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ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: GENERAL AVIATION PROCEDURES FOR FLIGHT IN NORTH ATLANTIC MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS AIRSPACE

1. PURPOSE. This Advisory Circular sets forth acceptable means, but not the only means, for persons operating under Federal Aviation Regulations (FAR) Part 91 and for Part 135 certificate holders, except those operating under Section 135.2, to obtain authorization to operate within specified airspace over the North Atlantic, designated as the North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) airspace, after 0001 Greenwich Mean Time (GMT), December 29, 1977.

2. REFERENCES. Federal Aviation Regulations Parts 21, 91, and 135, Advisory Circulars (AC) 25-4, AC 90-45A, AC 120-31A, AC 121-13, and International Civil Aviation Organization (ICAO) Annex 2.

3. INFORMATION.

a. The concept of the MNPS was proposed on a worldwide basis at the International Civil Aviation Organization (ICAO) 9th Air Navigation Conference. The objective of MNPS is to ensure the safe separation of aircraft and to derive maximum economic benefit from the improvement in accuracy of navigation equipment developed in recent years.

b. The MNPS concept is scheduled to be implemented on a regional basis, taking into account particular regional operating conditions. At the September 1976 Limited North Atlantic Regional Air Navigational Meeting, criteria for MNPS and the introduction of these criteria within parts of the NAT region, effective at 0001 GMT, December 29, 1977, were agreed upon. (This date corresponds to the initial decommissioning of LORAN A in the NAT Region.) The area concerned is designated as the "NAT-MNPS airspace."

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c. NAT-MNPS airspace is defined as follows:

(1) Between latitudes 27 degrees north and 67 degrees north.

(2) The Eastern boundaries of Santa Maria Oceanic, Shanwick Oceanic, and Reykjavik Flight Information Regions (FIR).

(3) The Western boundaries of Reykjavik and Gander Oceanic FIRs and New York Oceanic east of longitude 60 degrees west.

(4) Between FL 275 and FL 400.

d. Contingent upon supportive statistical data, the lateral separation of aircraft in the NAT-MNPS airspace is scheduled to be reduced in October 1978, from 120 nm to 60 nm. For users of the NAT Organized Track Structure (OTS), this should provide additional flight tracks nearer the optimum track.

e. When establishing the MNPS concept, it was decided by ICAO that all operators desiring to use the MNPS airspace must show that the navigation equipment and procedures to be used are capable of continuously complying with the specifications. In the case of U.S. operators, this showing must be made to the Federal Aviation Administration (FAA). Certain acceptable means of showing original capability of adhering to MNPS standards are contained herein. Continuance of that capability is the responsibility of the operator.

f. As established by ICAO, the minimum navigation performance specifications for operating in the airspace listed in paragraph 3. c. are listed below. An operational interpretation of the requirement is in brackets after the specification.

(1) The standard deviation (one sigma) of lateral track errors should be less than 6.3 nm.

(2) The proportion of the total flight time spent by aircraft 30 nm or more off track should be less than $5.3X10^{-4}$. [The proportion of the total flight time spent by aircraft 30 nm or more off the cleared track should be less than 1 hour in 1900 hours. (Note that 30 nm is half of the lateral separation; thus, an aircraft with more than such an error is closer to the adjacent track than the cleared track.)]

(3) The proportion of total flight time spent by aircraft between 50 and 70 nm off track should be less than $1.3X10^{-4}$. [The proportion of the

total flight time spent by aircraft between 50 and 70 nm off the cleared track should be less than 1 hour in 8000 hours. (Note that between 50 and 70 nm off track is equivalent to flying on the adjacent track.)]

g. If in-flight equipment unserviceability reduces the navigation capability below the MNPS as established by ICAO, Air Traffic Control (ATC) should be immediately advised so that any necessary adjustments of aircraft separation may be accomplished.

h. In evaluating a navigation system for use in ICAO MNPS airspace, consideration should be given to maintaining the high level of navigation performance listed in paragraphs 3. f. (2) and 3. f. (3). It should be noted that flight time spent between 50 and 70 nm off track [3. f. (3)] is also flight time spent more than 30 nm off track [3. f. (2)]. Operators should consider equipment reliability and a human errors analysis when evaluating a navigation system for use in the NAT-MNPS airspace.

