Over-Water Enroute Inspection

CAAI OPS DIRECTIVE
OPS 2.1.043

AIR OPERATOR SURVEILLANCE

1. Objective

1.1. This section contains information, direction, and guidance to be used by inspectors when conducting over-water en route inspections.

1.2. This section contains background information on the general navigational principles with which the operator and flightcrews must comply, definitions of relevant terminology, and specific guidance to be used by inspectors when observing flightcrews as they conduct Long Range Area navigation.

1.3. Inspectors should refer to OPS 2.1.015 of this handbook for information and guidance related to cockpit en route inspections.

2. General

2.1. **BACKGROUND.**

Although navigation errors are infrequent, human errors have accounted for most incidents involving navigation. In most cases, the errors have occurred when the navigation equipment was functioning normally, but the prescribed operating procedures were either inadequate or not followed. FAA Advisory Circular (AC) 90-79 (as amended), "Recommended Practices and Procedures for the Use of Long-Range Navigation Equipment," contains guidance to be used by operators for developing adequate procedures. Before receiving approval to conduct long-range Area navigation, operators must demonstrate competence by using these procedures in validation tests. Operators must develop programs that effectively train flightcrews in long-range navigation. The operator's line check programs must ensure a high degree of cockpit discipline. Operators may develop individual practices and procedures to comply with the required standards . Inspectors should, therefore, become familiar with the operator's specific procedures.

2.2. **DEFINITION OF TERMS.**

The following definitions appear in FAA AC 90-79 and other publications, such as the AIP, and are repeated for inspectors using this handbook for both convenience and clarity:

2.2.1. **Standard Service Volume:**

That airspace in which navigation signal coverage is provided from standard International Civil Aviation Organization (ICAO) navigational aids (such as VOR, DME, and NDB).

2.2.2. **Long-Range Area Navigation:**

Navigation conducted outside the ICAO standard service volume. Long Range Area navigation requires either a properly qualified flight navigator and the use of celestial navigation equipment or electronic long-range equipment, such as LORAN, INS, DOPPLER, OMEGA, or IRS.

2.2.3. **Gateway:**

A specific fix at which a transition from standard navigation to long-range Area navigation occurs, or vice versa. A gateway must be established so that a positive fix can be established by ICAO standard navigational aids.

2.2.4. **MNPS Airspace:**

Minimum navigational performance standards (MNPS) airspace is that airspace located outside the ICAO standard service volume in which minimum standards for adhering to track are required by international agreement. These standards contain minimum separation between parallel tracks. Operations within MNPS airspace require special training, navigation equipment, and adherence to specified procedures besides those required for Class II navigation.

NOTE: The ICAO North Atlantic MNPS Operations Manual contains details on MNPS operations.

2.2.5. **Dead Reckoning:**

Navigation conducted solely by calculating the effect of known or estimated winds to predict drift, groundspeed, track, and time en route.

2.2.6. **Fix:**

A measurement that establishes an aircraft's position at a specific time. A fix may be taken by range and bearing from a standard navigational aid, location by an electronic long-range navigational device, or location by a celestial observation.

2.2.7. **Waypoint:**

A point in space specified for navigation, flight planning, and ATC reporting purposes. A waypoint differs from a checkpoint in that it does not necessarily represent a distinguishable landmark.

2.2.8. **Cross-Checking:**

Cross-checking is the act of verification. Cross-checking involves matching a set of test data against a set of master data to detect deviations in sequence or content.

2.2.9. **Track Messages:**

In the North Atlantic track system, the bulk of air traffic flows east-to-west early in the day and west-to-east in the latter part of the day. As a result, early in the day most of the available tracks are east-to-west, and later in the day most of the available tracks are west-to-east. The assigned tracks also move north and south to take advantage of, or to avoid, winds. Available tracks for both eastbound and westbound flights vary approximately every 12 hours. Air Traffic Control (ATC) selects track coordinates and publishes them in a "track message." Track messages provide track coordinates, available flight levels, and gateways. An aircraft that operates on the organized track system must have a copy of the track message for the current period in the cockpit.

2.3. **FLIGHT PLANNING.**

ANR.OPS requires that one copy of a flightplan be designated as the master flightplan . All information related to navigation of the flight must be recorded on this document. When evaluating this area, inspectors should use the following guidance:

2.3.1. **Computerized Flightplans .**

Even though most operators use computerized flightplans , all flightplans must still be carefully checked to ensure accuracy. The routing on flightplans must be cross-checked

against navigational charts and track messages. Flightplans must also be legible.

