

Federal Aviation Agency



AC NO: AC 121-10
CERTIFICATION AND
OPERATIONS: AIR
CARRIER AND COMMERCIAL
OPERATORS OF LARGE
AIRCRAFT

EFFECTIVE :

3/23/67

SUBJECT : DOPPLER RADAR NAVIGATIONAL AIDS

1. PURPOSE. This Advisory Circular states an acceptable means, not the only means, of compliance with the referenced sections of the FAR as they apply to persons operating under Part 121 who desire approval of Doppler RADAR navigation systems for use in their operations.
2. REFERENCES. Federal Aviation Regulations 121.355, 121.389, 121.411, 121.412, 121.413, 121.415, 121.417, and 121.418.
3. CANCELLATION. Advisory Circular 120-3.
4. INFORMATION. A Doppler RADAR navigation system is a self-contained navigation system which is not continuously dependent on information derived from ground-based aids. However, ground-based aids, such as LORAN and CONSOL, or Celestial Navigation are required for periodic updating. Since Doppler RADAR is being installed by operators in increasing numbers, the FAA is updating the guidelines which may be used by operators in securing approval for its use. Under the provisions of FAR Sections 121.355 and 121.389, cockpit navigation over international routes previously requiring a navigator may be approved using Doppler RADAR navigation.
5. GENERAL. The operator desiring approval for use of Doppler RADAR navigational aids should contact the local Air Carrier District Office or International Field Office for advice in the preparation of an initial written request for FAA evaluation of its proposal. The information needed is described in item 6 of this circular. Thirty days should be allowed for review and evaluation of the initial request. Subsequent to approval of the initial request, the operator may submit an application for approval of operations specifications, en route flight procedures following the guidelines established in item 7 of this circular.

3/23/67

6. INITIAL REQUEST FOR EVALUATION. The initial request for evaluation of an operator proposal for use of Doppler RADAR should contain information concerning the following:
- a. Experience. Prior to presenting its initial request, an operator should have accumulated sufficient experience with the equipment to establish a history of the accuracy and reliability of the Doppler RADAR system it proposes to use. The applicant may cite previous or related operational experience in the approval of the system being installed. The applicant may also cite operational experience obtained during type certification of the aircraft. The Agency may adjust its evaluation and approval so as to avoid unnecessary duplication of effort. A comprehensive summary of this experience should be provided to show competency in the operation and maintenance of equipment and feasibility of the proposed operation.
 - b. Training Program. The operator should outline the training program he plans to set up to comply with sections 121.411, 121.412, 121.413, 121.415, 121.417, and 121.418. Under these rules, the training program for Doppler Systems is acceptable if -
 - (1) It encompasses all phases of the operation and the responsibilities of flight crewmembers, dispatchers and maintenance personnel.
 - (2) Its technical content, for pilots, covers -
 - (a) Theory and procedures, limitations, detection of malfunctions, preflight and inflight testing, cross-checking methods, etc. relating to the operation;
 - (b) The use of computers, an explanation of all systems, a review of navigation, and flight planning;
 - (c) The methods for updating Doppler by means of reliable fixes; and
 - (d) The actual plotting of fixes.
 - (3) Its recurrent training program includes Doppler training and line checks using Doppler navigation.
 - (4) Each pilot assigned as an operating crewmember completes as many trips over a route or area (either in actual operation or, in part, in an approved simulator), under the supervision of a check airman, as may be necessary to -
 - (a) Ensure his qualification in the system; and
 - (b) Enable certification of his proficiency in the system, as required by section 121.413.

Federal Aviation Agency



AC NO: 121-10 CH 1
CERTIFICATION AND
OPERATIONS: AIR
CARRIER AND COMMERCIAL
OPERATORS OF LARGE
AIRCRAFT

EFFECTIVE :
1/10/68

CHANGE

SUBJECT : CH 1 TO ADVISORY CIRCULAR 121-10
SUBJ: DOPPLER RADAR NAVIGATIONAL AIDS

- PURPOSE.** This advisory circular change transmits a page change to the subject advisory circular. The change provides a change in the wording of Note 6 on Attachment 1, Page 1, Sample Operations Specifications - En Route Procedures.
- EXPLANATION OF CHANGE.** Change in wording of Note 6 of Attachment 1, Page 1, Sample Operations Specifications - En Route Procedures.