i. The approved aircraft navigation system should be functionally checked prior to entering NAT-MNPS airspace. This may be accomplished by overheading a VOR, an NDB, or using a reliable radar fix. Self-contained navigation units approved on the basis of station referenced update should be updated each hour as a minimum.

j. To ensure that safety is not compromised through failure of operators to meet the conditions set forth in paragraphs 3. f. (2) and 3. f. (3), ICAO is establishing procedures for monitoring of aircraft navigation performance using ATC radar near the boundaries of NAT-MNPS airspace. Lateral errors in excess of 25 nm will be reported for investigation, as appropriate. If there is an excessive number of large errors, it may become necessary for ICAO to increase separation standards until improvement has been achieved.

4. EQUIPMENT AND OPERATIONAL APPROVAL FOR PART 91 AND 135 OPERATORS.

a. General. Persons operating under Part 91 who want approval to fly in NAT-MNPS airspace should contact the nearest General Aviation District Office (GADO) or Flight Standards District Office (FSDO). Part 135 operators should contact the FAA office that administers their operating certificate. Contact with the appropriate FAA office should be established at least 30 days prior to proposed operation in the MNPS airspace.

b. Acceptable Navigation System Equipment.

(1) Data gathered from operational experience with certain self-contained and station-referenced long-range navigation systems now in service indicate that the following systems should be capable of meeting NAT-MNPS. These are:

(a) Dual Inertial Navigation Systems (INS).

(b) Dual OMEGA.

(c) Single INS with OMEGA update.

(d) Single Doppler with OMEGA update.

NOTE: Of the above systems, each must be seperately approved in accordance with paragraph 4. c. as appropriate.

(2) Since VLF communication stations are not dedicated to navigation, VLF systems alone should not be used as a sole means of long-range navigation, or as a sole update means to other methods of navigation within NAT-MNPS airspace.

c. NAT-MNPS Considerations.

(1) Operators who have long-range navigation equipment installed in accordance with a type certificate (TC), a supplemental type certificate (STC), or an FAA Form 337, Major Repair and Alteration, may be issued Letters of Authorization to operate in NAT-MNPS airspace in accordance with the following:

(a) CURRENT dual INS systems may be accepted without further inflight evaluation.

(b) Dual OMEGA or Single INS or Doppler units utilizing OMEGA update which have been verified to MNPS accuracy through documented operational data provided by the operator (See Appendix 1, paragraph 2) may also receive authorization. In the absence of such data, these systems may be authorized based on successful completion of the ground and functional checks as outlined in Appendix 1.

(2) Newly developed navigation equipment and systems other than those listed in paragraph 4. b. (1) will not have had the necessary accuracy checks accomplished. In these cases, it will be necessary that an evaluation be accomplished, including both a ground and functional flight check as described in Appendix 1, to ascertain that no gross inaccuracy problems exist in the equipment. These checks are a prerequisite for MNPS authorization.

(3) If an operator's equipment (including antenna type and location) is installed on an aircraft in a manner that duplicates the installation and operating performance of the same equipment installed on the same type aircraft under an existing STC, authorization may be issued based on previously documented data or accuracy evaluation as outlined in Appendix 1.

(4) Operators desiring airworthiness approval (TC or STC) of airborne long-range navigation systems should contact the appropriate Engineering and Manufacturing District Office as early as practicable prior to desired operations.

(5) Upon presentation of airworthiness documentation and the completion of the appropriate accuracy checks, Part 91 operators may be issued a Letter of Authorization to operate within NAT-MNPS airspace.

(6) Air taxi operators of small aircraft may have their Operations Specifications amended to authorize flight in the NAT-MNPS airspace based on the appropriate airworthiness documentation and the appropriate accuracy checks.

5. ESTABLISHMENT OF NAVIGATION SYSTEM ACCURACY DATA BANK. To facilitate the issuance of future geographic OMEGA authorizations, Flight Standards Service has established a central data bank base collection point from which acceptable equipment determinations may be made based on total navigation system performance. To assure timely development of this data base, equipment performance data as outlined in Appendix 1, paragraph 2., may be forwarded to the Federal Aviation Administration, Flight Standards Service, AFS-804, 800 Independence Avenue, Washington, D.C. 20591.

