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Rotorcraft Terminal ATC Route Standards

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16. Abstract

This report focuses on major terminal areas and addresses both visual and instrument meteorological conditions under visual flight rules (VFR), special visual flight rules (SVFR), and instrument flight rules (IFR). It is intended to assess their effect on the National Airspace System (NAS), the users, and air traffic control.

This report is designed to incorporate the review, analysis, and development of rotorcraft ATC route structures and the analysis of current procedures and standards, with the objective of recommending modifications to existing FAA documents, standards, and procedures which will enhance rotorcraft operations and National Airspace System capacity in a terminal environment.

Additional reports will address en route IFR routing and procedures, and provide guidelines for the development and implementation of integrated rotorcraft route structures and procedures.

This is one of a series of three reports that address rotorcraft/helicopter standards, route structures, and procedures appled by FAA air traffic facilities. The series consists of:

1) Rotorcraft Terminal ATC Route Standards, DOT/FAA/RD-90/18,
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PREFACE

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Author's Note: On August 18, 1990, 14 CFR 91 was amended and paragraph numbers were changed. This document makes reference to the new paragraph numbers. The old paragraph is shown within parenthesis.

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1.0 INTRODUCTION

This is the first in a series of three reports that concentrate on existing rotorcraft/helicopter standards, route structures, and procedures applied by Federal Aviation Administration (FAA) air traffic facilities. The report focuses on major terminal areas and addresses both visual and instrument meteorological conditions under visual flight rules (VFR), special visual flight rules (SVFR), and instrument flight rules (IFR). It is intended to assess their effect on the National Airspace System (NAS), the users, and air traffic control, and to provide recommendations to enhance operations involving rotorcraft and fixed-wing aircraft.

This report is designed to incorporate the review, analysis, and development of rotorcraft ATC route structures and the analysis of current procedures and standards, with the objective of recommending modifications to existing FAA documents, standards, and procedures which will enhance rotorcraft operations and NAS capacity in a terminal environment.

Additional reports will address en route IFR routing and procedures, and will ultimately provide guidelines for the development and implementation of integrated rotorcraft route structures and procedures.

1.1 OBJECTIVE

The objective of this report is to develop procedures and standards that allow for safe and efficient simultaneous rotorcraft/fixed-wing access to terminal areas during all weather conditions for which the aircraft are designed.

For the purpose of this report, terminal areas are defined as Terminal Control Areas (TCA's), Airport Radar Service Areas (ARSA's), metropolitan centers, business centers, heliports, vertiports, and airports.

A three-fold investigative process, consisting of:

(1) documentation review,

(2) operational evaluation, and

(3) data collection and analysis,

was conducted to ensure that all concerns were appropriately addressed.

1.2 REQUIREMENTS

Initial review was accomplished to clarify and refine individual task parameters. This provided an operational base for documenting similarities and overlapping task parameters, allowing collected data

and subsequent recommendations to be cross-fed to ensure that each issue was appropriately addressed.

1.2.1 Subtask 1 - Review Present System

Review and analyze present standards, route structures and procedures applied by ATC facilities in major terminal areas and assess their effect on NAS operations.

1.2.2 Subtask 2 - VFR Operations

Identify constraints on rotorcraft operations within terminal area airspace under VFR conditions and propose solutions to alleviate those constraints.

1.2.3 Subtask 3 - SVFR Operations

Identify constraints on rotorcraft operations within terminal area airspace under SVFR conditions and propose solutions to alleviate those constraints.

1.2.4 Subtask 4 - IFR Operations

Identify constraints on rotorcraft operations within terminal area airspace under IFR conditions and propose solutions to alleviate those constraints.

1.3 BACKGROUND

Rotorcraft/helicopters have been active in the NAS for more than 40 years. Initial rotorcraft activities were exclusively associated with the military services; however, once the helicopter penetrated the civilian market place, commercial operations steadily increased.

Historically, commercial rotorcraft operated in visual conditions under either VFR or SVFR. In a nonradar environment the major factor precluding simultaneous operations of SVFR and IFR aircraft was the inability of air traffic control to provide separation between two aircraft operating in different environments. After the introduction of radar, many facilities were still reluctant to permit SVFR aircraft to operate in a control zone with IFR aircraft. Their rationale for this was that SVFR aircraft were required to remain clear of clouds; consequently, it was impossible to guarantee the aircraft's track, and it was difficult, if not impossible, to ensure the required separation.

When reduced separation minimums were ultimately adopted, many facilities developed their own procedures to optimize these new standards and ultimately improved their SVFR operations. The result was a dramatic reduction in delays for arriving and departing helicopters. Unfortunately, many of these procedures were discontinued when differing procedural interpretations resulted.

Independent access to the airport was lost for rotorcraft and delays again became the norm.

During the early years VFR and SVFR flight fulfilled the industry's basic needs and permitted helicopter operators to provide the services that their charters required. At that time most rotory-wing aircraft were ill-equipped to operate in instrument meteorological conditions. In the past few years, however, operational capabilities of rotorcraft have improved and their missions have been expanded to the extent that, in many locations, an all-weather capability has become a necessity. To meet this demand, rotorcraft have been equipped with highly sophisticated navigational equipment that permits them to operate in virtually any weather environment. As a result, helicopters have begun to intrude into airspace that had previously been the private domain of fixed-wing aircraft. As this interaction has increased, areas of conflict have begun to develop. Initially, the NAS was not prepared to meet these new demands and IFR helicopters were often considered more of a nuisance than a necessity. In many locations this discrimination continues today.

During the past 2 decades aviation has experienced tremendous growth. As a consequence of this virtual explosion of air traffic, many airports have reached saturation. Capacity demands have resulted in innumerable traffic delays, both in the air and on the ground. In order to meet these increased demands, slower aircraft (i.e., helicopters) are separated from the normal flow of traffic and delayed (rerouted or held on the ground) until adequate spacing is available to sequence them into the system.

The FAA has conducted numerous studies of the various factors that have led to the current problems in an attempt to rectify the situation without imposing a penalty on any one class/type of user. The most obvious solution appears to be the construction of new facilities, i.e. new airports, additional runways, and expanded airspace. Fiscal restraints and lack of available land, combined with public resistance, have made it difficult if not impossible to construct new airports and in many cases new runways. Although airspace is a constant that obviously cannot be increased, it could possibly be utilized more effectively.

The simplest and most economical approach to increase capacity is to modify existing procedures and/or develop new methods of operation that will provide separate routes to airports and permit both rotary-wing and fixed-wing aircraft equal, but independent, access to landing areas. Each must have access to separate noninterfering routes or corridors to approach and depart the airport.

In anticipation of these problems, the FAA Administrator, J. Lynn Helms, announced in April 1982 a cooperative venture between the aviation industry and the government to initiate an indepth review of the existing NAS and the procedures that governed its operation and to subsequently make recommendations for its improvement.

In this undertaking, known as the National Airspace Review (NAR), various groups were tasked to comprehensively review air traffic control procedures, flight regulations, and airspace. Their goals were to validate the current system and to identify near term changes that would promote greater efficiency and provide the operational framework for moving into the next generation.

The specific objectives of the NAR were (1) to conduct in-depth studies of the airspace and the procedural aspects of the air traffic system, (2) to identify and recommend changes that would promote greater efficiency for all airspace users, (3) to simplify the air traffic control system, and (4) to match airspace and air traffic control procedures with technological advancement and fuel efficiency programs.

During these studies, it was determined that helicopters have not been properly integrated into the air transportation system. Traditionally, rotorcraft have been forced to: (1) operate in airspace that was designed for fixed-wing aircraft, (2) conform to standards that were established for fixed-wing aircraft, and (3) adapt to procedures that have been designed for fixed-wing speeds and maneuverability. These problems have not only created additional workload for the helicopter pilot but also for fixed-wing pilots and air traffic controllers, who have been forced to modify their standard operations to accommodate the relatively slow-flying rotorcraft.

The major drawback for rotorcraft in today's instrument environment appears to be their inability to land and depart without encountering excessive delays. These delays tend to increase as airport traffic increases.

At many locations rotorcraft are perceived to be newcomers to the instrument flight scene and, consequently, are considered to be interlopers that not only add to the congestion but, because of their slow approach speeds, cause additional delays. They force controllers to provide exaggerated separation between helicopters and faster fixed-wing aircraft for fear that the fixed-wing will overtake the helicopter and create additional operational difficulties.

FAA Handbook 7110.65F, Air Traffic Control, paragraph 2-4, Operational Priority, requires the controller to "provide air traffic control service to aircraft on a 'first come, first serve' basis."

Regardless of this requirement, slower aircraft are generally delayed in order to expedite the movement of faster traffic. This concept may be contrary to the intent of FAA policy but is often justified by the rationale that it is better to delay one slow aircraft than two or more faster ones. Such rationale is hard to dispute; even so, tacit agreement with that philosophy does not account for all rotorcraft delays, many of which are still attributable to other air traffic procedures.

Helicopter needs must be addressed if they are ever to be fully integrated into the NAS. Unique air traffic control procedures and terminal instrument procedures must be adopted to ultimately provide rotorcraft with independent, but equal, access to the NAS. This would in turn help reduce, if not eventually eliminate, arrival/departure delays and increase airport capacity.

2.0 INVESTIGATIVE PROCESS

A matrix was established to ensure that a balance between each subtask was maintained during the research process. Using this matrix, existing operational standards, route structures, and air traffic control procedures were reviewed and an overview of their relationship to rotorcraft was developed. Site visits and personnel interviews were conducted to evaluate existing operational techniques, rule adaptations, and handbook interpretations including their impact on rotorcraft operations. Analysis of the data led to the development of recommendations to improve system effectiveness and integration of rotorcraft into the NAS.

2.1 REVIEW OF APPLICABLE DOCUMENTATION

In order to identify the requirements of this task, an in-depth review was made of FAA Handbook 7110.65, Federal Aviation Regulations (FAR) Parts 91, 121, and 135, and the Airman's Information Manual (AIM). Other documents listed in the bibliography were also included in the review.

2.2 SELECTION OF REPRESENTATIVE OPERATIONAL LOCATIONS

Several TCA's with relatively heavy concentrations of rotorcraft operations were suggested by the FAA as likely candidates for the analysis, with the stipulation that at least four be included in the study.

The suggested list included Houston, Miami, Washington DC, New York, Los Angeles, and Chicago. Pensacola, Florida and the concentrations of Eglin/Hurlburt Air Force Bases, Whiting Naval Air Station, and Fort Rucker were also included in the list of possible candidates.

Chicago and Washington were selected because of their relatively high concentration of helicopters and their mix of operations. Houston was added because of its involvement with off-shore helicopter activity. Ultimately, the off-shore study was expanded to include both New Orleans and Lafayette, Louisiana because of the heavy concentrations of rotorcraft within their terminal airspace.

It was deemed appropriate to also include the Pensacola, Eglin/Hurlburt, and Fort Rucker areas in the review, since military helicopter activity encompasses more than 50 percent of total rotorcraft activity within the NAS.

2.3 DATA COLLECTION

After an in-depth review of applicable FAA Orders, Handbooks, Manuals and other associated documents identified in paragraph 2.1 and the bibliography, interviews were conducted with personnel representing the full spectrum of helicopter operations, both military and civilian, including air traffic control, police patrol/surveillance,

pilot training, emergency medical services, executive transport, and off-shore operations in the Gulf of Mexico. More than 75 pilots and air traffic controllers/managers, representing more than 25 operators and air traffic facilities, were interviewed. Their comments and recommendations serve as the basis for this report.

3.0 DISCUSSION AND ANALYSIS OF CURRENT OPERATIONS

Rotorcraft provide only a small percentage of the total aviation activity within the United States. Consequently, with the exception of major metropolitan areas and the coastal regions of the Gulf of Mexico, rotorcraft generally have relatively little impact on the NAS. Conversely, the air traffic procedures, separation standards, and instrument flight procedures currently in use have tremendous impact on rotorcraft operations. Virtually all existing procedures were developed from a fixed-wing aircraft concept, and the distinctive operational characteristics of rotorcraft were not considered during their development.

Since deregulation, airports and airspace have become increasingly congested, resulting in increased delays, excessive costs for the operators, and inconvenience to the public. Rotorcraft are in a unique position to help relieve some of these problems "if" existing procedures can be modified to utilize and take advantage of their distinctive capabilities.

Rotorcraft have not been categorized for the purpose of determining the minimum operating distances between aircraft and the distance required between landing areas for simultaneous operations. Consequently rotorcraft automatically fall into the "all other" category and constraints are placed on simultaneous fixed-wing/helicopter operations. As a consequence, lateral separation must be increased from a minimum of 200 to 300 feet for a lightweight, single engine aircraft to a minimum of 600 to 700 feet for all other aircraft.

3.1 AIR TRAFFIC CONTROL PROCEDURES

If helicopters are ever going to enter the mainstream of the NAS, they should be readily accepted and easily identified throughout air traffic control communications. A means of recognition should be provided in FAA Handbook 7110.65F. At the present time the aircraft identification section of the current handbook only makes reference to "Army copters."

3.1.1 Phraseology in Handbook 7110.65F

Most pilots and controllers are complimentary of the changes pertaining to helicopters instituted in the early 1980s in Handbook 7110.65, but several comments were received from both groups regarding some of the recommended phraseology specified in those changes.

Questionable phraseology and implausible interpretations of the handbook contribute to a lack of consistency in air traffic's handling of helicopters from one operating region to another and, in some cases, from one airport to another. These differences are particularly obvious at airports where helicopters are seldom seen and

where controllers are unfamiliar with the procedures for handling rotorcraft operations.

One area of communications that has created some confusion is the disparity in recommended phraseology. For example, when a pilot requests permission to taxi (paragraph 3-81), the words "taxi" and "proceed" are interchangeable and by the use of one or the other the controller authorizes the pilot to perform the requested operation. The pilot's understanding is that he/she has been "cleared to taxi" or "cleared to proceed to taxi", regardless of the aircraft's position on the airport. However, when its time to depart, "cleared for takeoff" is only sufficient for a fixed-wing pilot, it must be amplified for a helicopter pilot, even if the aircraft is located in a movement area. If they are in a nonmovement area they may "proceed as requested", and if they are located in an area not visible from the tower, an area not authorized for helicopter use, an unlighted nonmovement area at night, or an area off the airport, they are informed that "departure will be at your own risk." All three phrases are perceived by most pilots to be authorization or clearance for takeoff.

Pilots and controllers alike question the need for all these different phraseologies and believe they are involved in a game of semantics. Does the phrase "proceed as requested" relieve the controller of any responsibility in the event of a mishap? Conversely, does the phrase "cleared for takeoff" impose additional responsibility on the controller in the event of a mishap? Regardless of the phraseology, the pilot is ultimately responsible for the safety of his aircraft, not the controller.

If takeoff clearance has been requested by the pilot and in the controller's judgment it is a reasonable operation, the appropriate clearance should be issued; if not, the clearance should be withheld and the reason for denial explained.

Arrival phraseology invoked comments and complaints similar to those involving departure phraseology.

Concern was also expressed by both pilots and controllers for a need to add an additional weight classification between 12,500 pounds and 300,000 pounds. Everyone understands that the purpose of these classifications are for wake turbulence separation minima, but they believe that there must be a difference between the wake turbulence generated by a 12,501 pound "large" aircraft and a 299,999 pound "large" aircraft.

3.1.2 Interpretation of Handbook 7110.65F

The air traffic community, as well as many representatives from user groups, has expressed concern regarding the ability of controllers to effectively manage helicopter operations within the NAS as a result of outside influences on procedural requirements and applications. Their

primary concerns revolve around the numerous interpretations of Handbook 7110.65 that have been developed.

It is a relatively common belief among both pilots and controllers that the handbook is clearly written but its intent has been clouded by the differing interpretations received from authoritative sources such as the National Transportation Safety Board, accident investigators, and procedural personnel in regional offices. These interpretations create situations that either restrict the use of published procedures or impose excessive constraints on their use. Analysis of the data obtained during this study appears to support these conclusions. This concern surfaced during all three flight regimes: VFR, SVFR and IFR.

Fewer problems are encountered in locations that experience considerable numbers of helicopter operations, such as Chicago, New Orleans, Pensacola, and Washington, DC. In these areas, procedural application is fairly consistent. In other areas where helicopter activities are not as common, controller uncertainty often results in even more airborne rerouting, and ultimately in departure and arrival delays.