PAGE CONTROL CHART

Remove Page	Dated	Insert Page	Dated
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Edward C. Hodson
Director
Acting Flight Standards Service

FEDERAL AVIATION AGENCY							Form Approved Budget Bureau No. 04-R083.1							
OPERATIONS SPECIFICATIONS - EN ROUTE FLIGHT PROCEDURES														
ROUTE OR ROUTE SEGMENT	VIA	OPERATION AUTHORIZED				TYPE OF AIRCRAFT AUTHORIZED			SPECIAL REQUIREMENTS					
		DAY		NIGHT		B-707			MOCA	MEA	MAA	OTHER	TYPE NAVIGATION ¹	
		VFR	IFR	VFR	IFR									
<u>"Western Gateway</u> Goose Bay NDB/VOR, Gander NDB/VOR, Nantucket Consol VOR, Torbay NDB, Keflavik NDB/VOR (8), Santa Maria NDB/VOR (8), Saglek NDB, St. Anthony NDB, Sydney VOR/NDB, Boston VOR/NDB <u>"Eastern Gateway</u> Keflavik NIB/VOR (8), Stornaway NDB, Skipness NDB/VOR, Bushmills Consol, Belfast NDB, Shannon LFR/VOR, Cork VOR, Jersey NDB, Dublin VOR/NDB, Ploneis Consol, Gognac NDB/VOR, Lugo Consol, Lisbon NDB/VOR, Santa Maria NDB/VOR (8), St. Nawgan VOR/NDB, Bilbao NDB, Madrid/Del Ray NDB via Santiago NDB, Lajes VOR/NDB, Strumble VOR/NDB, Nantes VOR, New Galloway NDB	All routes over North Atlantic between Eastern and Western Gateways with the limits of operation between latitude 65°N and latitude 35°N	NA	LX	NA	LX	X							NOTES: "Cockpit navigation authorized with the following equipment operating satisfactorily, at dispatch: 1. Dual Doppler and Computer Systems (Except one 10-mile alert light may be inoperative, and one offset indicator may be inoperative, provided the associated offset miles indicator is operative.) 2. Dual Polar Path Compasses 3. ADF 4. VOR 5. One Loran receiver operable from both of the two pilot stations. (Except Eastbound out of Santa Maria.) 6. Both pilots will be Doppler qualified in accordance with approved training programs, except that when navigation is being performed under the supervision of an approved Doppler-qualified check pilot, the pilots performing such supervised navigation need only have satisfactorily completed the approved Doppler ground school curriculum. 7. Operation of overwater portion of transatlantic flights is authorized up to and including 42,000 feet. 8. Following route segments approved without an alternate: (a) Eastbound only-U.S. & Canada terminals to Keflavik or Santa Maria. (b) Westbound only-European terminals to Keflavik or Santa Maria.	Doppler
EFFECTIVE DATE	NAME OF AIR CARRIER					¹ Where a navigator or special cockpit navigation and equipment is required, so specify; ie Navigator, Cockpit (Doppler - Loran), (Inertial).								
	XYZ AIRLINES, INC.													

