the facility. Services may be provided to both civil and military airports. An FAA TRACON is similar to a USAF RAPCON, USN RATCF or U.S. Army ARAC.

Terminal Radar Service Area/TRSA

Airspace surrounding designated airports wherein ATC provides radar vectoring, sequencing and separation on a full time basis for all IFR and participating VFR aircraft. Service provided in a TRSA is called Stage III service. Pilot participation is urged but is not mandatory.

tower en route control service/tower to tower

The control of IFR en route traffic within delegated airspace between two or more adjacent approach control facilities. This service is designed to expedite traffic and reduce control and pilot communications requirements.

Traffic Alert and Collision Avoidance System/TCAS

An airborne collision avoidance system based on radar beacon signals which operates independent of ground based equipment. TCAS generates traffic advisories, and resolution (collision avoidance) advisories in the vertical plane.

Traffic Management Unit/TMU

A non-control, coordination position at ARTCCs connected to the central flow control function at the ATCCC and responsible for dissemination of flow control information at the local level.

trajectory

A time-ordered sequence of all converted fixes and route segments for a flight plan or trial plan. A trajectory associates time with the converted fixes.

transcribed weather broadcast/TWEB

A continuous recording of meteorological and aeronautical information that is broadcast on L/MF and VOR facilities for pilots.

transfer of control

The action whereby control responsibility for an aircraft is transferred from one controller to another.

transition

(1) The general term that describes the change from one phase of flight or condition to another; e.g., transition from en route flight to the approach or transition, or the transition from IFR to VFR.

(2) A published procedure (SID transition) used to connect the basic SID to one of several en route airways/jet routes, or a published procedure (STAR transition) used to connect one of several en route airways/jet routes to the basic STAR.

transponder

(1) A general term for any device which provides a reply when interrogated.

(2) The airborne radar beacon receiver/transmitter which automatically receives radio signals from all interrogators on the ground and which selectively replies with a specific reply pulse or pulse group only to those interrogations being received on the mode to which it is set to respond.

uncontrolled aircraft

Those aircraft not participating in or receiving traffic separation service from the ATC system. This term does not include those flights receiving control service from control towers having only visual surveillance in performing control service.

uncontrolled airspace

That portion of the airspace which underlies controlled or mixed airspace. Aircraft operating solely in uncontrolled airspace are not presently required to carry navigation, communications, or transponder equipment; however, communications equipment meeting a limited channel capability requirements is needed for operations conducted at a tower equipped field. ATC has neither the responsibility nor the authority for exercising control over air traffic in this airspace.

UNICOM

A non government communications facility which may provide airport information at certain airports. Locations and frequencies of UNICOMs are shown on aeronautical charts and publications.

user

(1) The external individual or group that receives service from the NAS (e.g. pilot, air carrier, general aviation, military, law enforcement agency, etc.). (2) Air Traffic personnel, military personnel, or the aviation public.

vector

A heading issued to an aircraft to provide navigational guidance by radar.

vertical separation

Separation established by assignment of different altitude or flight levels.

vertical takeoff and landing/VTOL

Aircraft which have performance characteristics permitting vertical or almost vertical takeoffs, landings, and climb and descent angles.

visual approach

An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VMC conditions.

Visual Flight Rules/VFR

Rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition it is used by pilots and controllers to indicate type of flight plan.

1. VFR conditions — Weather conditions equal to or better than the minimums for flight under visual flight rules.

VFR (Visual Flight Rules) on top

ATC authorization for an IFR aircraft to operate in VFR conditions at any appropriate VFR altitude (as specified in FAR and as restricted by ATC). A pilot receiving this authorization must comply with the VFR visibility distance from cloud criteria, and the minimum IFR altitudes specified in FAR Part 91. The use of this term does not relieve controllers of their responsibility to separate aircraft in TCA/TRSA airspace.

Visual Meteorological Conditions/VMC

Meteorological conditions expressed in terms of visibility, distance from clouds and ceiling equal to or better than specified minima.

visual separation

A means employed by ATC to separate aircraft in terminal areas. There are two ways to effect this separation; either the tower specialist sees the aircraft involved and issues instructions, as necessary, to ensure that the aircraft avoid each other, or a pilot sees other aircraft involved and upon instructions from the specialist provides his own separation by maneuvering his aircraft as necessary to avoid it. This may involve following another aircraft or keeping it in sight until it is no longer a factor.

wake turbulence

Phenomena resulting from the passage of an aircraft through the atmosphere. The term includes vortices, thrust stream turbulence, jet blast, jet wash, propeller wash and rotor wash both on the ground and in the air.

waypoint/W/P

(1) A significant navigational position normally not marked by the site of a radio navigational aid. When used with respect to RNAV, it is a pre-determined geographical position, used for route or instrument approach definition or progress reporting purposes, that is defined relative to a VORTAC station position.

weather advisory

In aviation weather forecast practice, an expression of anticipated hazardous weather conditions as they affect the operation of air traffic and as prepared by the Weather Bureau.

weather observations

The observation, measurement, and recording of various weather phenomena. This process could be manual or automatic.

weather terms

1. weather information — Current weather information pius trend weather information plus forecast weather information.

2. current weather information — Surface aviation weather observations plus weather conditions aloft.

3. surface aviation weather observations — Observations at a single point on the ground up to an altitude of 6,000 Ft (AGL).

4. weather conditions aloft — From 6,000 feet above the ground to 60,000 feet MSL in the area of NAS responsibility. In addition, from ground level to 10,000 feet AGL within 45 NM of qualifying aerodromes.

5. trend weather information — Includes observations made during past 3 hours plus any forecast values from unexpired terminal forecasts.

6. forecast weather information — Terminal forecast plus area forecast plus winds aloft forecast plus unscheduled short-term advisories and forecasts.

7. terminal forecast — Is an area within a 5-mile radius of the runway complex.

8. area forecast — Is a forecast of general weather conditions over an area the size of several states.

9. winds aloft forecast — Are forecasts for specific locations in the contiguous U.S.

wind shear

A change in wind speed and/or direction in a short distance which results in a tearing or shearing effect. It can exist in a horizontal or vertical direction and occasionally in both.

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