Differing procedures are the result of dissimilar interpretations of the handbook, many of which originate outside of the FAA. Procedures are normally written to preclude the need for interpretation and should suffice for all locations. However, the perceived need to incorporate legal technicalities that may affect future judicial decisions, as well as a desire to allow the controller virtually unrestricted freedom of action, have resulted in the generalization of many procedures. When instructions are not specific, they are open to a variety of misunderstandings, quite often resulting in an application that does not conform to the original intent.

3.1.3 Application of Handbook 7110.65F Procedures

Rotorcraft operations are not only encumbered by priorities granted to fixed-wing traffic, but also by procedural interpretations that relate directly to the capabilities of fixed-wing aircraft. Admittedly, many of these IFR priorities are necessary and should not be affected. Procedures should not be open to interpretations that are inconsistent with good operating practice. Emphasis should be placed on developing and implementing procedures that will permit rotorcraft equal, efficient, and safe access to both airspace and airports.

In years past, various approach control facilities around the country had developed and implemented unique helicopter operations that contributed to a safe, efficient traffic flow. Some of these operations had been in effect for several years but were ultimately cancelled because of "interpretations" of the procedural handbook. These well-meaning "clarifications" nullified the procedures and eliminated their benefits.

Differing interpretations have led to inconsistencies in traffic management between regions and within regions, between facilities, that have resulted in confusion, misunderstanding, and a growing loss of confidence in the air traffic system on the part of the rotorcraft community. These interpretations have also contributed to air traffic delays and reduced airport capacity.

Some locales deny rotorcraft access to a TCA unless the helicopter operator is signatory to a Letter of Agreement with the controlling facility. Some insist that helicopters require an exemption to 14 CFR 93.113, the regulation that denies TCA access to SVFR fixed-wing aircraft. At least one FAA Flight Standards Field Office requires commercial SVFR helicopters to utilize distance from cloud criteria from 14 CFR 91.155 (91.105), i.e. 500 feet below any clouds and 3 mile visibility, which effectively eliminates SVFR for Part 135 operators performing as an air taxi.

Several paragraphs contained in the SVFR section of the Air Traffic Control Handbook have led to uncertainties, if not confusion, on the part of both controllers and pilots.

One paragraph specified as many as nine different separation standards between helicopters and helicopters, and helicopters and fixed-wing aircraft. Required SVFR separation varied between "sufficient separation to assure" and 2 miles, depending on the aircraft's position relative to the active runway. Although these reduced standards offered advantages to the helicopter community, few advantages were ever gained. When traffic volume reached the point where the procedures might prove advantageous, controllers have neither the time nor the inclination to research their memory banks for the appropriate standard. Consequently, the controller tends to resort to the simplest and safest rule, "maintain at least 3 mile separation," and any potential advantage is lost.

Another paragraph includes a statement: "When the aircraft on takeoff is a helicopter, hold the helicopter ... ", without any explanation as to the writer's rationale. Entries of this type also contribute to misunderstandings on the part of both pilots and controllers. Confusion results from references to "other procedures", especially since "other procedures" are never defined.

3.2 TRAINING

An opinion expressed almost unanimously by the pilot community, concerns the need for additional helicopter familiarization training for air traffic controllers. It is their perception that the lack of in-depth knowledge of helicopter operational capabilities on the part of the controller work force contributes to many of the problems that affect the overall system. They believe that correcting this shortcoming would do more to improve helicopter operations than any other single item. For this reason, pilots believe that a training program is needed to provide up-to-date information on helicopter

performance capabilities, and to open an avenue for the introduction of data on new models as they enter the helicopter fleet.

Pilots believe that most controllers concur with the fact that the helicopter is a unique vehicle, capable of performing differently than fixed-wing aircraft, but that they do not know just how unique or what those different performance characteristics are. They also perceive that controllers are taught that all helicopters have identical operating characteristics, regardless of size, weight, power, and/or load factor.

Rotorcraft are exceptionally versatile aircraft, capable of sustaining flight at airspeeds varying from 0 knots in a hover to 170 knots at cruise. While all helicopters have the capability to hover, cruise speeds differ by type and model from 90 knots to 170 knots. They are generally capable of maneuvering in less airspace than fixed-wing aircraft, and are able to fly steeper instrument approach paths (9 to 12 degrees) to restricted landing areas without the need for runways. These unique operating characteristics permit helicopters to perform a variety of maneuvers and missions, and procedures should be devised to take advantage of their capabilities.

Most controllers that were interviewed felt that they were familiar with helicopters but agreed that their knowledge was gained from field experience and not from any formalized training program provided by the FAA. Two facility managers have instituted rotorcraft familiarization training programs to overcome what they perceive to be a deficiency among their operational staffs. These managers believe that newly assigned personnel from facilities with little or no helicopter activity, and newly hired personnel from the Aeronautical Center, know virtually nothing about rotorcraft.

Further research revealed that rotorcraft are not currently referenced in the training syllabus at the Aeronautical Center, except during the study of Handbook 7110.65F where only specific rotorcraft procedures are addressed, and that no information was presented throughout the training program regarding operating characteristics and/or capabilities. Based on this information, the pilots' perceptions appear to be valid.

Local training courses that have been developed by various air traffic facilities for their assigned personnel have proven to be very beneficial, but unfortunately they are few and far between. Consequently, at most localities the only knowledge of helicopters available to controllers is that which is gained through trial and error in their day-to-day operations.

Controllers need to understand that all rotorcraft cannot be classified identically. Each type of rotorcraft has a different capability and each is capable of performing a variety of unique operations. Acceptance by controllers that rotorcraft are just like any other aircraft, while possessing some distinctive operating

characteristics, would be a major factor in improving the system, enhancing safety, reducing delays, and increasing airport capacity. The more knowledge a controller possesses regarding the complete capabilities of all aircraft in the system, the easier it will be to maintain positive control and to utilize each aircraft's individual operational characteristics.

The need for additional controller training was again raised in conjunction with rotorcraft IFR operations. In spite of having operated in the NAS for more than 40 years, IFR rotorcraft continue to be a mystery to some controllers. Here again, controllers appear to lack rudimentary knowledge of the operational capabilities of helicopters.

This lack of familiarity manifests itself in the various instructions issued by controllers to IFR helicopters. For example, helicopter formation flights have been directed to hover while flying in the clouds; single helicopters have been instructed to hover in position while on the glide path during execution of an ILS approach; and some helicopters reportedly have been vectored to the final approach fix 90 degrees from the final approach course and cleared for an approach necessitating a 90 degree descending turn to capture the localizer and the glide slope. While these maneuvers may be theoretically possible for rotorcraft, they are not feasible from a safety aspect. Many controllers however become frustrated when pilots inform them that they prefer not to comply with this type of instruction.

There is also a perception among rotorcraft operators that FAA Flight Standards field facilities are suffering from a shortage of personnel that are qualified in the rotorcraft field. In several regions, this lack of a "resident expert" leaves the rotorcraft community without a knowledgeable individual to uphold their interests and to field their concerns.

3.3 WAKE TURBULENCE

Numerous studies have been conducted on fixed-wing generated wake turbulence and how this phenomena affects other fixed-wing aircraft; however, very little data is available regarding helicopter generated wake turbulence. The AIM states: "... In forward flight, departing or landing helicopters produce a pair of high velocity trailing vortices similar to wing tip vortices of <u>large</u> fixed-wing aircraft."

Accurate, current wake turbulence data must be obtained to validate or repudiate this statement. If the statement is true and the information was incorporated into Handbook 7110.65F, it could require an increase in in-trail separation and affect the controller's method of dealing with rotorcraft, especially during the arrival and departure phases of flight.

Several individuals believe that there is a concern that the results of ongoing helicopter wake turbulence studies will prove that

rotorcraft generate excessive amounts of turbulence. They perceive that this has culminated in a decision to delay the studies and consequently have postponed categorizing rotorcraft.

Strict interpretation of the paragraphs that refer to landing and takeoff separation would tend to classify all helicopters as Category III aircraft and could ultimately impose restrictions for reasons that are not readily apparent.

The wake turbulence created by some large heavy lift rotorcraft may be a factor that should be considered, but large helicopters are not common and the majority of rotorcraft operations should not be penalized. Wake turbulence data should be obtained to validate reduced separation standards and to ultimately realize capacity increases.

While certain restrictions should obviously be imposed for safety reasons anytime small aircraft and rotorcraft are operating in close proximity, the AIM conception that all helicopters are equivalent to large fixed-wing aircraft in generating wake turbulence is misleading.

There are unsubstantiated opinions that rotorcraft are not as susceptible to the effects of wake turbulence as fixed-wing aircraft. This is an impression that should be verified or refuted during helicopter wake turbulence studies.

3.4 OBSTRUCTIONS

Unpublished obstructions, primarily antenna towers, are becoming more and more of a hazard to low level flight. Many of these antennas appear to be associated with mobile telephones. Pilots believe that the prolific growth of this recently popularized communications media is creating a hazard to the safety of the low level navigation system throughout the country. In some rural areas unreported towers have been found to exceed 2000 feet in height.

Apparent violations of 14 CFR 77 are causing increasing concern among some pilot groups. Construction of privately owned mobile telephone antennas, in both urban and rural areas, is rapidly increasing. Most pilots believe that many of these antennas are being constructed without regard to the reporting requirements in 14 CFR 77, subpart B.

No one questions the citizen's right to own and utilize such systems, but there is serious concern when the owners fail to comply with the "notice of construction" requirement detailed in the FAR. This failure to notify the proper authorities prevents adequate determination of the hazards created by the construction, precludes charting of the obstruction, and creates a serious hazard to air navigation that is magnified at night since pilots reporting the new towers claim that most are unlighted.

Although hazards are well defined in the AIM paragraph 572a, pilots should be reminded of their responsibilities and alerted to the tremendous increase in new construction through safety seminars, Operation Raincheck briefings, and other flight safety assemblies.

The Federal Communications Commission (FCC), Consumer Assistance and Small Business Division, advises that the licensing forms and forms to provide the construction notification required by 14 CFR 77.11 are provided to the purchaser by the manufacturer or distributor of this type of communications equipment, when the equipment is obtained.

Although the FCC has no means to ensure that the proper forms are filed, their enforcement branch has no qualms about removing the towers once they become aware of their existence and confirm that the owner/operator has failed to comply with the requirements of the FARs.

3.5 OPERATIONAL HAZARDS

The Aviation Training Brigade at Fort Rucker, Alabama has experienced interference from unknown individuals who engage in a "sport" that the Army has termed "spotlighting." At various times, always at night and generally after midnight, pilots have experienced problems with someone on the ground directing high powered spotlights into their eyes during approaches to unlighted landing areas.

Although law enforcement personnel have not been able to apprehend the culprits, there have been discussions with their legal representatives as to the charges that could be brought against the offenders, if and when they are caught. In their opinion, 14 CFR 91.11 (91.8), Prohibition Against Interference With Crewmembers, appears to be the only regulation preventing this type of activity; however, their lawyers interpret the paragraph to say that the offender must be on board the aircraft in order to be charged. The language in 14 CFR 91.11 (91.8) should be clarified to address this issue.

3.6 LETTERS OF AGREEMENT

Handbook 7110.65F makes numerous references to letters of agreement. Chapter 7, section 5, Special VFR, contains five such references. Although this may not require five separate letters, some of the references appear to be superfluous.

Some facilities are becoming inundated with letters of agreement. One facility has letters of agreement, that supplement the SVFR procedures described in Handbook 7110.65F, with more than 15 operators. The requirement for letters of agreement eventually result in procedures that vary, between facilities, from airport to airport and, from one region to another. It would seem logical that nationally standardized procedures could reduce or eliminate the requirement for many of these letters.

3.7 VISUAL FLIGHT RULES (VFR)

Rotorcraft difficulties in a VFR environment can be narrowed down to five basic areas:

(1) air traffic control procedures,

(2) a perceived need for controller training,

(3) categorization of rotorcraft,

(4) obstructions, and

(5) helicopter route charts.

The majority of rotorcraft activities are VFR and there are relatively few constraints and even fewer complaints from pilots.

Controllers believe that in a visual environment they are providing the best possible service to their helicopter customers. Operators generally concur with this opinion and are enthusiastic in their praise for the professionalism displayed by controllers throughout the system, but believe that there is room for improvement in several areas.

3.7.1 Helicopter Route Charts

The FAA initially began publication of helicopter route charts in December 1987 when they distributed a chart depicting the routes in the New York City area. This was followed by a chart of Washington, DC in February, and one of Chicago in May of 1988. In 1989 charts were published for Los Angeles in January and for Boston in April.

During discussions evaluating the helicopter route charts, there was virtually unanimous agreement that these charts could be beneficial to both pilots and controlling agencies and eventually could lead to a reduction in the number of letters of agreement that are now on file.

In areas where new route charts have been published, operators and controllers generally have nothing but praise for their usefulness and convenience despite the stated need for some editorial adjustments to improve reliability. Individuals in areas where there are no officially sanctioned charts are divided in their opinions as to both the value and necessity.

Symbology for all charts was considered to be outstanding. Most comments centered on four areas of concern:

(1) lack of standardization,

(2) variations in size and shape of charts,

(3) lack of methodology for updating the charts, and

(4) lack of a determination on whether or not use of the routes and altitudes should be mandated. While controllers essentially believe that routes should be mandatory within a TCA, some pilots disagree.

In January 1990, the FAA issued definitive instructions to their air traffic field facilities regarding future issuances of helicopter route charts. These instructions establish a systematic process for chart development, modification, and acquisition, and provide for an annual review to determine their accuracy and continued utility. The directive also stipulates a 2 year update cycle. Since implementation and publication of charts cannot occur without the concurrence of Air Traffic's Procedures and Airspace Rules and Aeronautical Information Divisions, ATO-300 and ATO-200 respectively, standardization should no longer be a concern. These instructions are contained in the Facility Operation and Administration Handbook 7210.3I, change 3, dated 1/11/90.

3.8 SPECIAL VISUAL FLIGHT RULES (SVFR)

It is the opinion of the rotorcraft community that SVFR is the major ingredient that makes their operations successful during inclement weather. Air traffic personnel, controllers and supervisors, expressed concern regarding their ability to operate the SVFR program as effectively and efficiently as they would like.

While SVFR operations within a TCA are not authorized for fixed-wing aircraft without an exemption, they are normally available to helicopter operators on a first-come, first-served basis. This provides the helicopter with an advantage over their fixed-wing compatriots and, in most cases, makes SVFR preferable to IFR.

When instrument weather conditions exist, most helicopter pilots prefer to conduct their operations under a SVFR clearance to avoid the extended delays associated with obtaining IFR departure or arrival clearances. Under SVFR they retain most of the advantages that visual flight offers, while eliminating the restrictions that instrument flight imposes.

SVFR operations are generally conducted utilizing the same routes and essentially the same procedures as those used for VFR with an added safety feature of ensured separation.

Most emergency medical service (EMS) operators do not permit their pilots to fly EMS missions in IFR conditions; consequently, the availability of a SVFR operation is a necessity if they are to accomplish their missions successfully in reduced ceiling and/or visibility conditions.

14 CFR 91.157 (91.107) defines the SVFR weather minimums required to operate an aircraft within a control zone. These minimums permit helicopters to operate with virtually no restrictions, i.e. the only stipulations being that they remain clear of clouds and maintain visual contact with the surface. Some approach controls place virtually no restrictions on rotorcraft SVFR operations, while others discontinue SVFR operations when ceilings are less than 500 feet and/or visibilities are less than 1 mile. As a rule these restrictions have minimal impact on rotorcraft activity, since the majority of helicopter operators apparently have self-imposed minima that are more restrictive, i.e. 500/2.

Minimums established by the operators appear to be quite universal. Daytime SVFR operations are restricted to 500 foot ceilings while night operations generally require ceilings of 800 feet. Very few commercial operators will fly SVFR when visibility is less than 2 miles.

Difficulties affecting rotorcraft VFR operators also affect SVFR operations. SVFR operators are faced with their own specific problems that generally fall into three categories:

(1) Handbook 7110.65 procedures and their inconsistent application,

(2) the lack of specific rotorcraft arrival/departure procedures to help segregate rotorcraft from high performance fixed-wing aircraft, and

(3) procedures that permit rotorcraft to transition from an instrument environment to visual flight conditions without interfering with the flow of IFR aircraft.