- c. Maintenance Program. The applicant should provide an outline of the training to be given maintenance personnel in the new equipment, proposed intervals for inspection and overhaul, test and inspection procedures, and the stationing of spare parts and test equipment.
- d. Equipment Installation.
- (1) The installation should include a navigation computer for each Doppler RADAR required. Cockpit arrangement should be such as to afford easy viewing and manipulation of necessary controls consistent with priority of existing equipment.
 - (2) Dual Doppler RADAR equipment (including dual antennas or a combined antenna designed for dual operation) are acceptable under FAR 121.355. A single operating transmitter with a standby is acceptable in lieu of two operating transmitters.
 - (3) When dual Doppler is installed, it will be permissible to utilize single heading source information to both equipments, providing a compass comparator system is installed, and operational procedures call for frequent cross-checks of all compass heading indicators by crewmembers.
 - (4) Currently, other navigational aids are considered necessary to update the Doppler RADAR, such as LORAN, CONSOL, DME, VOR or ADF. Such facilities should be available for the proposed route and the cockpit arranged so as to afford easy manipulation of the necessary controls. If a single LORAN is used for this purpose, it should be accessible to both pilots.
 - (5) Cockpit arrangements should provide for adequate lighting, suitable charts, plotting, necessary forms and related equipment.
- e. Operations Manual. Revisions to the Operations Manual should outline all procedures relative to use of the proposed system. Detailed methods for continuing the navigational function with partial or complete equipment failures, and methods for determining the most accurate system should be included.
- f. Minimum Equipment List (MEL). A proposal for revising the operator's approved MEL should be included. Items which are not required to be operative for dispatch should be fully justified on the basis of an acceptable level of safety. The Agency Master MEL for a particular type of airplane need not be revised to include Doppler items of equipment.

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g. Routes or Areas.

- (1) Each route or area being proposed for Doppler RADAR navigation should be analyzed with respect to availability of en route aids and gateway facilities.
- (2) Routes based on heading information from slaved magnetic compasses will not be authorized in areas having a weak or unreliable earth magnetic field. If free-gyro operation is proposed, detailed procedures for transition to, and use of this form of navigation, should be supplied.

h. Demonstration of Operational Ability. The operator should provide a schedule of flights that shows his ability to use Doppler cockpit navigation in his operations, instead of a navigator or a previously approved specialized means of navigation. During these flights, the pilots should navigate the aircraft using the Doppler System and their navigational duties should not encroach significantly on other required duties. The pilots should be relieved of any workload associated with any previously approved specialized means of navigation. This may be done by adding a navigator or other flight crewmember as appropriate. This additional flight crewmember should track the flight independent of the Doppler System, and give the information obtained to the pilot-in-command. The pilot-in-command decides if changes in course are necessary to remain within allowable navigational limits. Doppler Systems should not be used in Part 121 operations until the Agency approves amended operations specifications (see paragraph 7.a.).

i. Equipment Accuracy and Reliability.

- (1) Doppler RADAR units should be maintained within the accuracies specified by the operator's maintenance manual. A failure or malfunction within the system should not result in loss of the aircraft's required navigational capability.
- (2) Compass heading information to the Doppler RADAR should be maintained to an accuracy of ± 1.0 degree.

j. Agency evaluation should ensure:

- (1) Adequacy of operational procedures.
- (2) Accuracy and reliability of equipment and feasibility of the system on proposed routes.
- (3) Availability of gateway, area and en route ground-based aids to support the self-contained system.

- (4) Acceptability of cockpit workload.
- (5) Adequacy of flight crew qualification.

k. Agency observations:

- (1) Air carrier operations inspectors will observe sufficient qualification checks given to the first flight crews qualified during an initial evaluation program to ensure valid appraisal of the items listed in paragraph 6.j. Normally this will involve observation of at least 30 percent of the checks given during the initial evaluation program, however, in a potentially large operation involving numerous aircraft and flight crews the number of round trips observed need not exceed 75 where the evaluation proceeds satisfactorily. In a small operation involving only a few aircraft and flight crews, more than 30 percent of the checks may need to be observed to properly evaluate the overall program.
- (2) Inspectors observe enough checks after operational approval to ensure that the operator maintains the overall quality of his program.
- (3) Inspectors observe enough flights to ensure the adequacy of the gateway, area, and en route facilities to support the self-contained system, when the operator applies for additional routes or areas.