2.3.2. **Waypoint Numbering.**
After a flightplan is checked, the waypoints should be numbered. Many automatic navigation systems can accept only nine waypoints. Waypoints may be numbered sequentially initially starting with 1 and going up to 9; then the tenth waypoint can be numbered 1, the eleventh 2, and so on. Other navigation systems, such as flight management systems (FMS), can accept 100 or more waypoints. In such cases it is acceptable for waypoints to be numbered progressively. When more than one type of navigational device is in use (for example INS and FMS), the waypoints must be numbered so that they correspond to both devices. In this example, one acceptable practice is to number the first nine waypoints in the FMS as 11 through 19, and the second set of waypoints as 21 through 29, and so on.

2.3.3. **Plotting Chart.**
The planned route must be drawn on a plotting chart . All waypoints on the plotting chart must be cross-checked against the master flightplan .

2.3.4. **NOTAMs and PIREPs .**
Current Notices to Airmen (NOTAMs) must be available and checked to ensure that the required stations are in service for OMEGA and LORAN operations. Pilot reports (PIREPs) must also be checked to ensure that the actual winds are the same as the winds in the forecast.

3. Reference Material, Forms & Job-Aids

3.1. Reference Material

3.1.1. FAA Advisory Circular (AC) 90-79

3.1.2. OPS 2.1.015 – Cockpit Enroute Inspection

4. Process

4.1. **COCKPIT SET-UP .**
Cockpit set-up begins with the crewmembers turning the navigation computers on according to the flight manual procedures. Inspectors should observe crewmembers during cockpit set-up and be aware of the following:

4.1.1. **Software and Modification Status.** Before loading the initial present position and waypoints, crewmembers should

verify that the procedures they are using are compatible with the software loaded in the computer. Flight management systems (FMS) data bank dates should be checked to ensure that they are current.

4.1.2. **Present Position and Waypoint Entry.**

One crewmember should find and enter the initial present position into the navigation computers. A record of this action must be made on the master flightplan . An acceptable method of making this record is for the crewmember to copy the coordinates displayed after the entry sequence and mark them “initial present position.” An acceptable method for recording waypoint entry is to circle the waypoint on the master flightplan .

4.1.3. **Cross-Checking Initial Set-Up.**

A second crewmember must independently find the initial present position and verify that all of the navigation computers are correctly programmed. The second crewmember must then verify the accuracy of each waypoint as follows:

4.1.3.1 Verification must be recorded by the crewmember on the master flightplan . An acceptable means of recording verification is for the crewmember to draw a diagonal line through the initial present position and each waypoint as it is checked.

4.1.3.2 When the remote feature is used, the crewmember must independently check the present position and waypoints in each computer. It is possible for data to be lost during the transfer since the remote computer may not have received the same data that was transmitted.

4.1.4. **ZD Check.**

After the waypoints have been entered and verified by the crewmember, the crewmember must compare the track bearing and zone distance (ZD) shown by the computer with that shown in the flightplan . A track bearing or distance that varies by more than +2 should be investigated.

4.1.5. **Pre-takeoff Checks.**

Some manufacturers of navigation equipment recommend the completion of preflight navigation checks. For example, a manufacturer may recommend that after the crewmember places the “NAV Mode” selector switch to “NAV” on an Inertial Navigation Set (INS), and before moving the aircraft, the crewmember should check the ground speed. Any indication of more than a few knots may indicate a bad system. With systems such as INS and OMEGA that

navigate during ground operation, a taxi check may also be recommended. Current present position and ground speeds should be cross-checked to confirm correct operation. Inspectors should observe flight crewmembers making the checks required by the operator's procedures.

4.2. **GATEWAY PROCEDURES.**

Flights must not proceed beyond the gateway unless the correct functioning of the navigation computers can be verified. Inspectors should observe the flightcrew performing gateway checks and should ensure that flight crewmembers are following the operator's procedures. A typical set of operator procedures with some guidance for inspectors evaluating such procedures follows:

4.2.1. After crossing the gateway, a crewmember should record the time and present position of each navigation computer. Preferably, the crewmember should use the hold feature on the computer to freeze the present position display. This position must be compared to the known position of the gateway and to the deviation of each computer established. This gateway check detects errors that may have accrued in position information, and it also provides an opportunity for updating if required, as well as establishing, the most accurate computer.

4.2.2. Usually, the time and distance to the next waypoint is displayed on the computer that is supplying steering signals. This computer may be set up to use triple mixing, if this feature is available. A second computer should be set to display cross-track (XTK) and track angle error (TKE). The operator's procedures for triple mixing should be in accordance with the manufacturer's recommendations.