Routine delays are encountered by SVFR helicopters due to the possibility of confliction with IFR traffic utilizing the airport.

3.8.1 Helicopter Arrival and Departure Procedures

In reduced ceiling/visibility conditions, SVFR authorization is the single greatest benefit resulting from the unique maneuvering capability of rotorcraft in the terminal environment. Any delays encountered because of potential conflict with IFR traffic have historically been accepted as the "price of doing business" in a primarily fixed-wing environment. This must change if rotorcraft are to assume their rightful place in the air traffic community. Innovative procedures must be developed which will take advantage of the maneuverability and controllability of rotorcraft and provide them with specific arrival and departure routes that will ensure their access to the NAS without interfering with or depriving fixed-wing aircraft of those same rights.

When low ceilings and/or restricted visibilities deny aircraft the ability to operate under VFR, they must revert to SVFR or IFR.

SVFR is an instrument procedure with several provisos:

(1) SVFR operations are only available within a control zone;

(2) an ATC clearance is required;

(3) the pilot of a SVFR aircraft must remain clear of clouds and maintain visual contact with the surface; and

(4) the controller is permitted to provide less than standard vertical separation between a SVFR aircraft and an IFR aircraft.

Even though SVFR is considered to be an IFR operation, the priorities associated with it pertain to a visual environment. Procedures are established to assure that SVFR traffic does not interfere with or delay the flow of IFR traffic. As a consequence, delays are still encountered during both arrival and departure operations; typically not as often or as long as they are during IFR operations, but nevertheless more often than necessary.

These delay problems are accepted as an inherent part of the existing system but could virtually be eliminated with the implementation of specific rotorcraft arrival and departure procedures, i.e. STAR's and SID's or modifications of these procedures.

3.8.2 Helicopter Visual Approach

Air traffic controllers and operators expressed a desire for an approach procedure that would enable a pilot to transit from the en route portion of their flight to the airport without interference. Such a route or track would be especially advantageous during periods of reduced visibility. Some controllers believe that a method of visual routing would be helpful in their operation since it would provide them with advance knowledge of the aircraft's planned route of flight and contribute to a reduction in their workload. Several operators concurred with the controllers opinion and expressed the belief that some type of published visual routing would enable the pilots to proceed to the airport and land without fear of inadvertently conflicting with other arriving traffic and without experiencing any additional delays. SCT believes that the theory of a helicopter visual approach has merit and has attempted to further refine the concept.

A helicopter visual approach could be developed that would be similar to the visual approach described in FAA Order 7110.79C, Charted Visual Flight Procedure (CVFP). The helicopter approach should incorporate lower weather minima, i.e. ceilings 300 to 500 feet, visibility 1 mile. It should be relatively simple in design and easy to fly. The

approach should also be flight checked for obstruction clearance. There should be no requirement for the pilot to have the airport/heliport in sight, only the visual landmark that serves as the initial approach point. An approach path (final approach segment) perpendicular to the flow of IFR fixed-wing traffic would be optimum. Such a track would not disrupt the flow of IFR traffic and would ultimately terminate at a landing area (helipad) well removed from the active runway. Ideally, an approach path should be selected that would compliment local noise abatement standards.

Each visual approach procedure should provide a method of accessing the procedure, i.e. the initial approach fix (IAF), a depicted route, and a designated landing area. Access to the approach could be gained in several ways; the simplest would be to initiate the approach from a geographical landmark on the helicopter route chart. In some cases this might require modification of an existing chart, but from a cost/benefit aspect it would be less expensive than installing an electronic navigational aid.

A landing area, helipad, or heliport should be located adjacent to, but well clear of, the active IFR runway(s). For example, if the IFR traffic flow is north-south, at least two landing areas may be necessary, one on each side of the runway. With proper planning and the availability of adequate real estate, landing areas should be located at least 1 mile from the approach end of the arrival/departure runway to permit simultaneous operations.

Separate approaches should be designed for each landing area. This would ensure that arriving SVFR helicopters could land without crossing an active runway.

Once on the ground, the helicopter would be handled the same way as other taxiing aircraft.

3.8.3 Helicopter Route Charts for SVFR Operations

The graphic depictions of prominent landmarks that appear on the charts are deemed by the users to be outstanding, as they serve to enhance the capability of the pilot to navigate via the appropriate route. In essence, the graphic symbols provide the pilot with a visual navigational aid that can be utilized in a manner similar to an electronic navigational aid by providing direction and/or track.

The use of a helicopter route chart is considered to be as important, if not more important, in a SVFR environment as in a VFR environment.

The two greatest points of contention are:

(1) should the altitudes published on the charts be mandatory, and

(2) can rotorcraft be required to fly the published routes, and should they be required to do so.

The majority of operators and controllers believe the FAA should mandate the use of published routes and, where applicable, the altitudes that lie within a control zone, TCA, or controlled airspace, and an ATC clearance should be required for any deviation from them.

Many of the routes extend beyond the TCA and/or control zone and are outside of controlled airspace; these generate the most controversy. Pilots believe that their use should be optional whereas controllers believe that if routes and altitudes are published on the chart their use should be mandatory.

Although virtually every pilot would probably fly the routes and altitudes voluntarily, there would probably be strong objections voiced from some quarters, if they became mandatory, because of an aversion to regulation. 14 CFR 91, General Operating and Flight Rules, section 91.119(d) (91.79(d)) states:

> "(d) Helicopters. Helicopters may be operated at less than the minimums prescribed in paragraph (b) or (c) of this section if the operation is conducted without hazard to persons or property on the surface. In addition, <u>each person operating a helicopter shall comply with the routes or altitudes specifically prescribed for helicopters by the Administrator</u>."

Routes and altitudes should be mandatory in controlled airspace, and the FAA Administrator appears to have the authority to require their use elsewhere if he/she desires. Mandating their use could provide the opportunity to develop various unique rotorcraft SVFR approach procedures that could permit the helicopter to operate independently from fixed-wing aircraft in both visual and instrument environments. Separation would also be provided to permit SVFR helicopters and IFR traffic to operate simultaneously into and out of a control zone.

Well defined routes that separate visual tracks from standard IFR tracks would not only provide the pilots with navigational assistance but would provide controllers with knowledge of the helicopter's predictable ground track.

If the routes were mandatory, procedures could be developed to provide the helicopter pilot with a visual approach procedure that could theoretically originate at the boundary of the TCA or control zone and terminate at the airport or landing site.

Since authorization to enter and/or transit controlled airspace are predicated on the helicopter pilot's compliance with ATC instructions and the ability to fly the published routes, an approach could be designed along the same lines as the CVFP authorized in Order 7110.79C and described in Handbook 7110.65F, paragraph 7-34. A helicopter

visual approach could incorporate lower weather minima than the CVFP and should be relatively simple to design.

Helicopter-only approaches could be developed to originate at a specific point on a published route and provide the pilot with a visual track, either VFR or SVFR, to the point of intended landing.

3.9 INSTRUMENT FLIGHT RULES (IFR)

Although some helicopter operators have expressed the desire to operate in an IFR environment, economically they cannot accept the delays imposed by today's limited rotorcraft instrument structure.

In spite of the fact that technological advances in rotorcraft avionics permit them to operate more effectively within the IFR system than most fixed-wing aircraft of comparable speed, operators contend that access to the IFR system is restricted. They believe that the IFR system and its associated instrument procedures were developed for, and continue to be based on, fixed-wing capabilities and requirements and have not been updated to incorporate rotorcraft. For example, they perceive that the FAR's were written for fixed-wing aircraft and that very few of the regulations are directed towards rotorcraft. They profess that most helicopter references in the FAR's merely exempt them from certain sections while few stipulate specific rotorcraft requirements.

Historically, the number of rotorcraft operating in instrument conditions within the NAS have been relatively insignificant and has posed no problem for air traffic control. Today, as more and more helicopters become capable of instrument flight and attempt to gain access to the instrument environment, they are gradually becoming a significant factor.

From a rotary-wing/air traffic control standpoint, current procedures create problems by:

(1) forcing relatively slow rotorcraft to fly the same routes as their faster fixed-wing counterparts, or

(2) requiring controllers to provide additional radar vectors to rotorcraft in order to separate them from faster aircraft.

The first situation demands greater separation intervals between rotorcraft and a trailing aircraft because of speed differentials. This results in under-utilization of airspace and excessive delays for the faster aircraft. Second, while radar vectors contribute to a reduction of some delays they create additional workload for the controller and merely relocate the "choke-point" closer to the airport or en route fix.

An effective helicopter mission profile is believed to consist of an IFR departure from an airport/heliport via an established helicopter

standard instrument departure, a cruising altitude during the en route phase in the lower altitude stratum at or below 5,000 feet, a descent via a point-in-space approach to visual conditions and finally, visual flight to the destination. In those situations where meteorological conditions at the destination airport/heliport preclude visual flight, a helicopter standard terminal arrival route should be available to provide a separate, nonconflicting descent, route, and independent instrument approach to the landing area. Unfortunately this concept of independent procedures is not available in practice.

3.9.1 Air Traffic Delays

Visual environs are preferred by the majority of helicopter operators; however there are many instances when weather conditions require that a flight or a portion of the flight be conducted in instrument conditions (IFR). When this happens, the air traffic controller typically treats the helicopter like a fixed-wing aircraft and additional delays, in some instances extended delays, are encountered not only for rotorcraft, but for fixed-wing aircraft. These delays are magnified during the arrival and departure phases of flight.

Restrictions of traffic flows are magnified at locations where rotorcraft mix with high-speed, fixed-wing aircraft. As a consequence, air traffic controllers are inclined to hold rotorcraft on the ground and/or reroute or delay them in the air in order to expedite the faster traffic. These delays, which many controllers believe are absolutely necessary, leave helicopter operators with the perception that fixed-wing aircraft receive priority treatment and that rotorcraft have been relegated to a second-class status.

The regimentation imposed by instrument flight nullifies many rotorcraft capabilities since IFR requires them to operate in a fixed-wing dominated system. Unfortunately, the relatively slow speeds of today's rotorcraft prove to be a detriment to their integration into the existing IFR system.

Current procedures are designed to provide a single track, or in some cases parallel tracks, to and from the runway(s). This forces the controller to establish queues for all aircraft, regardless of speed. When the relatively slow helicopter enters the IFR picture, it forces the controller to provide increased spacing for virtually all succeeding aircraft and the delay process begins. As a consequence, controllers are inclined to discourage IFR rotorcraft rather than impose delays on other IFR traffic.

In order to eliminate these delays, procedures must be developed that will permit rotorcraft to transition from instrument conditions to visual conditions, independently of standard instrument approach paths. In this context, FAA Order 8260.3B, Terminal Instrument Procedures (TERPS), offers an alternative, the point-in-space approach. This approach could prove beneficial for rotorcraft operations as well as the entire national airspace system.

Several initiatives have been attempted during the past several years to increase airport capacity but have had very little impact on reducing delays. Simultaneous converging instrument approach procedures (SCIA) and the parallel/converging runway monitor (PCRM) program are two examples. While the SCIA program was only partially successful, the PCRM is still in a test phase and is being evaluated. Neither program provides rotorcraft with any significant benefits. Hopefully, helicopters will be included in the PCRM test program before its termination. Inclusion of rotorcraft in these programs could generate both near- and far-term solutions to rotorcraft related delay/congestion problems in the NAS.

Efforts must be expended to design and develop specific terminal procedures for the rotorcraft community. Procedures that will permit rotorcraft to have separate but equal access to the NAS and its associated airports and heliports are urgently needed. Although the IFR procedures developed for fixed-wing aircraft can be safely flown by rotorcraft, they create more problems than they solve in a mixed aircraft environment.

3.9.2 In-Trail Separation

One area that contributes to IFR arrival delays is the requirement to provide at least 3 mile longitudinal radar separation between aircraft, especially during the final approach segment. Reduction of this spacing requirement could help minimize delays imposed on rotorcraft. From the point of view of some controllers, the accuracy of radar information obtained from a single site would support a reduction in separation below the required 3 miles; the size of the reduction has not been determined but is believed to be on the order of 2 miles.

The general consensus of rotorcraft operators and the air traffic community is that in-trail separation can safely be reduced between rotorcraft, and in some cases between rotorcraft and fixed-wing aircraft. Although this is a collective opinion not supported by in flight data, it is backed by experience, both from a user and a provider standpoint.

While several late model rotorcraft are capable of maintaining approach speeds of 140 to 150 knots, as compared to the 160 to 180 knot speeds flown by many high performance fixed-wing aircraft, most IFR rotorcraft fly the final approach at airspeeds between 60 and 100 knots. These slower airspeeds are not compatible with the final approach speeds of higher performance fixed-wing aircraft.

A precedent for reduced in-trail separation has been established in a program that permits a reduction of longitudinal separation to 2.5 miles inside the final approach fix when it has been demonstrated that runway occupancy times are 50 seconds or less. Although this program, described in FAA Handbook 7210.3I and 7110.65F (table 1) does not directly discriminate against rotorcraft, the requirement to sample

data from 500 aircraft pairs for validation essentially eliminates helicopters from consideration because of their low IFR operational counts.

TABLE 1 AUTHORIZATION FOR 2.5 MILE SEPARATION

"Handbook 7210.3I"	Handbook 7110.65F
1236 REDUCED SEPARATION ON FINAL	5-72 MINIMA
Separation between aircraft may be reduced to 2.5 NM inside the final approach fix (FAF) when an operational need exists and has been documented through the regional Air Traffic Division to FAA Headquarters, ATO-300. Documentation to support implementation shall consist of the following: a. A Runway Occupancy Time (ROT) of 50 seconds or less is documented for each runway using, as a minimum, data from 500 aircraft pairs when aircraft are using reduced separation (less than 3 NM). b. The number of go-arounds does not exceed 2 percent of the approaches made. c. All reported wake turbulence encounters evaluated and satisfactorily resolved. d. Any observed simultaneous runway occupancy is evaluated and satisfactorily resolved. Note - The ROT is the length of time it takes an arriving aircraft to proceed from over the runway threshold to a point clear of the runway."	f. TERMINAL: Separation between aircraft may be reduced to 2.5 NM inside the final approach fix when: (1) Facilities desiring implementation of this procedure have documented an operational need through the regional Air Traffic division to FAA headquarters, ATO-300; (2) The leading aircraft's Weight Class is the same or less than the trailing aircraft; (3) Heavy aircraft and the Boeing 757 are permitted to participate in the separation reduction as the trailing aircraft only; (4) A runway occupancy time of 50 seconds or less is documented; (5) BRITE/TCDD displays are operational and used for quick glance references; (6) Turnoff points are visible from the control tower; and (7) Runways are clear and dry."

In support of rotorcraft, their runway occupancy time is rarely, if ever, a factor since the pilot can alter course and proceed directly to a designated landing area once the airport is in sight. Under

these circumstances, longitudinal separation inside the final approach fix could be reduced to allow rotorcraft to be fed into the IFR arrival stream without unduly delaying subsequent traffic.

3.9.3 Simultaneous Converging Instrument Approaches (SCIA)

The procedures for SCIA were introduced in 1986 and are described in FAA Order 7110.98. Its application allows for simultaneous instrument approaches to runways that converge at angles between 15 and 100 degrees. The objective of the SCIA procedure is to reduce arrival delays in the terminal environment by attempting to duplicate procedures in instrument meteorological conditions (IMC) that exist under visual conditions by permitting the use of converging runways.

SCIA procedural criteria is extremely restrictive. It requires the availability of radar and a precision approach system on each runway. Additionally, the missed approach points must be at least 3 miles apart, missed approach procedures must diverge, and the associated primary TERPS surfaces cannot overlap. This latter restriction imposed by the order, further restricts the viability of SCIA procedures for helicopters and normally equates to minima that equal or exceed basic VFR weather requirements, i.e. ceilings of 1000 feet with 3 mile visibilities, and effectively eliminates any real flow improvement. At many locations, minimums have been established as ceilings of 700 feet and visibilities of 2 miles.

With these minima a helicopter operator could operate VFR or SVFR into the control zone unless they were on an IFR flight plan and in instrument conditions. In that case, if a procedure existed that permitted them to transition from an instrument environment to a visual environment, such as a point-in-space approach, they would not create delays for the other IFR traffic.