R. P. SKULLY
Director, Flight Standards Service

APPENDIX 1. GROUND AND FUNCTIONAL FLIGHT CHECKS AND DATA RECORDING

1. GENERAL. The following information provides guidelines for the accomplishment of ground and functional checks of Dual OMEGA and combination long-range navigation systems (INS or Doppler with Omega update) and which are prerequisite accuracy confirmations necessary for the issuance of approval for NAT-MNPS operations.

a. GROUND EVALUATION. After the navigation system has been installed and before the aircraft is flown, an operational/functional test should be accomplished.

(1) Location of the display. Cockpit arrangement should be visible and useable by the pilot(s) seated at their duty stations.

(2) A functional test should be conducted with all electrical/electronic equipment operating normally on aircraft power. A ground location may be selected that minimizes the presence of external electromagnetic interference. In addition, it should be demonstrated that the equipment will not adversely load other systems to which it may be connected.

(3) Manufacturer's instructions. The system should be functionally checked in accordance with instructions and limitations provided by the manufacturer.

(4) Information concerning operating limitations should be provided to the pilot by means of the aircraft flight manual and/or approved manual material and placards.

b. FUNCTIONAL FLIGHT CHECK. A functional flight test should be accomplished which includes the following factors:

(1) The total en route distance should be at least 1,000 nm.

(2) Meet a lateral accuracy level of not more than 4 nm at three observation points, each of which is at least one-hour flight time from the other points. These points may be:

(a) A reliable radar fix, or

(b) Overheading a VOR/DME or an NDB.

(3) Cockpit display and controls evaluation which evaluate the system readouts and control accessibility during both sunlight and night operation.

(4) Ascertain that there is no undue flightcrew workload during the manipulation and monitoring of the navigation system.

2. RECORDING OF FLIGHT DATA. The following is provided as a guide for the recording of inflight accuracy data that may be used to confirm NAT-MNPS. The submission of this data may be used as outlined in paragraphs 5 and 6 to support the issuance of permanent NAT-MNPS authorizations.

a. Aircraft record entries should indicate that the system has been properly tested and meets the requirements of the applicable regulations. Each person approving the aircraft for return to service should comply with the provisions of Section 43.9 regarding content, form, and disposition of the record. Also, each person making such entry should state that the equipment associated with the alteration will perform its intended function and meet the applicable rules and regulations.

b. Equipment performance during the MNPS trial period should provide a data base for further NAT-MNPS authorizations. Operators are encouraged to maintain navigation records on each system to provide:

(1) type of aircraft,

(2) system identification; e.g., GNS-500, LTN-51, Carousel IV, etc.,

(3) identification of route in degrees (latitude and longitude or other identifiable fix if overland),

(4) error at arrival point; e.g., lateral crosstrack error,

(5) any reliability problems; e.g., power changeovers, etc.

APPENDIX 2. ADDITIONAL CONSIDERATIONS FOR OPERATIONS IN THE NORTH ATLANTIC (NAT) MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (MNPS) AIRSPACE

1. GENERAL. Recent actions by the North Atlantic Systems Planning Group of ICAO at the September 1977 meeting in Paris resulted in development of additional procedures and recommendations concerning operations in the NAT-MNPS airspace. In addition, further information was provided relative to the monitoring of flights in this airspace. Regulatory authority for implementation of the MNPS concept was the subject of a recent amendment to Part 91, Sections 91.1, 91.20, and Appendix C of the Federal Aviation Regulations.

2. MONITORING OF FLIGHTS WITHIN THE NAT-MNPS AIRSPACE.

a. In order to determine navigational capabilities and ensure MNPS requirements are met, several countries, including the United States, have agreed to participate in monitoring activities. In addition, some countries plan to expand their monitoring activities by the use of additional radar stations.

b. Follow-up action on observed and reported deviations.

(1) With regard to follow-up action on observed deviations, the following procedures will be followed by ATC:

(a) The observing ATC unit should, whenever possible, inform the pilot of the aircraft concerned of such errors.

(b) All navigational deviations of 25 NM or more from cleared track observed by ATC of U.S. civil aircraft will be reported to the FAA for further action.