7. REQUEST FOR APPROVAL.

- a. The operator may forward a request for approval of its proposal following FAA observation of a representative number of satisfactory pilot qualification checks and resolution of all items arising during the initial evaluation program. Final FAA approval is indicated by approval of amended operations specifications, en route flight procedures, defining the new operations. Approval is limited to those routes or route segments over which the adequacy of the equipment and of cockpit navigation has been demonstrated.
- b. Proposed operations specifications authorizing cockpit navigation over routes predicated on Doppler RADAR navigation should contain the following:
 - (1) Specific points fixed by an acceptable ground-based navigational aid where use of self-contained aids will commence and terminate.

3/23/67

- (2) Latitude limits and type heading reference authorized; i.e., Slaved Magnetic Compass or Free Gyro.
- (3) Requirement that pilots be qualified in the navigational system.
- (4) Specific Doppler equipment that may be inoperative for dispatch.

8. COORDINATION WITH WASHINGTON OFFICE.

- a. The appropriate ACDO or IFO advises the Director, Flight Standards Service:
 - (1) When an application for evaluation is received;
 - (2) When any problem areas exist; and
 - (3) Concerning the status of the program as it progresses
- b. Before approving the use of Doppler navigation over any route or area ACDO or IFO coordinates its recommendations with the Director, Flight Standards Service.


Acting Director
Flight Standards Service

OPERATIONS SPECIFICATIONS - EN ROUTE FLIGHT PROCEDURES

Form Approved
Budget Bureau No. 04-R083.1

ROUTE OR ROUTE SEGMENT	VIA	OPERATION AUTHORIZED				TYPE OF AIRCRAFT AUTHORIZED				SPECIAL REQUIREMENTS				
		DAY		NIGHT		B707				MOCA	MEA	MAA	OTHER	TYPE NAVIGATION ¹
		VFR	IFR	VFR	IFR									
<p><u>"Western Gateway</u> Goose Bay NDB/VOR, Gander NDB/VOR, Nantucket Consol VOR, Torbay NDB, Keflavik NDB/VOR (8), Santa Maria NDB/VOR (8), Saglek NDB, St. Anthony NDB, Sydney VOR/NDB, Boston VOR/NDB</p> <p><u>"Eastern Gateway</u> Keflavik NIB/VOR (8), Stornaway NDB, Skipness NDB/VOR, Bushmills Consol, Belfast NDB, Shannon LFR/VOR, Cork VOR, Jersey NDB, Dublin VOR/NDB, Ploneis Consol, Gognac NDB/VOR, Lugo Consol, Lisbon NDB/VOR, Santa Maria NDB/VOR (8), St. Nawan VOR/NDB, Bilbao NDB, Madrid/Del Ray NDB via Santiago NDB, Lajes VOR/NDB, Strumble VOR/NDB, Nantes VOR, New Galloway NDB</p>	<p>All routes over North Atlantic between Eastern and Western Gateways with the limits of operation between latitude 65°N and latitude 35°N</p>	NA	LX	NA	LX	X								Doppler
<p>NOTES:</p> <p>"Cockpit navigation authorized with the following equipment operating satisfactorily, at dispatch.</p> <ol style="list-style-type: none"> Dual Doppler and Computer Systems (Except one 10-mile alert light may be inoperative, and one offset indicator may be inoperative, provided the associated offset miles indicator is operative.) Dual Polar Path Compasses ADF VOR One Loran receiver operable from both of the two pilot stations. (Except Eastbound out of Santa Maria.) Pilots will be qualified in accordance with approved training programs. If pilots are not Doppler qualified, then specialized navigation will be required. Operation of overwater portion of transatlantic flights is authorized up to and including 42,000 feet. Following route segments approved without an alternate: (a) Eastbound only-U.S. & Canada terminals to Keflavik or Santa Maria. (b) Westbound only-European terminals to Keflavik or Santa Maria. 														
EFFECTIVE DATE	NAME OF AIR CARRIER					¹ Where a navigator or special cockpit navigation and equipment is required, so specify; ie Navigator, Cockpit (Doppler - Loran), (Inertial).								
	XYZ AIRLINES, INC.													