In general SCIA procedures do not provide advantages to the rotorcraft operator because of their restrictive criteria. The procedures have the potential of providing helicopters with better service, fewer delays, and entrance to airports that are unable to provide other independent access. A modified SCIA procedure could provide rotorcraft with an IFR approach to an airport, without interfering with fixed-wing aircraft, if relatively minor changes were made to the directive.

While most major terminal facilities have investigated the possibility of instituting the SCIA program, only four currently offer it, Dallas/Fort Worth, Denver, Dulles International, and Philadelphia. Those facility managers that have declined to implement SCIA procedures believe the penalties far outweigh the benefits.

Rotory-wing aircraft are severely restricted by current SCIA criteria. The use of a nonprecision approach in lieu of one of the precision approaches required by the directive would provide additional access to airports with multiple runways for many IFR rotorcraft.

Several managers have attempted to reduce delays by sequencing fixed-wing traffic to one runway for a precision approach and vectoring rotory-wing traffic to a different runway for a different approach, not necessarily precision. While this procedure works well, it still requires 3-mile radar separation and, although it has contributed somewhat to a reduction in air traffic delays since it separates the rotorcraft from the faster fixed-wing traffic, it also has its drawbacks. This procedure works best when the rotorcraft can reach visual conditions where pilots are able to cancel their IFR flight plan and proceed to the airport VFR.

Regardless, delays continue for two reasons:

(1) the requirement to maintain a minimum 3 mile radar separation between <u>all</u> IFR aircraft, and

(2) the requirement for separate airspace for all approach procedures.

As a consequence the controller is often prevented from instituting converging procedures when they are most needed. The SCIA directive is currently being reviewed and modifications are anticipated in the summer of 1990.

3.9.4 Point-In-Space Approach

If rotorcraft are ever going to gain equal access with fixed-wing aircraft to airports, without interfering with the fixed-wing traffic flow, new innovative approach procedures must be developed and adopted. VFR and SVFR flight environments appear to provide the best solution to this access problem, but the difficulty of transitioning from an instrument to a visual environment continues to pose a significant problem. The concept of a point-in-space approach, if properly developed, seems to offer the simplest and most logical method of providing this transition and ultimately permitting rotorcraft to help relieve some of the delay problems.

A point-in-space approach, if properly designed, has the potential to provide the key ingredient for transitioning rotorcraft from an IFR world to a visual environment and could provide the latitude for tailoring airspace to fit the needs of both fixed- and rotory-wing aircraft with a minimum of expense.

Today's operating procedures require the use of a published instrument approach to make the IFR-VFR transition. This forces both fast and slow aircraft to be funneled into a single approach path, leading to a slow down of traffic and delays. The end result is saturation of the approach control airspace.

FAA Order 8260.3B, chapter 11, Helicopter Procedures, authorizes development of a point-in-space approach at locations where the center of the landing area is not within 2600 feet of the missed approach

point, and explains that the intent of the approach is to provide rotorcraft with a means to transition from an instrument environment to one of visual flight.

3.9.4.1 Special-Use Point-In-Space Approaches

Several special-use point-in-space approaches have been published that carry the "not within 2600 feet of the missed approach point" criteria to the extreme. For example, the COPTER RNAV-070° APPROACH to Philadelphia (figure 1) requires the pilot to fly 19.9 miles from the MAP to Philadelphia International Airport, while the COPTER RNAV-271° APPROACH to New York's John F. Kennedy Airport (figure 2) indicates the distance from the MAP to the airport is 17.4 miles. However, neither approach provides a visual route for the pilot to follow, merely a heading to be flown. The hazards for a pilot unfamiliar with these environments are too numerous to mention; consequently, neither approach is approved for public-use.

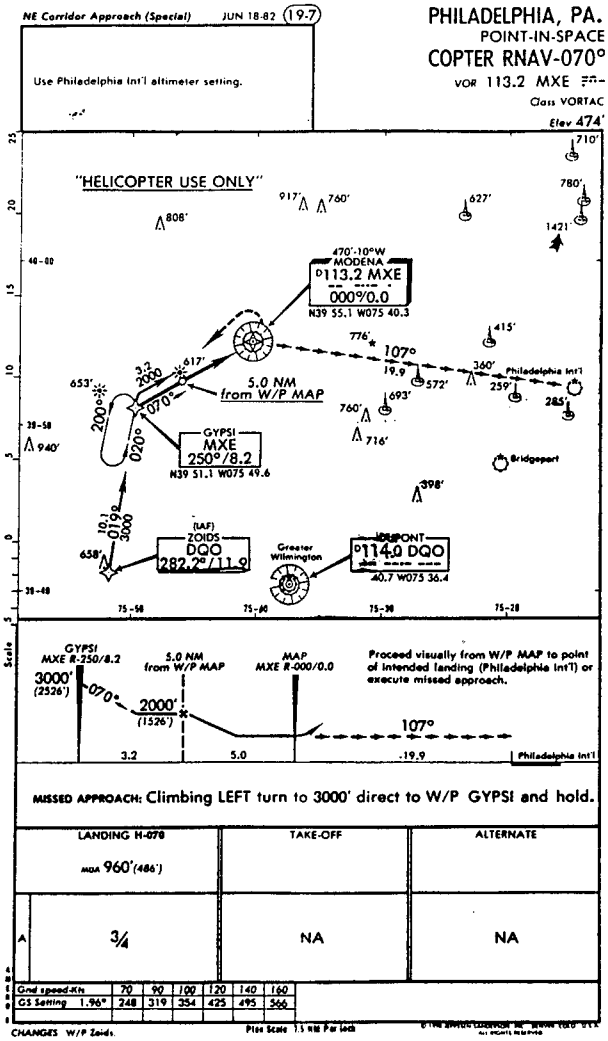

FIGURE 1 PHILADELPHIA - POINT-IN-SPACE APPROACH

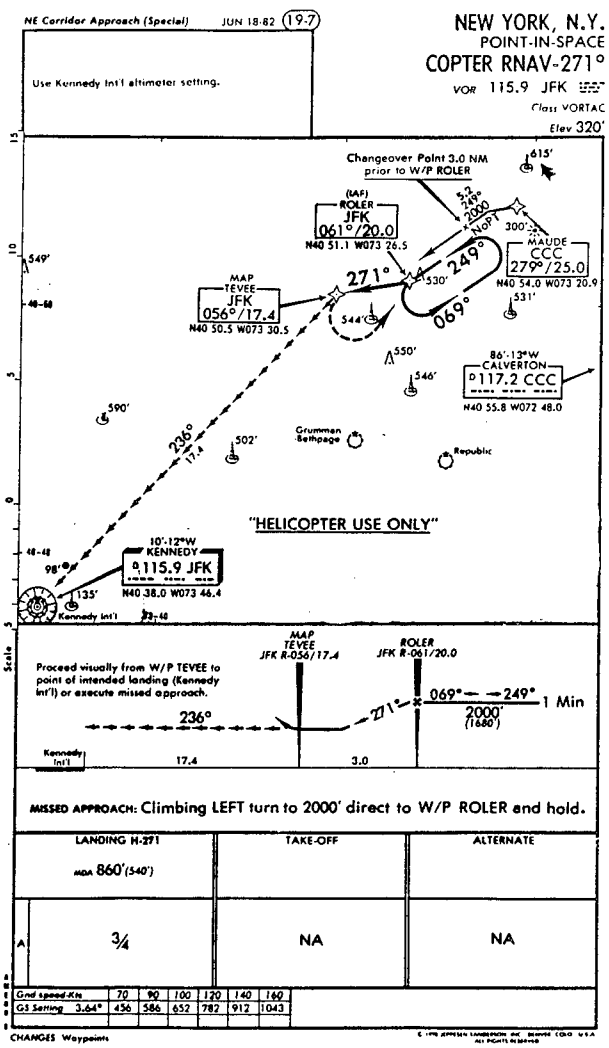

FIGURE 2 NEW YORK JFK - POINT-IN-SPACE APPROACH

Virtually all existing point-in-space approaches are deployed under the "special-use" category of FAA Order 8260.19A, Flight Procedures and Airspace, and do not terminate in controlled airspace. If the procedure is to provide any significant advantages to the NAS, it must be available for public use. Paragraph 402a of the order requires that public-use approaches be located in controlled airspace. If it is not feasible to develop an approach into an existing control zone or if the point of intended landing is outside the control zone, it would be necessary to provide additional controlled airspace, i.e. another control zone. Installation of an automated weather observing system (AWOS) or an automated surface observing system (ASOS) at the termination point of the approach would provide the necessary weather information that is required to maintain a control zone.

If point-in-space procedures are to be beneficial, further refinements are necessary. Although the point-in-space approach is an IFR procedure, it should be designed to segregate rotorcraft tracks from the IFR traffic flow until the aircraft on the point-in-space approach reaches visual conditions. The visual aspect of the point-in-space approach refers to the portion of the flight from the approach termination point (minimum descent altitude/decision height (MDA/DH)), along a visual segment of the flight, to the airport/heliport.

Employment of point-in-space approach procedures could provide a multitude of advantages to the NAS; however, to be effective they should terminate at a prominent landmark depicted on a helicopter route chart. This would provide pilots with a means to orient themselves, and also with a visually acquired track to follow once visual conditions are encountered. It would also provide the rotorcraft operator with the capability of transiting controlled airspace, i.e. a TCA or ARSA, to a landing area other than the airport. The approach and the routes should provide the helicopter with a track that is well clear of the IFR tracks of fixed-wing aircraft.

Since a point-in-space approach would provide an avenue for rotorcraft to gain access to an airport without interfering with the fixed-wing traffic flow, the approach should terminate at the outer perimeter of the airport traffic area or control zone. This would permit rotorcraft to proceed visually, VFR or SVFR, to the airport/heliport of intended landing. If the missed approach point (MAP) is located too close to the airport, it would impinge on previously established instrument approach airspace.

3.9.4.2 Public-Use Point-In-Space Approach

Development of a public-use, point-in-space approach would provide rotorcraft with access to many busy terminal areas. Terminals with light to moderate traffic can generally absorb IFR rotorcraft without seriously impacting their fixed-wing operations and therefore would not necessarily be candidates for a point-in-space approach.

Any point-in-space approach that is developed to provide access to a public-use airport/heliport should be considered a public-use approach. Special (lower) minimums may possibly be applied at public-use facilities for operators demonstrating increased capability.

Special-use approaches should be limited and restricted to locations with unusual geographical characteristics or where special equipment and/or training is required prior to utilization of the approach.

Although the intent of a point-in-space approach is to provide the pilot with a means of transitioning from an IFR environment to a VFR environment, regulatory changes would be required before the concept could realistically provide any appreciable advantages for the air traffic system.

Since the approach is an instrument procedure, the pilot must be on an IFR flight plan. Even though the pilot should be flying in visual conditions at the MDA/DH, his/her IFR flight plan remains intact until such time as the pilot lands the aircraft or personally cancels the flight plan. Until cancellation is received or the aircraft is on the ground, the air traffic system is required to provide standard IFR separation. This requirement negates many of the potential advantages that a point-in-space approach could provide.

Prior to issuing an IFR clearance, the controller must take several factors into consideration; among them are the aircraft's destination, the route of flight, the IFR portion of the flight, whether or not the flight plan is a composite IFR/VFR flight and if a composite flight plan is filed, what is the clearance limit.

Handbook 7110.65F makes the following statements that impact point-in-space procedures:

> "Paragraph 4-21b. Clearance Limit - Specify the destination airport when practicable, even though it is outside controlled airspace. Issue short range clearances as provided for in any procedures established for their use."
>
> "Paragraph 4-17 IFR-VFR and VFR-IFR Flights. a. Clear an aircraft planning IFR operations for the initial part of flight and VFR for the latter part to the fix at which the IFR part ends."
>
> "Paragraph 2-4 Note - It is solely the pilot's prerogative to cancel his IFR flight plan. ..."
>
> "Paragraph 4-80a Note 1 - Clearances authorizing instrument approaches are issued on the basis that, if visual contact with the ground is made before the approach is completed, the entire approach procedure will be followed unless the pilot ... cancels his IFR flight plan."

FAA Order 8260.3B states:

> "Paragraph 1107, Point In Space Approach. - ... the point-in-space and the missed approach point are identical and upon arrival at this point, helicopters must proceed under visual flight rules (or Special VFR in control zone as applicable) to a landing area or conduct the specified missed approach procedure. The published procedures shall be noted to this effect ..."

Consequently, if the clearance limit is the airport and the pilot does not cancel the IFR flight plan, the pilot is entitled to IFR protection from takeoff to landing.

If the clearance limit is a fix, i.e. short range clearance, rather than the airport, the pilot must enter holding at that point and is not permitted to proceed without additional clearance, unless the pilot is in visual conditions and cancels the IFR flight plan.

If the clearance limit is the approach fix, the pilot is not permitted to proceed beyond that point without an approach clearance. Assuming an approach clearance is issued, how far the pilot is permitted to proceed without cancelling the IFR flight plan becomes the question.

These paragraphs point out a problem that must be corrected before a realistic point-in-space approach program can be implemented. Under normal circumstances the approach would terminate with either a landing or a missed approach. With a point-in-space approach there is no immediate landing area; therefore, it would appear that the pilot must either execute the published missed approach or cancel the IFR flight plan in order to proceed any further along the intended flight path to the airport or heliport. If the pilot does not cancel the IFR flight plan, then the air traffic system must continue to provide IFR separation between the point-in-space and the intended landing area. Under current rules, neither the controller nor the pilot by executing the published procedure can effectively cancel an IFR flight plan.

In cases where the pilot fails to cancel the IFR flight plan would it be logical, reasonable, or even possible to establish a rule that an IFR flight plan would automatically be cancelled after successful completion of a point-in-space approach? Successful completion could be defined as the pilot's report of reaching visual meteorological conditions (VMC) or, in the event of a lack of communications, the pilot's failure to perform the missed approach procedure.

The special point-in-space procedures designed for use in the northeast corridor state that after reaching the MAP, the pilot shall "<u>proceed</u> <u>visually</u> from the waypoint to the point of intended landing or execute missed approach," whereas the procedures designed for operations within the Gulf of Mexico state "Helicopters must <u>proceed VFR</u> from MAP to landing area, or conduct specified missed approach."

While there may be more latitude in designing special procedures than there is for public procedures, neither statement can effectively cancel the pilot's IFR flight plan and ATC must continue providing IFR separation until the aircraft lands or the pilot personally cancels.

Since airspace is becoming more and more congested and it is impossible to manufacture additional airspace, methods must be devised to utilize the existing airspace more efficiently. The point-in-space approach appears to be a unique procedure that could help relieve traffic congestion while maintaining adequate safety standards.

In the near-term, VFR and SVFR access appear to provide the best solutions to relieving congestion and reducing delays, but the problem of transitioning from an instrument to a visual environment continues to pose problems. A realistic point-in-space procedure appears to be the most logical near-term solution. Eventually, with full deployment of MLS many of these difficulties may be overcome, but the current shortage of MLS navigational aids places that solution in the long-term category.

3.9.5 Standard Terminal Arrival (STAR) and Standard Instrument Departure (SID)

STAR's provide pilots with the ability to transition between an outer fix, or arrival waypoint in the en route structure, to the terminal area and the airport. Conversely, SID's depict routes from the airport through the terminal area to the en route structure. They permit pilots to perform their own navigation while reducing controller workload.

Conflict between rotory-wing and fixed-wing aircraft normally occur in terminal airspace where a mix of fast and slow aircraft must be sequenced in a logical order before landing or after takeoff. When aircraft are of the same type, or capable of flying at similar airspeeds, these predetermined routes provide assistance to the controller by removing the need to provide numerous radar vectors in order to establish the appropriate sequence. In-trail spacing becomes extremely time consuming and often difficult when the traffic is comprised of turbine-powered fixed-wing aircraft with a normal speed of 210 to 240 knots and aircraft that are only capable of a 100 to 150 knot speed range. Consequently, the slower aircraft are often rerouted to at least partially simplify the operation.

A helicopter STAR should be developed that originates at a feeder fix in the en route environment, and incorporates VOR/DME, RNAV, and/or LORAN-C routing to a final approach fix for an independent approach to the airport. Alternatively, the routing could lead to an approach fix for a point-in-space approach. The approach would terminate in visual conditions at the edge of the airport traffic area or provide entry to the VFR route structure.