4.2.3. A crewmember should record the actual winds for the purpose of comparing them with preflight planning and to use them in case the flight must reverse course.

4.3. **WAYPOINT CHANGEOVER PROCEDURES.**

When conducting an over-water en route inspection , inspectors should ensure that an operator's waypoint changeover procedures include the following:

4.3.1. **Inbound.**

When approaching a waypoint, a crewmember should cross-check the coordinates of the subsequent waypoint against the flightplan .

4.3.2. **Outbound.**

After passing a waypoint, a crewmember should confirm that each computer has switched to the next leg and that the aircraft is tracking along the desired track. Waypoint passage must be recorded by a crewmember on the master flightplan . One acceptable means of doing this is for the crewmember to place a second diagonal line through the circle surrounding the waypoint number. The crewmember must record both the time that the waypoint was passed and the fuel on board, as well as compute an estimated time of arrival (ETA) at the next waypoint for ATC reporting.

4.3.3. **Course Plot.**

Plotting procedures reduce course deviation incidents and should be used by crewmembers when navigation is done solely by long-range navigation computers. Approximately 10 minutes after passing each waypoint, a crewmember should record the present position and then place that position on the plotting chart. This plotted position should fall on the track line.

4.4. **AFTER ARRIVAL PROCEDURES.**

Inspectors should ensure that, after arrival, a crewmember determines the distance from the actual position to the present position displayed on each computer. Crewmembers should record these observations in accordance with the operator's procedures.

4.5. **NAVIGATION CONTINGENCY PROCEDURES.**

Inspectors must ensure that an operator's training programs, manuals, and check airman programs contain procedures for partial and total navigation systems failure. Specific procedures depend upon the type of equipment being used and the area in which operations are being conducted. Inspectors must be aware that the improper application of these procedures can result in a collision with another aircraft. Inherent in these procedures is the requirement that the crewmembers contact ATC whenever the flight is unable to continue according to the current ATC clearance. This includes situations in which the aircraft is offcourse or is unable to maintain assigned altitude. The flightcrew's command of this information must allow for an immediate application in an emergency. The crewmember should have knowledge of the first actions to take without having to reference flight information documents. Flightcrews must be knowledgeable of where these procedures are published and must be able to locate them expeditiously when needed.

4.6. **AIRCRAFT PERFORMANCE.**

Inspectors should be aware of the one-engine and two-engine

inoperative performance requirements for extended over-water operations. When conducting an extended over-water inspection, inspectors should evaluate the operator's methods of complying with these rules and the flightcrew's knowledge of these procedures. Inspectors should also take into account the guidance that follows when evaluating engine failure procedures.

4.6.1. **ETPs .**

Operators often use Equal Time Point (ETP) computations to show compliance with engine-out performance requirements. When evaluating this area, inspectors should consider the following:

4.6.1.1 Proficiency.

Flight crewmembers are often assigned the responsibility for computing ETPs , and must be proficient in making them. Whether or not flight crewmembers perform the calculations, they must be familiar with the conditions for them as well as the meaning of these calculations.

4.6.1.2 Use of Alternate Airports.

Operators may use en route alternate airports and compute multiple ETPs to show compliance with engine-out performance rules. For example, on a flight from San Francisco to Tokyo, an operator might designate Seattle, Anchorage, and Adak as en route alternate airports. To do so, each alternate airport must be listed on the flight release. Flightcrews must be knowledgeable in the procedures they must follow should an engine fail.

4.6.2. **Fuel Dumping and Driftdown .**

Engine failure procedures normally require driftdown , fuel dumping, or both. Flightcrews must be aware of how to make these determinations. Often, aircraft weight and altitude information is presented in tabular format; therefore, flightcrews must be competent in interpreting these presentations.

4.7. **FLIGHT RELEASE RULES.**

Inspectors should be thoroughly familiar with the rules for releasing flights in an extended over-water operation. Inspectors should ensure that operators and flightcrews comply with these rules, which include the following:

4.7.1. **Weather Minimums.**

Inspectors should ensure that the flightcrews are thoroughly familiar with the minimum weather requirements for destination and alternate airports. Flightcrews should be aware of the required procedures to follow when the weather at a destination or alternate airport goes below the minimums while the flight is en route.

4.7.2. **Special Operations.**

Since the operations specifications (OpSpecs) contain several restrictions on special operations, inspectors should pay particular attention to operations using special fuel reserves or planned re-release operations.

5. Task Outcomes

5.1. The inspection must be completed in the same manner as a Cockpit Enroute Inspection (OPS 2.1.015)