*Cancelled by A/C 121-13.
10/14/69*

Federal Aviation Agency



AC NO: AC 121-10 CERTIFICATION AND OPERATIONS: AIR CARRIER AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT
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EFFECTIVE :

3/23/67

SUBJECT : DOPPLER RADAR NAVIGATIONAL AIDS

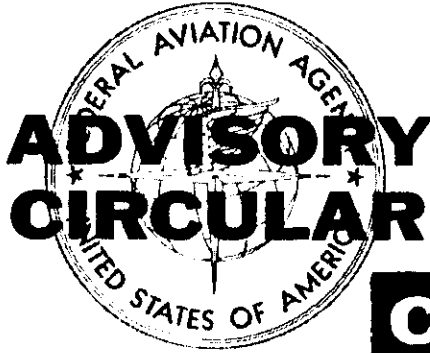
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2. **REFERENCES.** Federal Aviation Regulations 121.355, 121.389, 121.411, 121.412, 121.413, 121.415, 121.417, and 121.418.
3. **CANCELLATION.** Advisory Circular 120-3.
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5. **GENERAL.** The operator desiring approval for use of Doppler RADAR navigational aids should contact the local Air Carrier District Office or International Field Office for advice in the preparation of an initial written request for FAA evaluation of its proposal. The information needed is described in item 6 of this circular. Thirty days should be allowed for review and evaluation of the initial request. Subsequent to approval of the initial request, the operator may submit an application for approval of operations specifications, en route flight procedures following the guidelines established in item 7 of this circular.

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6. INITIAL REQUEST FOR EVALUATION. The initial request for evaluation of an operator proposal for use of Doppler RADAR should contain information concerning the following:
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 - b. Training Program. The operator should outline the training program he plans to set up to comply with sections 121.411, 121.412, 121.413, 121.415, 121.417, and 121.418. Under these rules, the training program for Doppler Systems is acceptable if -
 - (1) It encompasses all phases of the operation and the responsibilities of flight crewmembers, dispatchers and maintenance personnel.
 - (2) Its technical content, for pilots, covers -
 - (a) Theory and procedures, limitations, detection of malfunctions, preflight and inflight testing, cross-checking methods, etc. relating to the operation;
 - (b) The use of computers, an explanation of all systems, a review of navigation, and flight planning;
 - (c) The methods for updating Doppler by means of reliable fixes; and
 - (d) The actual plotting of fixes.
 - (3) Its recurrent training program includes Doppler training and line checks using Doppler navigation.
 - (4) Each pilot assigned as an operating crewmember completes as many trips over a route or area (either in actual operation or, in part, in an approved simulator), under the supervision of a check airman, as may be necessary to -
 - (a) Ensure his qualification in the system; and
 - (b) Enable certification of his proficiency in the system, as required by section 121.413.

Federal Aviation Agency

*Cancelled by AC 121-13
10/14/69*



AC NO: 121-10 CH 1 CERTIFICATION AND OPERATIONS: AIR CARRIER AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT
EFFECTIVE : 1/10/68

CHANGE

SUBJECT : CH 1 TO ADVISORY CIRCULAR 121-10
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Edward C Hodson
Director
Acting Flight Standards Service