In busy terminal areas, dedicated helicopter SIDs are needed to segregate departing rotorcraft from the standard departure routes of fixed-wing aircraft. They should originate at the heliport/helipad and not from the end of a runway. Initial routing should be perpendicular to the flow of arriving traffic and well clear of the fixed-wing departure stream. At lower activity airports, exclusive rotorcraft SIDs and STARs may not be necessary unless there are significant rotary-wing/fixed-wing traffic conflictions.

3.9.6 Microwave Landing System (MLS)

MLS technology introduces an opportunity to develop creative, independent rotorcraft arrival and departure procedures into and out of both airports and heliports. The following elements comprise a typical MLS installation:

> The Azimuth Station (AZ), similar to the ILS localizer, will provide proportional guidance coverage to ± 40 degrees of the system centerline. At some locations this may be expanded to ± 60 degrees.
>
> The Elevation Station (EL), similar to the ILS glide slope, provides various glide paths within the coverage area of the AZ. This will make it possible to provide independent approach guidance to additional runways or helipads at or near an airport.
>
> Precision DME (DME/P) will provide range accuracy in the final approach mode of ± 100 feet, while the Back Azimuth (BAZ), where available, will provide the capability to establish precision missed approach and departure procedures.

Variable glide path angles and different approach tracks should enable both rotary-wing and fixed-wing aircraft to make independent approaches to the same airport utilizing the same approach aid. In addition, the technology may allow the establishment of a new nominal DH of 150 feet. In short, the versatility of the MLS offers great potential for developing a new generation of rotary-wing/fixed-wing approach and departure procedures in terminal airspace.

3.9.7 Traffic Alert and Collision Avoidance System (TCAS)

A requirement for rotorcraft to install a TCAS system and a transponder could contribute to a safer environment, especially in congested airspace and in areas where narrow rotorcraft routes and/or corridors exist. The TCAS would provide assistance in avoiding collisions and enhance the "see and avoid" philosophy of VFR and SVFR flight. The greatest benefits would accrue if transponders with Mode 3 capabilities were required, but even a basic transponder would provide traffic advisories to the pilot with a TCAS equipped aircraft.

Many obstructions are difficult to see, even in the best of visibility conditions. The possibility of utilizing TCAS to assist in

obstruction avoidance at extremely low flight altitudes may be worth pursuing. It might be feasible to install a transponder on some of these hard-to-see obstructions, especially obstructions that are located in heavily travelled rotary-wing corridors. The TCAS would indicate the obstruction as traffic and the pilot could then take the appropriate steps to avoid it. Chart graphics could be developed to depict the transponder equipped obstruction on the route chart. Unique transponder codes could be assigned to obstructions allowing intelligent airborne equipment to differentiate between obstructions and other aircraft.

3.9.8 Parallel/Converging Runway Monitor (PCRM)

The objective of the PCRM program is to establish the technical characteristics for a future radar runway-monitoring system that will permit more efficient utilization of closely spaced and converging runways during instrument conditions.

The PCRM study was initiated in 1987 under a program entitled Parallel Runway Monitor (PRM) and gradually evolved from a study designed solely to improve IFR parallel runway operations, to one which can be applied to converging operations and other multiple approaches.

Different radar systems are currently undergoing tests at Raleigh-Durham, NC and Memphis, TN. The Raleigh-Durham test uses a fixed phased-array antenna, while Memphis is utilizing a pair of open-array beacon antennas mounted back to back.

Both systems appear to have the potential of increasing airport access during instrument weather conditions. Action must be taken to ensure that any potential for providing additional airport access for rotorcraft is not overlooked during this test program.

3.9.9 FAA Handbook 8260.3B, Terminal Instrument Procedures (TERPS)

For several years air traffic managers, their staffs, and the user community have expressed the need for innovative rotorcraft instrument procedures that will permit air traffic control to take advantage of the rotorcraft's full capabilities. They believe emphasis should be placed on arrival and departure procedures that take these capabilities into account.

A common perception among both air traffic personnel and rotorcraft operators is that many problems associated with the handling of IFR rotorcraft are directly related to the procedural restrictions imposed by TERPS. They believe, for example, that:

(1) handbook criteria do not stay abreast of technological advances;

(2) excessively long periods of time are required to effect any change in procedures;

(3) minimum descent altitudes are too high and unrealistic for rotorcraft; and

(4) procedural criteria are outdated and based on antiquated data.

A common claim is that chapter 11, Helicopter Procedures, shows only minor differences between rotorcraft and fixed-wing procedural standards and that very little credit has been allowed for the unique maneuvering capabilities of helicopters.

Many of these individuals fail to fully understand that in TERPS standards, the primary difference between VFR protected airspace and that required for IFR is how the aircraft are separated from obstructions and the large margin for error tolerance applied to instrument flight. VFR rules are associated with the "see and avoid" concept, while IFR rules provide for significant lateral and vertical separation between the intended flight path and obstructions.

While the visual maneuvering capability of rotorcraft has been acknowledged, it has not been demonstrated under instrument conditions. Tests conducted by the FAA Technical Center have shown that under instrument approach conditions, rotorcraft require approximately the same amount of maneuvering airspace as fixed-wing aircraft of comparable speed. Hence, protected airspace for helicopters, as presented in the TERPS handbook, is not markedly different from the fixed-wing criteria described in preceding chapters.

Efforts to reduce rotorcraft minimums on steep angle precision approaches have also proven unsuccessful. Helicopters have been flown under test instrument conditions at their minimum allowable IFR airspeeds and have experienced problems decelerating between the DH and the landing area. The visual segment of the approach must be sufficiently long to allow the helicopter to decelerate from its approach speed and land vertically on the helipad. Tests have shown that this distance is approximately 2,500 feet for approach speeds of 60 knots. This distance, when projected in a vertical direction along specified steep angle approach paths, equates to approximately a 270 foot DH at a 6 degree angle and to a 450 foot DH for a 9 degree approach path (see figure 3).

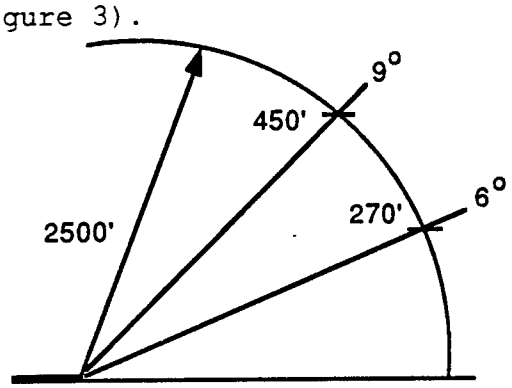

FIGURE 3 DH REQUIREMENT FOR DECELERATION

At this time there are two areas of TERPS being investigated that look promising for providing rotorcraft benefits: slow speed decelerating approaches, and the visual segment following the completion of a successful instrument approach to MDA/DH.

Work on certification requirements for the decelerating approach is currently underway in a joint effort of the FAA Technical Center, the FAA Southwest Region, and the National Research Council of Canada. These approach procedures will require a significant amount of aircraft instrumentation in the form of advanced flight directors, in addition to MLS ground and airborne equipment.

The FAA is presently doing work at their headquarters through the Vertical Flight Program Office (ARD-30) to evaluate the IFR visual segment with the hope of reducing the size of the protected airspace once a helicopter reaches visual conditions during an instrument approach. The results of these evaluations will determine whether or not TERPS restrictions can be eased. This effort, while it will not likely produce reduced helicopter minimums, could reduce the amount of required protected airspace beneath the IFR portion of the approach procedure. These procedures would be very useful in congested airspace areas such as downtown heliports. Additionally, these procedures may prove useful in providing rotorcraft approaches that are independent from fixed-wing approach procedures.

These issues need to be addressed for the benefit of the rotorcraft community. If the results prove to be negative and there is no justification for changing TERPS criteria without a decided improvement in navigation accuracy and/or rotorcraft avionics, the industry should be informed. On the other hand, if the answers are favorable they may allow improved TERPS criteria for helicopters and provide for appropriate gains. Regardless, follow-on action needs to be taken to clarify the situation.

3.10 MISCELLANEOUS

The following opinions were received from various individuals during the study and are incorporated with little or no comment. In some cases the opinions require no action on the part of the FAA or industry. In other cases the opinions did not appear to be broad-based enough to invoke action at this time.

3.10.1 Airborne Radar Approach (ARA) and Offshore Standard Approach Procedures (OSAP)

The procedures for ARA and OSAP approaches are described in Advisory Circular (AC) 90-80A, Approval of Offshore Helicopter Approaches, dated 10/21/88, and apply to helicopter offshore support operations by both 14 CFR 91 and 14 CFR 135 operators. These procedures have proven to be beneficial in an overwater environment but in the opinion of several operators should be restricted to offshore locations and not be modified or extended for onshore sites.

By definition an ARA is a nonprecision instrument approach procedure based upon utilization of the aircraft's radar system as the primary approach aid. The ARA has been utilized quite extensively in the Gulf of Mexico to assist IFR helicopters in executing instrument approaches to various oil platforms.

OSAP is defined as a procedure designed specifically for helicopters operating over water to and from offshore platforms, rigs, and ships, and is not to be used less than 5 nautical miles from land. The procedure utilizes LORAN-C for course guidance and airborne weather/mapping radar for detecting and avoiding obstructions.

3.10.2 Siting of Heliports

Some air traffic personnel believe that the FAA should move heliports from airports to downtown locations and provide a rapid transit system from the heliport to the airport. They believe this would help relieve airport congestion and still provide helicopter passengers with airport access with a minimum of delay. It is their opinion that most helicopter passengers are more interested in gaining access to the business district than the airport and consequently this option would meet those needs.

Many rotorcraft operators do not concur. It is their belief that more passengers have a desire for airport access, a minimum of baggage handling, and fewer delays, than those who are primarily interested in gaining access to the business district. Downtown heliports are needed but airport helipads are of equal or greater importance.

3.10.3 Communications and Surveillance

Rotorcraft operators were not aware of any significant communication problems in terminal areas, the exception being aircraft on approach to, or on the ground at, outlying heliports/helipads on the fringe of the terminal airspace. Even then, pilots rarely have difficulty hearing tower transmissions although it is not uncommon for the tower to have problems hearing them. Whether this was a problem with aircraft transmitters or the result of low operating altitudes has not been determined. It does, however, indicate a possible requirement for remote communications facilities (RCAG) at some locations.

3.10.4 Visual Meteorological Conditions (VMC)

For an aircraft to operate in VMC (VFR conditions), 14 CFR 91.155 (91.105) requires ceilings of 1000 feet and visibilities of 3 miles. A suggestion was received that the FAA amend the FAR to incorporate a weather category entitled "Rotorcraft VMC" or "Helicopter VFR." In this environment a ceiling of 500 feet and a visibility of 1 1/2 miles would be the standard for rotorcraft to operate VFR. It was believed that under these conditions, there would be a lesser need for

communications, since the need for air traffic control clearances would decrease and as a consequence, there would be less frequency congestion and reduced workload for both the pilot and the controller. The contention was that everyone would gain.

4.0 RECOMMENDATIONS

Based on the analysis of current procedures, review of current air traffic control standards, and the discussions with users and air traffic control field personnel, a number of recommendations are presented.

4.1 HANDBOOK 7110.65F

4.1.1 Paragraph 2-87, Aircraft Identification

This paragraph gives more than 40 examples of how to identify aircraft; only one reference is made to rotorcraft and that refers to a military helicopter.

Recommendation:

Amend paragraph 2-87a examples, to incorporate at least one civil helicopter type, model, or manufacturer's name, i.e. "Bell Two Seven Three Three."

4.1.2 Paragraph 2-88, Description of Aircraft Types

This paragraph gives 15 examples of how to identify aircraft with no reference to rotorcraft.

Recommendation:

Amend paragraph 2-88c examples, to include at least one helicopter model, name, or designator, i.e. "Sikorsky S-Seventy Six."

4.1.3 Paragraph 3-92, Simultaneous Same Direction Operation

Paragraph 3-144, Simultaneous Landings or Takeoffs, authorizes simultaneous helicopter operations with as little as 200 feet separation; however, when a fixed-wing aircraft and a helicopter are involved, the requirements of paragraph 3-92 must be invoked.

Current procedure:

"Authorize simultaneous, same direction operations on parallel runways, on parallel landing strips, or on a runways and a parallel landing strip only when the following conditions are met:

a. operations are conducted in VFR conditions unless visual separation is applied.

b. two-way radio communication is maintained with the aircraft involved and pertinent traffic information is issued.

c. the distance between the runways or landing strips is in accordance with the minima in the Table (use the greater minimum if two categories are involved)."

3-92c Table. - Same Direction Distance Minima

Aircraft Category	Minimum distance (feet) between parallel Runway centerlines	Edges of adjacent strips or runway and strip
Lightweight, single engine, propeller driven	300	200
Twin-engine, propeller driven	500	400
All others	700	600

Recommendation:

Establish helicopter categories that can be correlated with the fixed-wing standards or, if this is not feasible, incorporate rotorcraft into these categories based on their size.

4.1.4 Paragraph 3-106, Same Runway Separation (Departure)

Questions have arisen and some confusion has been generated when a helicopter is the preceding aircraft and is landing on the runway.

Current procedure:

"Separate a departing aircraft from a preceding departing or arriving aircraft using the same runway by ensuring that it does not begin takeoff roll until:

a. The other aircraft has departed and crossed the runway end or turned to avert any conflict. If you can determine distances by reference to suitable landmarks, the other aircraft need only be airborne if the following minimum distance exists between aircraft:

(1) When only Category I aircraft are involved - 3000 feet.

(2) When a Category I aircraft is preceded by a Category II aircraft - 3000 feet.

(3) When either the succeeding or both are Category II aircraft - 4,500 feet.

(4) When either is a Category III aircraft - 6000 feet.

(5) When the succeeding aircraft is a helicopter, visual separation may be applied in lieu of using distance minima.

3-106a Note. - Aircraft Categories are as follows:

Category I - Light-weight, single-engine, personal-type propeller driven aircraft. (Does not include higher performance, single-engine aircraft such as the T-28.)

Category II - Light-weight, twin engine, propeller driven aircraft weighing 12,500 pounds or less, such as the Aero Commander, Twin Beechcraft, DeHavilland Dove, Twin Cessna. (Does not include such aircraft as a Lodestar, Learstar, or DC-3.)

Category III - All other aircraft such as the higher performance single-engine, large twin-engine, four engine, and turbojet aircraft."

Recommendation:

Establish helicopter categories that can be correlated with these fixed-wing standards, or if this is not feasible, incorporate rotorcraft into the above categories based on the same criteria that was utilized during the original categorization.

4.1.5 Paragraph 3-107d, Intersection Takeoff - Wake Turbulence Application

Since helicopters have not been categorized, they logically fall in Category III. This effectively classifies helicopters as "large" aircraft and places additional restrictions on their operation or on the operations of small aircraft operating in the vicinity of helicopters.

Current procedure:

"d. Separate a small aircraft taking off from an intersection on the same runway (same or opposite direction takeoff) behind a preceding departing large aircraft by ensuring that it does not start takeoff roll until at least 3 minutes after the large aircraft has taken off. Inform an aircraft when it is necessary to hold in order to provide the required 3-minute interval.

3-107d Note. - Aircraft conducting touch-and-go and stop-and-go operations are considered to be departing from an intersection, reference paragraph 3-91."

Recommendation:

Include helicopters in the aircraft categories described in paragraph 3-106a note.

4.1.6 Paragraph 3-122, Same Runway Separation (Arrival)

In section 4.1.4, questions have arisen and some confusion has been generated when a helicopter is the preceding aircraft and is landing on the runway.

Current procedures:

"a. Separate an arriving aircraft from another aircraft using the same runway by ensuring that the arriving aircraft does not cross the landing threshold until one of the following conditions exists or unless authorized in paragraph 3-131:

(1) The other aircraft has landed and taxied off the runway. Between sunrise and sunset, if you can determine distances by reference to suitable landmarks and the other aircraft has landed, it need not be clear of the runway if the following minimum distance from the landing threshold exists:

(a) When a Category I aircraft is landing behind a Category I or II - 3,000 feet.