(2) In cases of individual large errors (25 NM or more from cleared track), the pilot of the aircraft concerned will normally be notified by the ATC unit observing the error. In these instances, it may be necessary for the FAA to review the navigational performance capability of the particular operator in order to ascertain corrective action needed to ensure compliance with MNPS requirements.

3. OPERATIONS WHERE SHORT-RANGE NAVIGATIONAL EQUIPMENT MAY BE APPLICABLE.

a. Flights between Iceland and other parts of Europe. Navigational facilities available on the route from Bergen (Flesland) via Myggenes and Ingo to Keflavik and on the route from Sumburgh via Akraberg to Myggenes have, in the past, provided the basis for navigational accuracy equal to the MNPS standards. Consequently, operators of aircraft equipped with normal short-range navigation equipment (VOR/DME and ADF) operating on these routes within MNPS airspace should be able to demonstrate MNPS capability and thereby obtain FAA approval of that capability for operation on those routes.

b. Provision for other special routes. Persons operating aircraft along routes in MNPS airspace between points in Northern UK, Ireland, Iceland and points in Northeastern Canada (Goose and Frobisher) which are equipped with normal short-range navigation equipment (VOR/DME and ADF) and at least one fully operational set of the following navigation equipment, should be able to demonstrate MNPS capability and thereby obtain FAA approval of that capability on those routes:

(1) Doppler with computer

(2) INS

(3) OMEGA

(4) LORAN C

c. The equipment listed in (1) thru (4) need not be part of the permanent navigation equipment installed on the aircraft. Consequently, operators desiring to operate in the parts of the MNPS airspace described in paragraphs a. and b. may be issued letters of authorization evidencing FAA approval of MNPS navigation performance capability. The letters of authorization will be limited to the specific areas described in paragraphs a. and b. for which the particular aircraft is equipped.

4. SUGGESTIONS FOR OPERATORS OF AIRCRAFT WHICH EXPERIENCE PARTIAL LOSS OF NAVIGATION CAPABILITY PRIOR TO ENTERING THE NAT-MNPS AIRSPACE.

a. Because of the large variety of circumstances which may exist at the time an aircraft is faced with partial loss of its navigation capability prior to entry into NAT-MNPS airspace, it is not possible to establish hard and fast procedures for handling such situations. The following suggestions in no way restrict the pilot's use of judgment to take the best possible course of action in light of the circumstances as they prevail at the time that partial loss of navigation capability occurs.

b. Pilots experiencing partial navigation equipment failure should consider using the following routes:

(1) STN - 60°N 010°W - 61°N 12° 34'W - LIMA - KF;

(2) EGL - 58° 30'N 015°W - 60°N 017°W - 61°N 18° 20'W - OSKAR - KF;

(3) G11/G3 - KF;

(4) KF - UNIFORM - 63'N 030°W - 61°N 040°W - OZN;

(5) OZN - 60°N 050°W - 59°N 060°W - KL;

(6) OZN - 59°N 050°W - CHAR - HOPEDALE;

(7) OZN - 58°N 050°W - CAPELIN - GOOSEBAY.

c. If a pilot experiencing partial navigation equipment failure elects to use any of the routes specified in the preceding paragraph, the following steps should be taken:

(1) A revised flight plan should be filed with the appropriate ATC unit which should include notification of the failure; and

(2) An appropriate ATC clearance should be obtained. (A revised oceanic ATC clearance is issued only after coordination between all Oceanic Area Control centers concerned. ATC may not be able to grant a clearance for the altitude requested.)

5. DEVIATION AUTHORITY. Appendix C to Part 91, which was added by Amendment 91-144 effective 12/29/77, provided that Air Traffic Control (ATC) may authorize an aircraft operator to deviate from the MNPS requirements for a specific flight if, at the time the flight plan is filed, ATC determines that the aircraft may be provided appropriate separation and that the flight will not interfere with, or impose a burden upon, the operations of other aircraft that meet the MNPS requirements. The ultimate decision on the method of handling such aircraft will be made by the ATC authorities controlling the operation, taking into account all relevant factors, including the navigation capability of the aircraft concerned.

6. FUTURE INFORMATION RELATING TO MNPS. Any additional information relating to operations in the MNPS airspace will be contained in the Airman's Information Manual (AIM).