- c. Maintenance Program. The applicant should provide an outline of the training to be given maintenance personnel in the new equipment, proposed intervals for inspection and overhaul, test and inspection procedures, and the stationing of spare parts and test equipment.
- d. Equipment Installation.
- (1) The installation should include a navigation computer for each Doppler RADAR required. Cockpit arrangement should be such as to afford easy viewing and manipulation of necessary controls consistent with priority of existing equipment.
 - (2) Dual Doppler RADAR equipment (including dual antennas or a combined antenna designed for dual operation) are acceptable under FAR 121.355. A single operating transmitter with a standby is acceptable in lieu of two operating transmitters.
 - (3) When dual Doppler is installed, it will be permissible to utilize single heading source information to both equipments, providing a compass comparator system is installed, and operational procedures call for frequent cross-checks of all compass heading indicators by crewmembers.
 - (4) Currently, other navigational aids are considered necessary to update the Doppler RADAR, such as LORAN, CONSOL, DME, VOR or ADF. Such facilities should be available for the proposed route and the cockpit arranged so as to afford easy manipulation of the necessary controls. If a single LORAN is used for this purpose, it should be accessible to both pilots.
 - (5) Cockpit arrangements should provide for adequate lighting, suitable charts, plotting, necessary forms and related equipment.
- e. Operations Manual. Revisions to the Operations Manual should outline all procedures relative to use of the proposed system. Detailed methods for continuing the navigational function with partial or complete equipment failures, and methods for determining the most accurate system should be included.
- f. Minimum Equipment List (MEL). A proposal for revising the operator's approved MEL should be included. Items which are not required to be operative for dispatch should be fully justified on the basis of an acceptable level of safety. The Agency Master MEL for a particular type of airplane need not be revised to include Doppler items of equipment.

g. Routes or Areas.

- (1) Each route or area being proposed for Doppler RADAR navigation should be analyzed with respect to availability of en route aids and gateway facilities.
- (2) Routes based on heading information from slaved magnetic compasses will not be authorized in areas having a weak or unreliable earth magnetic field. If free-gyro operation is proposed, detailed procedures for transition to, and use of this form of navigation, should be supplied.

h. Demonstration of Operational Ability. The operator should provide a schedule of flights that shows his ability to use Doppler cockpit navigation in his operations, instead of a navigator or a previously approved specialized means of navigation. During these flights, the pilots should navigate the aircraft using the Doppler System and their navigational duties should not encroach significantly on other required duties. The pilots should be relieved of any workload associated with any previously approved specialized means of navigation. This may be done by adding a navigator or other flight crewmember as appropriate. This additional flight crewmember should track the flight independent of the Doppler System, and give the information obtained to the pilot-in-command. The pilot-in-command decides if changes in course are necessary to remain within allowable navigational limits. Doppler Systems should not be used in Part 121 operations until the Agency approves amended operations specifications (see paragraph 7.a.).

i. Equipment Accuracy and Reliability.

- (1) Doppler RADAR units should be maintained within the accuracies specified by the operator's maintenance manual. A failure or malfunction within the system should not result in loss of the aircraft's required navigational capability.
- (2) Compass heading information to the Doppler RADAR should be maintained to an accuracy of ± 1.0 degree.

j. Agency evaluation should ensure:

- (1) Adequacy of operational procedures.
- (2) Accuracy and reliability of equipment and feasibility of the system on proposed routes.
- (3) Availability of gateway, area and en route ground-based aids to support the self-contained system.

- (4) Acceptability of cockpit workload.
- (5) Adequacy of flight crew qualification.

k. Agency observations:

- (1) Air carrier operations inspectors will observe sufficient qualification checks given to the first flight crews qualified during an initial evaluation program to ensure valid appraisal of the items listed in paragraph 6.j. Normally this will involve observation of at least 30 percent of the checks given during the initial evaluation program, however, in a potentially large operation involving numerous aircraft and flight crews the number of round trips observed need not exceed 75 where the evaluation proceeds satisfactorily. In a small operation involving only a few aircraft and flight crews, more than 30 percent of the checks may need to be observed to properly evaluate the overall program.
- (2) Inspectors observe enough checks after operational approval to ensure that the operator maintains the overall quality of his program.
- (3) Inspectors observe enough flights to ensure the adequacy of the gateway, area, and en route facilities to support the self-contained system, when the operator applies for additional routes or areas.