(b) When a Category II aircraft is landing behind a Category I or II - 4,500 feet.

(2) The other aircraft has departed and crossed the runway end. If you can determine distances by reference to suitable landmarks and the other aircraft is airborne, it need not have crossed the runway end if the following minimum distance from the landing threshold exists:

(a) Category I aircraft landing behind Category I or II - 3,000 feet.

(b) Category II aircraft landing behind Category I or II - 4,500 feet.

(c) When either is a category III aircraft - 6,000 feet.

(3) When the succeeding aircraft is a helicopter, visual separation may be applied in lieu of using distance minima."

Recommendation:

Clarify the intent of paragraph 3-122(3) to remove the confusion that results in determining the appropriate separation standards when a helicopter is the preceding aircraft (3,000, 4,500, or 6000 feet) and whether or not visual separation may be authorized in this instance.

4.1.7 Paragraph 3-140a Note. Taxi and Ground Movement Operation

Most controllers have little or no knowledge of the hazards that affect helicopter flight; therefore, when information is presented in the controller's handbook it should be described accurately. The information in this note regarding ground resonance is incorrect as it refers to taxiing helicopters.

Current paragraph:

"3-140a Note. - Ground taxiing uses less fuel than hover-taxiing and minimizes air turbulence. However, under certain conditions, such as rough, soft, or uneven terrain, it may become necessary to hover/air-taxi for safety considerations. Helicopters with articulating rotors (usually designs with three or more main rotor blades) are subject to "ground resonance" and may, on rare occasions, suddenly lift off the ground to avoid severe damage or destruction."

Recommended editorial change:

Delete the sentence beginning "Helicopters with articulating rotors ..."

4.1.8 Paragraph 3-141, Helicopter Takeoff Clearance

Numerous comments were received from controllers regarding subparagraphs b. and c. It was their opinion that the reasoning for the phraseology was confusing.

Current procedure:

"a. Issue takeoff clearance from movement areas other than active runways, or in diverse directions from active runways, with additional instruction, as necessary. Whenever possible, issue takeoff clearance in lieu of extended hover-taxi or air-taxi operations.

b. If takeoff is requested from nonmovement areas and, in your judgment, the operation appears to be reasonable, use the following phraseology instead of the takeoff clearance in a. above.

Phraseology:

PROCEED AS REQUESTED, USE CAUTION (reason and additional instructions, as appropriate).

c. If takeoff is requested from an area not visible, an area not authorized for helicopter use, an unlighted nonmovement area at night, or an area off the airport, and traffic is not a factor, use the following phraseology.

Phraseology:

DEPARTURE FROM (requested location) WILL BE AT YOUR OWN RISK (reason and additional instructions, as necessary).

TRAFFIC (as applicable),
or
TRAFFIC NOT A FACTOR.

d. Unless requested by the pilot, do not issue downwind takeoffs if the tailwind exceeds 5 knots."

Recommendation:

Incorporate both paragraphs, b. and c., into one paragraph and amend the phraseology. Example:

b. If takeoff is requested from a nonmovement area, an area not visible from the tower, an unlighted area at night, or an area off the airport, and traffic is not a factor, use the following phraseology:

DEPARTURE FROM (requested location) WILL BE AT YOUR OWN RISK, USE CAUTION, CLEARED FOR TAKEOFF (additional instructions as necessary).

Note: The phrase "an area not authorized for helicopter use" was intentionally deleted from the paragraph since it was perceived that there was at least an implication that the controller and the FAA were condoning a questionable, if not illegal, operation.

4.1.9 Paragraph 3-145, Helicopter Landing Clearance

Subparagraphs b. and c. of this paragraph are virtually identical with paragraphs 3-141b. and c. above except for the words "landing ... to" replace the words "takeoff ... from".

Recommendation:

Incorporate both paragraphs into one and amend the phraseology appropriately, see section 4.1.8.

4.1.10 Paragraph 5-115, Departures and Arrivals on Parallel or Nonintersecting Diverging Runways

This paragraph describes procedures that permit simultaneous operations between aircraft arriving and departing parallel or nonintersecting diverging runways and/or helipads; however, the wording of the paragraph appears to impose penalties and/or restrictions when rotorcraft are involved.

Current procedures:

"5-115 DEPARTURES AND ARRIVALS ON PARALLEL OR NONINTERSECTING DIVERGING RUNWAYS

TERMINAL

Authorize simultaneous operations between an aircraft departing on a runway and an aircraft on final approach to another parallel or nonintersecting diverging runway if the departure course diverges immediately by at least 30 degrees from the missed approach course until separation is applied and provided one of the following conditions is met:

5-115 Note. - When one or both of the takeoff/landing surfaces is a helipad, consider the helicopter takeoff course as the runway centerline and the helipad center as the threshold.

a. When parallel runway thresholds are even, the runway centerlines are at least 2,500 feet apart.

b. When parallel runway thresholds are staggered and:

(1) The arriving aircraft is approaching the nearest runway - The centerlines are at least 1,000 feet apart and the landing thresholds are staggered at least 500 feet for each 100 feet less than 2,500 the centerlines are separated.

(2) The arriving aircraft is approaching the farther runway - The runway centerlines separation exceeds 2,500 feet by at least 100 feet for each 500 feet the landing thresholds are staggered.

c. When nonintersecting runways diverge by 15 degrees or more and runway edges do not touch.

d. <u>When the aircraft on takeoff is a helicopter, hold the helicopter until visual separation is possible or apply the separation criteria in paragraph 5-115a, b, or c.</u>"

Recommendation:

Delete paragraph 5-115d from Handbook 7110.65F. The intent of paragraph 5-115d is obscure, if not confusing.

4.2 PROCEDURAL INTERPRETATIONS OF HANDBOOK 7110.65F

Author's note: Paragraphs 4.2.1, 4.2.2, 4.2.3, and 4.2.4 refer to Handbook 7110.65E and were amended with the issuance of changes 1 through 6 to Handbook 7110.65F. It has been included in this report since it was originally recommended by the author in an earlier letter report submitted as part of subtask 3.

4.2.1 Paragraph 7-40, Authorization

Current procedure:

"a. Special VFR (SVFR) operations in weather conditions less than basic VFR minima are authorized:

(1) At any location not prohibited by FAR 93.113 or when an exemption to FAR 93.113 has been granted and an associated Letter of Agreement established ... "

4.2.1.1 Interpretation

Helicopters have been granted an exemption to FAR 93.113; consequently a letter of agreement must be consummated before helicopters can operate within a TCA. Only those operators who have signed the letter are permitted to operate within that TCA.

4.2.1.2 Recommendation

Add a clarifying note to subparagraph (1), e.g. 7-40a(1). Note - FAR 93.113 does not prohibit helicopters from operating in a TCA.

4.2.2 Paragraph 7-43, Altitude Assignment

Current procedure:

"Do not assign a fixed altitude when applying vertical separation, but clear the Special VFR aircraft at or below an altitude which is at least 500 feet below any conflicting IFR traffic but not below the minimum safe altitude prescribed in FAR 91.79.

7-43 Note 1. - Special VFR aircraft are not assigned fixed altitudes because of the clearance from clouds requirement.

7-43 Note 2. - The minimum safe altitudes are (1) over congested areas, an altitude at least 1,000 feet above the highest obstacle, and (2) over other than congested areas, an altitude at least 500 feet above the surface."

4.2.2.1 Interpretation

No aircraft, including helicopters, can be assigned an altitude that is below the minimum safe altitudes specified in 7-43 Note 2. If the intent of Handbook 7110.65F was to incorporate the special altitude exceptions granted to helicopters by 14 CFR 91.119(d) (91.79(d)), that paragraph would have been referenced.

4.2.2.2 Recommendation

Expand paragraph 7-43 Note 2, to include the pertinent portions of 14 CFR 91.119(d) (91.79(d)).

"7-43 Note 2. - The minimum safe altitudes for fixed-wing aircraft are:

(1) over congested areas, an altitude at least 1,000 feet above the highest obstacle,

(2) over other than congested areas, an altitude at least 500 feet above the surface.

Helicopters may be operated at less than the minimums prescribed in (1) or (2)."

4.2.3 Paragraph 7-48, Special VFR Helicopter Separation

"a. Control a Special VFR Helicopter by Special VFR procedures unless other procedures are contained in a letter of agreement.

TERMINAL

b. Control a Special VFR helicopter by visual separation or Special VFR procedures unless local procedures are contained in a letter of agreement."

4.2.3.1 Interpretation

"Other procedures" or "local procedures" are only permitted if all helicopter operators that utilize the airport are signatories to a letter of agreement that describe the procedures in detail.

4.2.3.2 Recommendation

Delete paragraph 7-48, and 7-48 note, since it merely restates the fact that SVFR helicopters must be controlled utilizing SVFR procedures.

4.2.4 Paragraph 7-49, Local Procedures

"TERMINAL

At locations where the volume or complexity of helicopter operations warrants, a letter of agreement shall specify that Special VFR helicopters are required to maintain visual reference to the surface and the traffic patterns, routes, and reporting or holding fixes necessary to achieve separation, in accordance with the following minima:

a. Between Special VFR helicopters - 1 mile. You may, however, use 200 feet if they are departing simultaneously on diverging courses and you can determine this minimum by reference to the surface markings or you can instruct one to remain at least 200 feet from each other.

b. Between an arriving Special VFR helicopter and an arriving IFR aircraft executing a straight-in approach:

(1) If the arriving IFR aircraft on a straight-in approach is less than 1 mile from the landing threshold - 1/2 mile.

(2) If the arriving IFR aircraft on a straight-in approach is 1 mile or more from the landing threshold - 1 1/2 miles.

c. Between an arriving IFR aircraft executing a circling approach or a missed approach and an arriving Special VFR helicopter - 2 miles.

d. Between a departing IFR aircraft and a Special VFR helicopter:

(1) If the departing aircraft is less than 1/2 mile beyond the runway end - 1/2 mile.

(2) If it is 1/2 mile or more beyond the runway end - 2 miles.

e. Between a departing Special VFR helicopter and a departing IFR aircraft - 1/2 mile if courses diverge by at least 45 degrees after takeoff.

f. Between an arriving IFR aircraft and a Special VFR helicopter - Sufficient separation to assure that the helicopter takes off on a course which diverges by at least 45 degrees from the runway centerline before the arriving aircraft is 1 mile from the airport."

4.2.4.1 Interpretation

These reduced standards are only permitted if all helicopter operators that utilize the airport have signed the referenced letter of agreement.

4.2.4.2 Recommendation

Evaluate the SVFR separation standards described in paragraph 7-49 with the objective of reducing the number of standards and standardizing helicopter SVFR procedures throughout the NAS.

4.2.4.3 Amend Paragraph 7-49

Specify/clarify that helicopter operators who have not signed the letter of agreement shall receive standard SVFR separation and service, and that the reduced minimums authorized by the paragraph are only applicable to signatories to the letter of agreement.

Author's note. Proposal ATO-320-89-005 was developed and circulated by the Air Traffic Procedures Division, Terminal Procedures Branch on 5/16/89 to Air Traffic field facilities and interested organizations for comment. The proposal was based on recommendations by the author that had been incorporated into an earlier letter report.

4.2.4.4 New Paragraph 7-49, Local Procedures - Letter of Agreement Criteria (Revised 1/11/90)

"TERMINAL

When warranted by the volume and/or complexity of local helicopter operations, letters of agreement may be used to specify alternate SVFR helicopter separation minima. However, each letter of agreement shall, as a minimum, specify that SVFR helicopters are to maintain visual reference to the surface and adhere to the following aircraft separation minima:

a. Between SVFR helicopters - 1 mile. This separation may be reduced to 200 feet if:

(1) both helicopters are departing simultaneously on courses that diverge by at least 30 degrees; and

(2) you can determine this separation by reference to surface markings, or you instruct one of the departing helicopters to remain at least 200 feet from each other.

b. Between a SVFR helicopter and an arriving or departing IFR aircraft:

(1) if the IFR aircraft is less than 1 mile from the landing airport - 1/2 mile.

(2) if the IFR aircraft is 1 mile or more from the airport - 1 miles."

Recommendations:

The new paragraph 7-49 is much easier to understand and the separation standards much easier to implement; however, two minor editorial changes are needed: the last portion of subparagraph a(2) should either read " ... you instruct the departing helicopters to remain at least 200 feet from each other," or "you

instruct one of the departing helicopters to remain at least 200 feet from the other."

The last portion of subparagraph b(2) should read "1 mile".

4.3 PILOT/CONTROLLER GLOSSARY

The glossary is incorporated into Handbooks 7110.10I and 7110.65F and the Airman's Information Manual (AIM).

ADD or AMEND the following definitions:

4.3.1 Aeronautical Chart

ADD: (7) Helicopter Route Charts

4.3.2 Aircraft Classes

Current definition:

"For the purposes of Wake Turbulence Separation Minima, ATC classifies aircraft as Heavy, Large, and Small as follows:

1. Heavy - Aircraft capable of takeoff weights of 300,000 pounds or more whether or not they are operating at this weight during a particular phase of flight.

2. Large - Aircraft of more than 12,500 pounds, maximum certified takeoff weight, up to 300,000 pounds.

3. Small - Aircraft of 12,500 pounds or less maximum certificated takeoff weight."

Recommendation:

Increase the weight limitation for the "small" aircraft class to 20,000 to 25,000 pounds. If this is not feasible, incorporate a new weight classification of "light" or "medium." This new classification would encompass aircraft of more than 12,500 pounds maximum certified takeoff weight, up to 75,000 pounds.

Amend the definition of aircraft classes to:

AIRCRAFT CLASSES - For the purpose of Wake Turbulence Separation Minima, ATC classifies aircraft as Heavy, Large, Light/Medium, and Small as follows:

1. Heavy - Aircraft capable of takeoff weights of 300,000 pounds or more whether or not they are operating at this weight during a particular phase of flight.

2. Large - Aircraft/rotorcraft of more than 75,000 pounds, maximum certified takeoff weight, up to but not including 300,000 pounds.

3. Light/Medium - Aircraft/rotorcraft of more than 12,500 pounds, maximum certified takeoff weight, up to 75,000 pounds.

4. Small - Aircraft/rotorcraft of 12,500 pounds or less maximum certificated takeoff weight.

4.3.3 Rotorwash

ADD a rotorwash definition, for example:

ROTORWASH - The main rotor system of a helicopter generates a high velocity downward wind which is initially vertical but on contact with the surface changes to horizontal. At a given distance its velocity increases with increasing helicopter weight. The effect of the rotorwash diminishes rapidly as you move away from the area directly beneath the rotor blades and is normally negligible outside 2 to 3 rotor diameters of the hovering helicopter.

4.4 AIRMAN'S INFORMATION MANUAL (AIM)

4.4.1 Paragraph 238c

This paragraph describes the procedures defined in Handbook 7110.65F, paragraphs 3-141 and 3-145, Takeoff and Landing Clearance, and would require a rewrite in the event that changes were made to the controller's handbook.

4.4.2 Paragraph 550

This paragraph contains a statement that, if true, could affect helicopter in-trail wake turbulence separation standards.

"550 HELICOPTERS

In a slow hover-taxi or stationary hover near the surface, helicopter main rotor(s) generate downwash producing high velocity outwash vortices to a distance approximately three times the diameter of the rotor. When rotor downwash hits the surface, the resulting outwash vortices have behavioral characteristics similar to wing tip vortices produced by fixed wing aircraft. However, the vortex circulation is outward, upward, around, and away from the main rotor(s) in all directions. Pilots of small aircraft should avoid operating within three rotor diameters of any helicopter in a slow hover taxi or stationary hover. In forward flight, departing or landing helicopters produce a pair of high velocity trailing vortices similar to wing tip vortices of "large" fixed wing aircraft. Pilots of small aircraft should

use caution when operating behind or crossing behind landing and departing helicopters."

Recommendation:

Delete the word "large" from the emphasized sentence so that the sentence reads: "In forward flight, departing or landing helicopters produce a pair of high velocity trailing vortices similar to wing tip vortices of fixed-wing aircraft."

If current rotorcraft wake turbulence data does not support such a change, increase the emphasis (priority) on helicopter wake turbulence studies to either validate or refute the statement.

4.5 TRAINING

Revise the air traffic training program at the FAA Aeronautical Center in Oklahoma City. Specifically, incorporate the study of rotorcraft operating characteristics, capabilities, and versatility into the curriculum.

<u>This familiarization course should describe</u>:

a. Three or four of the most commonly utilized IFR helicopters, e.g. Bell Model 212; Sikorsky Models SK-65, SK-70, SK-76; and Aerospatiale Model SA-355.

b. Three or four of the more popular small turbine powered VFR helicopters e.g. Bell Model 206, McDonnell Douglas Model 369/500, Aerospatiale Model 350, and Messerschmidtt-Boelkow-Blohm (MBB) Model BO-105.

c. And three or four of the more common reciprocating engine helicopters, e.g. Bell BH13, Rogerson/Hiller Model UH12, Enstrom Model F28, Robinson Model R22, and Schweizer/Hughes Model 269/300.

d. Emphasis should be placed on relative cruise speeds, approach speeds, maneuverability, and potential effects of rotorwash, and hovering, both in and out of ground effect. Include performance characteristics such as the following: hovering capabilities are based on gross weight, available power, and density altitude; as a consequence, a helicopter operating on a hot summer day, at maximum gross weight, may not be able to hover and could be required to utilize a runway for a fixed-wing type rolling takeoff. Furthermore, it should be emphasized that hovering during an instrument approach is unsafe and is not an acceptable maneuver.

4.6 HELICOPTER VISUAL APPROACH

Research the possibility of developing an independent visual approach for rotorcraft, similar to the CVFP procedures currently in use. This helicopter visual approach procedure could provide SVFR entrance to an airport whose approaches are restricted because of instrument meteorological conditions without conflicting with the IFR traffic flow.

4.6.1 Examples of Potential Helicopter Visual Approaches, to Washington National Airport

Referenced routes are depicted on the Washington area, helicopter route chart (see figure 4).

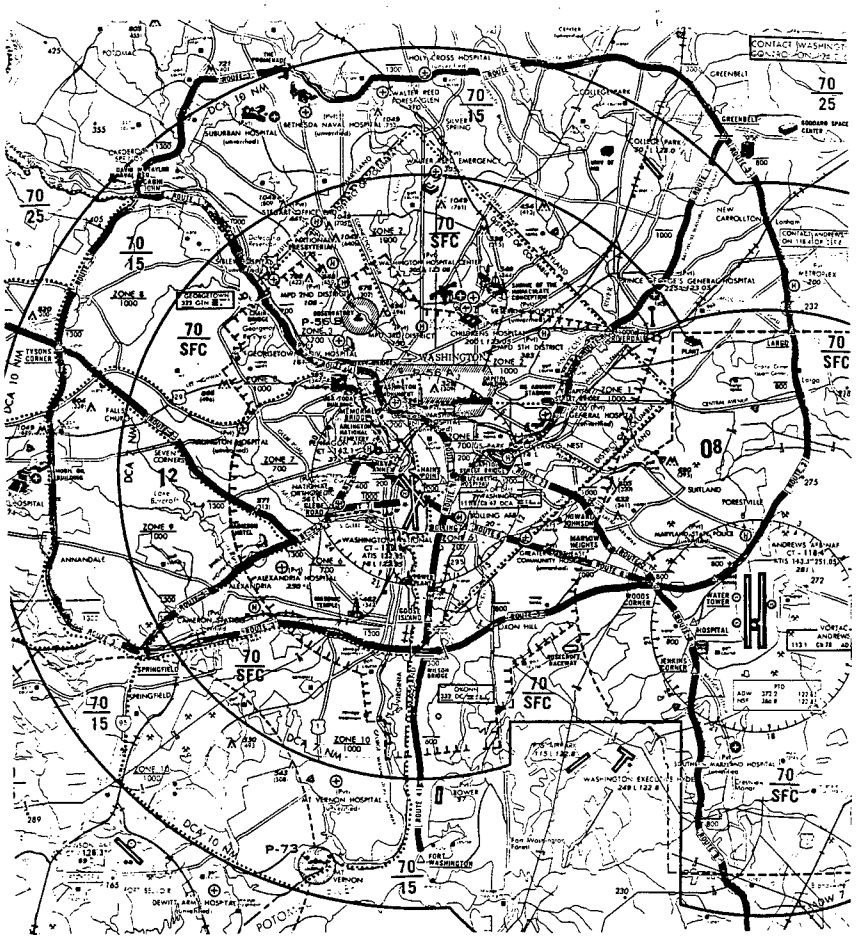

FIGURE 4 WASHINGTON DC HELICOPTER ROUTE CHART EXCERPT - NATIONAL AIRPORT TCA

4.6.2 Glebe Approach (Helicopter Visual)

An example of a helicopter visual approach called the Glebe Approach is shown in figure 5.

Transition visually to the final approach course via Helicopter Route 5, at or below 1300/800 feet MSL. - descend eastbound along South Glebe Road/Four Mile Run. Remain at or above 200 feet until passing the railroad yard, then direct to landing at the west helipad. Do not cross the railroad yard if landing traffic is not in sight.

GLEBE TRANSITION -
Helicopter Route 5 -
from the south - Springfield, via I-395 to Glebe Road/Route 7 intersection, at or below 1300 feet MSL.
from the north - Pentagon/Navy Annex via I-395 to Glebe Road/Route 7 intersection, at or below 800 feet MSL.

Helicopter Route 7 -
from the west - via Route 7 to Glebe Road.

LANDING AREA: West helipad - southwest corner of airport. (West end of taxiway A, western edge of General Aviation parking ramp.)

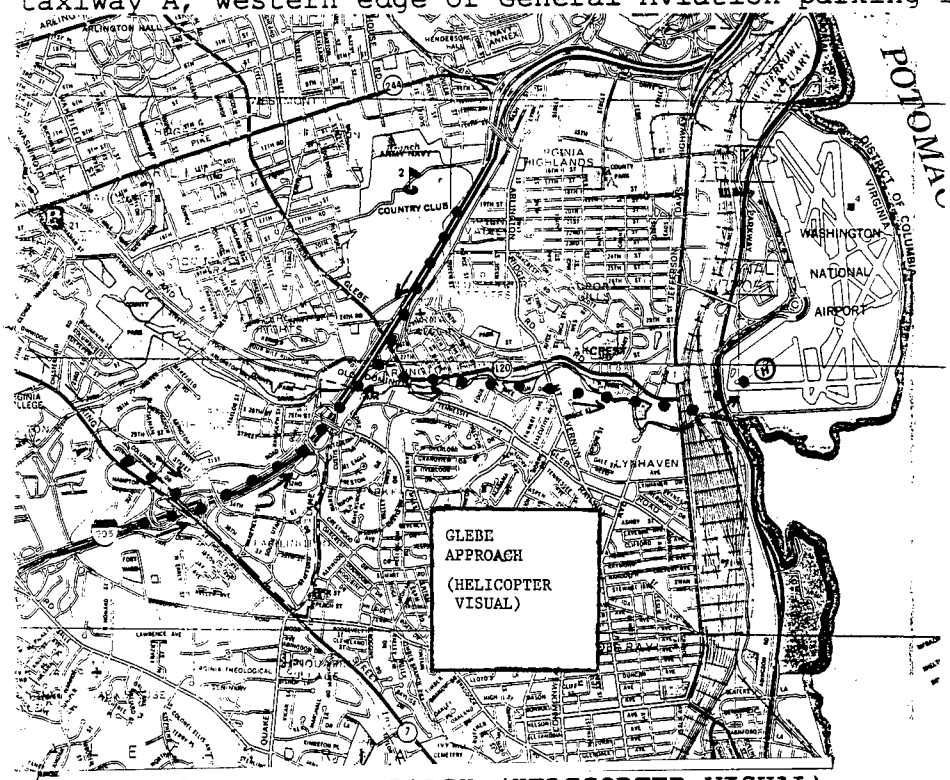

FIGURE 5 GLEBE APPROACH (HELICOPTER VISUAL)

4.6.3 Bolling Approach (Helicopter Visual)

An example of a helicopter visual approach called the Bolling Approach is shown in figure 6.

Transition visually to the final approach course via Helicopter Route 6 or Interstate I-295 at or below 500 feet MSL - descend westbound visually over Bolling Heliport, direct to National Airport east helipad. Remain at or above 200 feet until crossing the eastern

shoreline of the Potomac River. Do not cross the shoreline if landing traffic is not in sight.

BOLLING TRANSITION
Interstate I-295 -
from the south - Wilson Bridge, via I-295 to Bolling AFB main gate/Portland Street, at or below 500 feet AGL.
from the north - Douglas Bridge, via I-295 to Bolling AFB main gate/Portland Street, at or below 500 feet AGL.

Helicopter Route 6 -
from the east - via Route 6 from Andrews AFB to Bolling AFB.

LANDING AREA - East Helipad located on shoreline midway between approach end of runway 33 and approach end of runway 21.

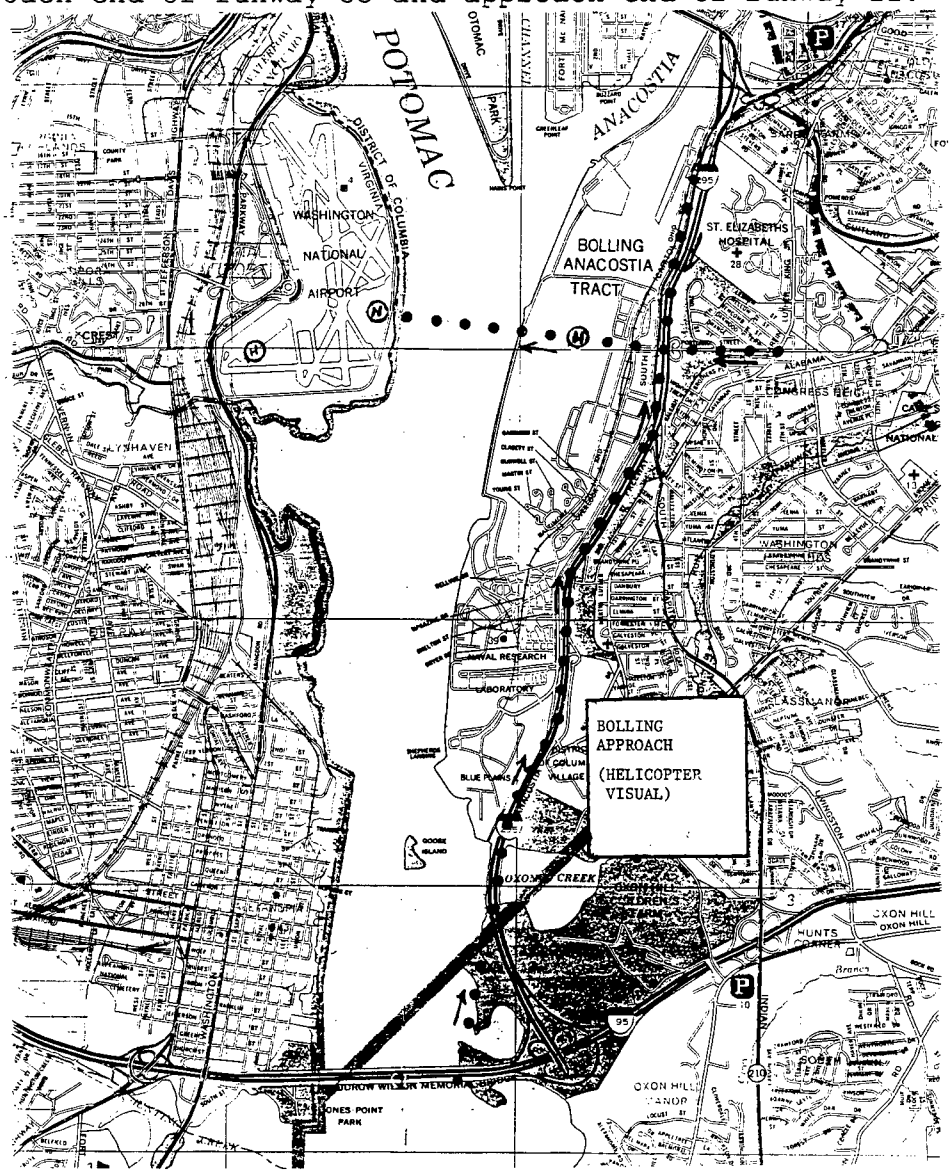

FIGURE 6 BOLLING APPROACH (HELICOPTER VISUAL)

4.6.4 Sample Helicopter Visual Approach Directive

The following paragraph contains a sample helicopter visual approach directive:

ORDER 7110.XX

SUBJECT: HELICOPTER VISUAL APPROACH PROCEDURE (HVAP)

1. PURPOSE. This order establishes criteria for developing helicopter visual approach procedures at locations experiencing excessive airport traffic delays for fixed-wing and rotory-wing aircraft.

2. DISTRIBUTION. This order is distributed to selected Washington, Regional, Aeronautical and Technical Center offices, all Flight Standards field offices, all Air Traffic facilities, and Technical Assistance Groups. External distribution and limited military distribution.

4. ACTION. When it has been determined by the ATC facility manager that an HVAP is required, action may be initiated to develop procedures in accordance with paragraph 5., PROGRAM. The regional Air Traffic Division (ATD) shall review proposed HVAP's to ensure compatibility with paragraphs 5 and 6.

5. PROGRAM. HVAP's will be developed by ATC in accordance with the following:

a. Determine that the use of HVAP will not cause an operational hardship on the control facility or the users of the ATC system.

b. Design procedures to minimize fuel use and flight time.

c. Ensure that the visual arrival routes and altitudes are in accordance with established procedures and are compatible with ATC operational requirements.

d. Coordinate proposed procedures with the responsible Flight Standards District Office to ensure that the new or revised procedures are compatible with aircraft flight characteristics.

6. CRITERIA. Comply with the following criteria to ensure safety is not compromised:

a. Radar control required.

b. Operating tower required at airport served by HVAP.

c. HVAP's shall be developed to a specific helipad.

d. HVAP's shall originate at or near, and be designed around prominent visual landmarks. When a determination is made that a landmark cannot be readily identified at night, the procedure shall be annotated "Procedure Not Authorized at Night."

e. HVAP's normally should not extend beyond 5 miles from the landing area.

f. Use electronic navaids as supplementary information only.

g. Course information between landmarks along the proposed flight path may be provided for general orientation.

h. Minimum altitudes may be established for obstruction clearance. Recommended altitudes may be established for noise abatement purposes.

i. Establish weather minimums for the procedure as follows:

(1) ceiling of at least 500 feet.

(2) visibility of at least 1 mile.

(3) greater ceiling/visibility values may be required if determined necessary for the safe accomplishment of the procedure, and

(4) the published ceiling and visibility values must be reported at the airport/heliport for authorized use of the procedure.

j. Missed approach procedures will not be published.

k. HVAP's shall be named for the primary landmark utilized during the approach, i.e. Bolling Visual, Glebe Visual, etc.

7. GUIDELINES.

a. Changes in arrival flight routes which routinely route traffic over noise sensitive areas may require an environmental assessment and impact statement or finding of no significant impact as defined in Order 1050.1C, Policies and Procedures for Considering Environmental Impacts.

b. Chart format and symbology shall be in accordance with criteria established by ATO-200, consistent with applicable charting policies (reference FAA Annex to IACC-4).

c. Regions shall ensure that procedures are contained within controlled airspace and the TCA, if one exists.

d. Facility managers shall document new and/or revised HVAP's for each helicopter visual approach on a separate FAA Form 7110.XX and forward to the regional ATD.

e. After ATC approval of a procedure by the ATD manager, the region will process the HVAP through the Flight Standards Flight Inspection and Procedures Staff to the appropriate Flight Inspection Field Office (FIFO). The FIFO will determine flyability and process the HVAP through the same channels used for instrument approach procedures.

f. FAA Form 7110.XX will be stocked at the depot. Copies may be ordered through normal supply channels (NSN: 0052-00-XXX-XXXX:U/I:SH).

/s/
Director, Air Traffic Operations Service

4.7 FEDERAL AVIATION REGULATIONS

The following paragraphs contain recommended changes to the FAR's.