7. REQUEST FOR APPROVAL.

- a. The operator may forward a request for approval of its proposal following FAA observation of a representative number of satisfactory pilot qualification checks and resolution of all items arising during the initial evaluation program. Final FAA approval is indicated by approval of amended operations specifications, en route flight procedures, defining the new operations. Approval is limited to those routes or route segments over which the adequacy of the equipment and of cockpit navigation has been demonstrated.
- b. Proposed operations specifications authorizing cockpit navigation over routes predicated on Doppler RADAR navigation should contain the following:
 - (1) Specific points fixed by an acceptable ground-based navigational aid where use of self-contained aids will commence and terminate.

3/23/67

- (2) Latitude limits and type heading reference authorized; i.e., Slaved Magnetic Compass or Free Gyro.
- (3) Requirement that pilots be qualified in the navigational system.
- (4) Specific Doppler equipment that may be inoperative for dispatch.

8. COORDINATION WITH WASHINGTON OFFICE.

- a. The appropriate ACDO or IFO advises the Director, Flight Standards Service:
 - (1) When an application for evaluation is received;
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- b. Before approving the use of Doppler navigation over any route or area ACDO or IFO coordinates its recommendations with the Director, Flight Standards Service.


Acting Director
Flight Standards Service

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	XYZ AIRLINES, INC.														

OPERATIONS SPECIFICATIONS - EN ROUTE FLIGHT PROCEDURES

ROUTE OR ROUTE SEGMENT	VIA	OPERATION AUTHORIZED				TYPE OF AIRCRAFT AUTHORIZED				SPECIAL REQUIREMENTS				
		DAY		NIGHT		B707				MOCA	MEA	MAA	OTHER	TYPE NAVIGATION ¹
		VFR	IFR	VFR	IFR									
<p><u>"Western Gateway</u> Goose Bay NDB/VOR, Gander NDB/VOR, Nantucket Consol VOR, Torbay NDB, Keflavik NDB/VOR (8), Santa Maria NDB/VOR (8), Saglek NDB, St. Anthony NDB, Sydney VOR/NDB, Boston VOR/NDB</p> <p><u>"Eastern Gateway</u> Keflavik NIB/VOR (8), Stornaway NDB, Skipness NDB/VOR, Bushmills Consol, Belfast NDB, Shannon LFR/VOR, Cork VOR, Jersey NDB, Dublin VOR/NDB, Ploneis Consol, Gognac NDB/VOR, Lugo Consol, Lisbon NDB/VOR, Santa Maria NDB/VOR (8), St. Nawgan VOR/NDB, Bilbao NDB, Madrid/Del Ray NDB via Santiago NDB, Lajes VOR/NDB, Strumble VOR/NDB, Nantes VOR, New Galloway NDB</p>	<p>All routes over North Atlantic between Eastern and Western Gateways with the limits of operation between latitude 65°N and latitude 35°N</p>	NA	LX	NA	LX	X								Doppler
<p>NOTES: "Cockpit navigation authorized with the following equipment operating satisfactorily, at dispatch. 1. Dual Doppler and Computer Systems (Except one 10-mile alert light may be inoperative, and one offset indicator may be inoperative, provided the associated offset miles indicator is operative.) 2. Dual Polar Path Compasses 3. ADF 4. VOR 5. One Loran receiver operable from both of the two pilot stations. (Except Eastbound out of Santa Maria.) 6. Pilots will be qualified in accordance with approved training programs. If pilots are not Doppler qualified, then specialized Navigation will be required. 7. Operation of overwater portion of transatlantic flights is authorized up to and including 42,000 feet. 8. Following route segments approved without an alternate: (a) Eastbound only-U.S. & Canada terminals to Keflavik or Santa Maria. (b) Westbound only-European terminals to Keflavik or Santa Maria.</p>														

EFFECTIVE DATE	NAME OF AIR CARRIER	¹ Where a navigator or special cockpit navigation and equipment is required, so specify; ie Navigator, Cockpit (Doppler - Loran), (Inertial).
	XYZ AIRLINES, INC.	