4.7.1 <u>14 CFR 65. Certification: Airmen Other Than Flight Crewmembers</u>

Editorial change:

"Subpart B - Air Traffic Control Tower Operators

65.43 Rating Privileges and Exchange.

(a) The holder of a senior rating on August 31, 1970, may at any time after that date exchange his rating for a facility rating at the same air traffic control tower. However, if he does not do so before August 31, 1971, he may not thereafter exercise the privileges of his senior rating at the control tower concerned until he makes the exchange.

(b) The holder of a junior rating on August 31, 1970, may not control air traffic, at any operating position at the control tower concerned, until he has the applicable requirements of paragraph 65.37 of this part. However, before meeting those requirements he may control air traffic under the supervision, where required, of an operator with a senior rating (or facility rating) in accordance with paragraph 65.41 or this part in effect before August 31, 1970."

Recommendation:

Delete section 65.43 since it is no longer applicable.

4.7.2 14 CFR 77. Objects Affecting Navigable Airspace

14 CFR 77 77.11: SCOPE is quoted in part:

"(a) This subpart requires each person proposing any kind of construction or alterations described in 77.13(a) to give adequate notice to the Administrator. It specifies the locations and dimensions of the construction or alteration ... "

"FAR 77-13: Construction or Alteration Requiring Notice.

(a) Except as provided in 77-15, each sponsor who proposes any of the following construction or alterations shall notify the Administrator in the form and manner prescribed in 77-17:

(1) Any construction or alteration of more than 200 feet in height above the ground level at its site."

Recommendation:

The FAA and the FCC must reemphasize the importance of timely notification of new or planned construction. Additionally, pilots should be reminded that a new antenna can be constructed virtually overnight and that any newly observed structures should be reported to the nearest FAA facility, first upon initial sighting by means of a pilot report, and with a subsequent follow up in writing.

4.7.3 14 CFR 91. General Operating and Flight Rules, Section 91.11 - Prohibition Against Interference with Crewmembers

14 CFR 91.11(a) (91.8(a)) states: "No person may assault, threaten, intimidate, or interfere with a crewmember in the performance of the crewmember's duties aboard an aircraft being operated."

Recommendation:

Clarify this paragraph to additionally restrict intimidation and interference from persons not on board the aircraft in addition to persons on board the aircraft.

4.8 HELICOPTER ROUTE CHARTS

Recommendations:

a. Print the helicopter route chart on the reverse of the terminal area chart where appropriate. This would reduce the number of charts that pilots are required to carry.

b. Standardize the NOTES that are printed on the charts or separately identify those notes that mandate action from notes that merely provide information.

c. Provide obstruction protection on the routes where altitudes are mandatory and flight check those routes. Implement an obstruction evaluation program to afford them protection from future construction.

d. When compulsory reporting points are depicted, indicate the controlling agency to receive the reports. If the purpose of the reporting point is to self-announce your position for the benefit of other operators, this should be noted.

e. Establish hospital-to-hospital routes for EMS operations. The majority of EMS operations involve this type of activity. Establish other EMS routes as required by local conditions and operations.

f. Overlay helicopter routes on the TCA chart. The routes could be depicted by a series of helicopters placed along the routes so that other pilots would be aware of the helicopter activity.

g. Print mandatory altitudes in a contrasting color for emphasis.

h. Reduce the size of existing charts, if feasible, without diminishing clarity.

i. Annotate dedicated helicopter frequencies on TCA charts and instrument approach procedure charts. Currently they are only depicted on the helicopter route charts and fixed-wing pilots are unaware of helicopter activities.

4.9 REDUCED IN-TRAIL SEPARATION

Recommendation:

Develop simulation models and test programs that investigate the possibility of reducing longitudinal separation on final approach, when at least one of the aircraft is a rotorcraft.

4.10 SIMULTANEOUS CONVERGING INSTRUMENT APPROACH (SCIA)

Recommendations:

a. Through the use of validated simulation models determine the feasibility of reducing the lateral separation between radar identified IFR aircraft to less than 3 miles, when at least one of the aircraft is a rotorcraft.

b. Amend the criteria in Order 7110.98, Simultaneous Converging Instrument Approaches, paragraph 7b, to remove the requirement that both runways have a precision instrument approach system when the aircraft on the nonprecision approach is a rotorcraft.

4.11 POINT-IN-SPACE APPROACH

Recommendations:

a. Design/develop point-in-space approach procedures that terminate at, or close to, a prominent landmark, i.e. highway interchange, bridge, toll plaza, etc. The landmarks would permit pilots to orient themselves once clear of the clouds. The termination point of the approach could serve a dual purpose, since it could also be an access point to a route depicted on a local helicopter route chart.

b. Investigate the feasibility of using a system of lights, similar to lead-in lights, at the termination point of the approach that would provide a "route direction arrow" to indicate the next desired track. More than one arrow could be used in the event several routes radiate from the same point.

c. Change the publication standard for point-in-space procedures to depict the landmark (termination point or MAP) in the space presently reserved for a sketch of the airport/heliport.

d. Investigate the possibility of amending the existing rules and/or procedures to mandate cancellation of an IFR flight plan once a rotorcraft completes a point-in-space approach and the pilot does not execute the appropriate missed approach procedure. This is especially important if the pilot is entering uncontrolled airspace.

4.12 STANDARD INSTRUMENT DEPARTURE (SID)/STANDARD TERMINAL ARRIVAL (STAR)

Recommendations:

a. Publish a new generation of SID's and STAR's designed for rotorcraft that will provide separate, independent routing to and from the airport.

b. At busy airports the SID should be designed to commence at the heliport/helipad and not at the end of a runway. Initial routing should be perpendicular to the flow of arriving traffic and well clear of the fixed-wing departure stream. At lower activity airports this may not be necessary if there are no significant rotary-wing/fixed-wing traffic conflictions.

c. The STAR should incorporate VOR/DME, RNAV, and LORAN-C tracks that provide routing to a final approach fix for an independent

approach to the airport. Alternatively, the routing could lead to a fix that could: (1) provide access to a point-in-space approach that would terminate in visual conditions outside the airport traffic area, and (2) provide subsequent entry to a VFR/SVFR route to the airport.

4.13 TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS)

Recommendation:

Investigate the possibility of utilizing TCAS to assist in obstruction avoidance at extremely low flight altitudes. It might be feasible to require installation of a transponder on some hard-to-see obstructions, especially obstructions that are located in heavily travelled rotary-wing corridors. The TCAS would indicate the obstruction as traffic, and the pilot could then take the appropriate steps to avoid it. Chart graphics could be developed to depict the transponder-equipped obstruction on the route chart.

4.14 PARALLEL/CONVERGING RUNWAY MONITOR (PCRM)

Recommendation:

Incorporate rotorcraft in the test phase of the PCRM program at Raleigh-Durham and Memphis to evaluate the effectiveness of PCRM in helicopter operations.

4.15 TERMINAL INSTRUMENT PROCEDURES (TERPS)

Recommendation:

Qualifying data are needed to change the existing TERPS standards for rotorcraft. Additional data, based on slower airspeed approaches and superior visual maneuverability after leaving instrument flight, are not available to confirm whether or not helicopter performance differs appreciably from comparable fixed-wing aircraft under similar conditions.

Continued effort should be expended to collect data that offers any possibility of reducing TERPS airspace for rotorcraft. This data should be gathered in conjunction with other ongoing rotorcraft simulation programs such as the visual segment evaluation studies.

4.16 WAKE TURBULENCE

Recommendation:

Increase the priority of, and intensify the effort to complete, the rotorcraft wake turbulence studies to validate the possibilities of reducing in-trail separation between rotorcraft and between rotary-wing and some fixed-wing aircraft.

5.0 CONCLUSIONS

The FAA has conducted numerous studies of the factors that created today's problems of delay and congestion. One often heard solution is the presumption that more is better, i.e. more airports, more runways, more airplanes, and additional airspace. Fiscal restraints and lack of available land combined with public resistance, have made it difficult if not impossible to construct new airports and in many cases new runways. Adding more aircraft to the current system would not improve conditions, merely exacerbate them, since congestion would be increased with no gain in capacity. Airspace is a constant that obviously cannot be increased, although it could possibly be utilized more effectively.

The alternative thus becomes the need to do more within existing parameters, to modify and improve current procedures and/or, develop new methods of operation that will provide separate routes to airports that permit both rotary-wing and fixed-wing aircraft equal, but independent, access to landing areas.

Presently, rotorcraft operations constitute a very small percentage of the total operations within the NAS. This percentage is even smaller when an all-weather capability is taken into consideration. If vertical lift aircraft are to be permitted to assist in solving some of these air transportation capacity problems, they must have access to separate noninterfering routes or corridors to approach and depart the airport.

The need for change in rotorcraft operating procedures is dependent on the operating rules, i.e. visual operations experience fewer problems than instrument operations. Consequently, innovative instrument approach procedures must be developed if rotorcraft are going to be permitted to help relieve the congestion/delay problems.

Rotorcraft VFR operations apparently are not experiencing any significant problems. Those that do exist are minor in nature and can generally be rectified by editorial changes to Handbook 7110.65F and/or clarification of the intent of the existing paragraphs.

Special VFR is the most beneficial procedure available to rotorcraft during instrument weather conditions, but those procedures have several drawbacks the most notable of which is the inability to access the service at all times since helicopter SVFR operations are often shut down at major terminal areas during busy times.

IFR operations not only generate most of the rotorcraft operator's problems but add to the controller's workload and ultimately contribute to airport delays because of the requirement to fly a relatively slow airspeed on approach.

While helicopters possess many unique qualities that are beyond the capabilities of fixed-wing aircraft, they are burdened with at least

one very distinct disadvantage, the aforementioned relatively slow speeds. This encumbrance is most obvious during instrument conditions and is magnified during the arrival and departure phases of flight. As a consequence they tend to add to delay problems rather than contributing toward their reduction.

Potential solutions to this dilemma indicates a need to separate slower flying helicopters from faster fixed-wing aircraft. Segregation can be accomplished by the air traffic controller by vectoring other traffic around the helicopter, and vice versa, however this process intensifies the controller's work and is too time consuming to be efficient.

The alternative is separate egress/ingress routes for rotorcraft, routes that do not impede a smooth traffic flow and provide both rotory- and fixed-wing aircraft with equal access to their desired landing areas without confliction.

A rotorcraft STAR that terminates with a point-in-space approach could logically be the first step in providing this segregation. Existing point-in-space procedures need to be refined and a degree of realism must be added, i.e. a visual route from the DH/MDA to the landing area rather than an assigned heading. Furthermore, an added degree of safety must be incorporated to assist the pilot in obstacle avoidance, i.e. the approach and the visual route should be flight checked for accuracy and safety.

Some type of visual approach is needed that can ensure separation between a SVFR helicopter and an IFR aircraft. While a 3 mile separation is required between IFR aircraft, only 1 mile is necessary between a SVFR helicopter and an IFR aircraft. A helicopter visual approach, patterned after the current charted visual flight procedures, could serve a dual purpose; (1) it could be designed initially to provide route information to regular SVFR helicopters from their entry into the control zone to the helipad/heliport and, (2) it ultimately could be expanded to serve as an extension to a point-in-space procedure where it could depict an approach path from the MDA/DH to the airport. While the CVFP program has not proven to be a panacea to commercial aviation it has helped increase the traffic flow and in many cases reduced workload for both pilot and controller.

The proposed helicopter visual approach has the potential to provide benefits to the SVFR rotorcraft operator by allowing independent access to an airport during instrument flight conditions. Additional benefits would accrue for the fixed-wing community by providing access to IFR operators without the interference or delays created by rotorcraft. An additional benefit would be provided to the controller since the need to mix slower moving helicopters with faster fixed-wing aircraft would no longer exist.

The potential advantages offered by the point-in-space approach, the helicopter route charts, and a potential helicopter visual approach

are only limited by one's imagination and their effective use could provide near-term solutions to many delay problems.

None of these procedures would deny rotorcraft the privilege of operating within the IFR system if that were preferred but would offer a safe realistic alternative in the event of airspace saturation and/or airport congestion. Eventually, approaches utilizing MLS, LORAN-C, GPS, etc. may prove more beneficial, but except for LORAN-C, these approach aids cannot reasonably be expected to be readily available for widespread general use before the end of the decade.

Individually, many of the recommendations may seem to be only modestly significant, but collectively they address many of the concerns expressed by the helicopter communities and air traffic control. Implementation would make helicopter operations more efficient and reduce many delays. Other recommendations may appear to be superficial but their intent is to recognize and accommodate the growing importance of rotorcraft within the NAS.

Most recommendations are cost effective and will not require excessive financial outlays. Very little, if any, new avionics or expensive navaids would be required to implement the recommendations but in toto their implementation would contribute toward a reduction in airport delays.

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Handbook/Order	Title
7030.1A	Protected Airspace for Instrument Approach Procedures
7100.8A	Standard Instrument Departure (SID)
7100.9A	Standard Terminal Arrival (STAR)
7110.10I	Flight Services
7110.22	Arrival and Departure Handling of High Performance Aircraft
7110.65F	Air Traffic Control
7110.79C	Charted Visual Flight Procedures
7110.83B	Oceanic Air Traffic Control
7110.91	Tower En Route Control
7110.97	Airport Operating Practices
7110.98	Simultaneous Converging Instrument Approaches (SCIA)
7110.102	Air Traffic LORAN-C Approach Procedures
7210.3I	Facility Operations and Administration
7220.2	Operational Position Standards
7400.2C	Procedures for Handling Airspace Matters
7610.4G	Special Military Operations
8260.3B	United States Standard for Terminal Instrument Procedures (TERPS)
8260.19A	Flight Procedures and Airspace
8400.9	National Safety and Operational Criteria for Runway Use Programs

Advisory Circular	Title
AC 27-1	Certification of Normal Category Rotorcraft
AC 29-2A	Certification of Transport Category Rotorcraft
AC 61-13B	Basic Helicopter Handbook
AC 61-82	Airline Transport Pilot - Helicopter - Flight Test
AC 67-1	Medical Information for Air Ambulance Operators
AC 70-2D	Airspace Utilization Considerations in the Proposed Construction, Alteration, Activation, and Deactivation of Airports
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AC 90-83	Terminal Control Areas (TCA)
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AC 90-88	Airport Radar Service Area (ARSA)
AC 91-22A	Altitude Alerting Devices/Systems
AC 91-32A	Safety in and Around Helicopters
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AC 150/5345-43D	Specification for Obstruction Lighting Equipment
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AC 210-5A	Military Flying Activities

Airman's Information Manual (AIM)

Federal Aviation Regulations - 14 CFR Parts 60 through 139

LIST OF ACRONYMS

AIM.....Airman's Information Manual
ARA.....Airborne Radar Approach
ARSA.....Airport Radar Service Area
ASOS.....Automated Surface Observing System
ATC.....Air Traffic Control
AWOS.....Automated Weather Observing System
AZ.....Azimuth Station (MLS)
BAZ.....Back Azimuth Station (MLS)
CFR.....Code of Federal Regulations
CVFP.....Charted Visual Flight Procedure
DH.....Decision Height
DME.....Distance Measuring Equipment
DME/P.....Precision DME (MLS)
EL.....Elevation Station (MLS)
EMS.....Emergency Medical Service
FAA.....Federal Aviation Administration
FAF.....Final Approach Fix
FAR.....Federal Aviation Regulation
FCC.....Federal Communications Commission
HVAP.....Helicopter Visual Approach
IAF.....Initial Approach Fix
IFR.....Instrument Flight Rules
ILS.....Instrument Landing System
IMC.....Instrument Meteorological Conditions
LORAN.....Long-Range Navigation
MAP.....Missed Approach Point
MDA.....Minimum Descent Altitude
MLS.....Microwave Landing System
NAR.....National Airspace Review
NAS.....National Airspace System
OSAP.....Offshore Standard Approach Procedure
PCRM.....Parallel/Converging Runway Monitor
PRM.....Parallel Runway Monitor
RCAG.....Remote Communications Air/Ground Facility
RNAV.....Area Navigation
SCIA.....Simultaneous Converging Instrument Approaches
SID.....Standard Instrument Departure
STAR.....Standard Terminal Arrival
SVFR.....Special Visual Flight Rules
TCA.....Terminal Control Area
TCAS.....Traffic Alert and Collision Avoidance System
TERPS.....Terminal Instrument Procedures
VFR.....Visual Flight Rules
VMC.....Visual Meteorological Conditions
VOR.....Very High Frequency Omnidirectional Range