Federal Aviation Administration – Regulations and Policies
Aviation Rulemaking Advisory Committee

Air Carrier Operations Issue Area
Autopilot Engagement Requirements Working Group

Task 1 – Criteria for Autopilot Engagement

Task Assignment

[redacted] [redacted]FILE COPY

Aviation Rulemaking Advisory Committee; Air Carrier Operations Subcommittee; Autopilot Engagement Requirements Working Group

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of establishment of Autopilot Engagement Requirements Working Group.

SUMMARY: Notice is given of the establishment of an Autopilot Engagement Requirements Working Group by the Air Carrier Operations Subcommittee of the Aviation Rulemaking Advisory Committee. This notice informs the public of the activities of the Air Carrier Operations Subcommittee of the Aviation Rulemaking Advisory Committee.

FOR FURTHER INFORMATION CONTACT: Mr. David S. Potter, Executive Director, Air Carrier Operations Subcommittee, Flight Standards Service (AFS-201), 800 Independence Avenue, SW., Washington, DC 20591, Telephone: (202) 267-8166; FAX: (202) 267-5230.

SUPPLEMENTARY INFORMATION: The Federal Aviation Administration (FAA) established an Aviation Rulemaking Advisory Committee (56 FR 2190, January 22, 1991) which held its first meeting on May 23, 1991 (56 FR 20492, May 3, 1991). The Air Carrier Operations Subcommittee was established at that meeting to provide advice and recommendations to the Director, FAA Flight Standards Service, on air carrier operations, pertinent regulations, and associated advisory material. At its first meeting on May 24, 1991 (56 FR 20492, May 3, 1991), the subcommittee established the Autopilot Engagement Requirements Working Group.

Specifically, the working group's task is the following:

> Determine the criteria for autopilot engagement. The current regulation (§ 121.579) does not address existing autopilot technology. This working group would require the expertise of TERPS specialists, flight test engineers, and air carrier pilots.

The Autopilot Engagement Requirements Working Group will be comprised of experts from those organizations having an interest in the task assigned to it. A working group member need not necessarily be a representative of one of the organizations of the parent Air Carrier Operations Subcommittee or of the full Aviation Rulemaking Advisory Committee. An individual who has expertise in the subject matter and wishes to become a member of the working group should write the person listed under the caption "**FOR FURTHER INFORMATION CONTACT**" expressing that desire and describing his or her interest in the task and the expertise he or she would bring to the working group. The request will be reviewed with the subcommittee chair and working group leader, and the individual advised whether or not the request can be accommodated.

The Secretary of Transportation has determined that the formation and use of the Aviation Rulemaking Advisory Committee and its subcommittees are necessary in the public interest in connection with the performance of duties imposed on the FAA by law. Meetings of the full committee and any subcommittees will be open to the public except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the Autopilot Engagement Requirements Working Group will not be open to the public, except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of working group meetings will be made.

Issued in Washington, DC, on August 7, 1991.

David S. Potter,

Executive Director, Air Carrier Operations Subcommittee, Aviation Rulemaking Advisory Committee.

[FR Doc. 91-19172 Filed 8-12-91; 8:45 am]

BILLING CODE 4910-13-M

Recommendation Letter

AIR LINE PILOTS ASSOCIATION

535 HERNDON PARKWAY □ P.O. BOX 1169 □ HERNDON, VIRGINIA 22070 □ (703) 689-2270

October 13, 1993

Mr. Anthony J. Broderick
Associate Administrator for
Regulation and Certification
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington, D.C. 20591

Subject: Report of the Autopilot Engagement Requirements Working Group

Dear Mr. Broderick:

The Autopilot Engagement Requirements Working Group of ARAC was tasked to review FAR Part 121.579 - Minimum Altitudes for Use of Autopilot, to determine what changes were required to this regulation to allow the autopilot to be engaged below the present restriction of 500 feet. I am pleased to inform you that the working group has completed this task.

Enclosed is a draft Notice of Proposed Rulemaking and draft Advisory Circular which address this issue. These documents have been coordinated with the FAA 's Flight Standards Service, Office of Rulemaking, and the Chief Counsel's Office.

It is our recommendation that rulemaking proceed and these documents be published for public comment. We would be pleased to assist in any appropriate manner during this process.

Thank you for the opportunity to address this issue.

Sincerely,

W. W. Edmunds Jr

William W. Edmunds, Jr.
Assistant Chairman
Aviation Rulemaking Advisory Committee

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enclosure

Acknowledgement Letter

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

800 Independence Ave., S.W.
Washington, D.C. 20591

NOV 19 1993

Mr. William W. Edmunds, Jr.
Assistant Chairman, Aviation Rulemaking
Advisory Committee
Air Line Pilots Association
Herndon, VA 22070

Dear Mr. Edmunds:

We have received your October 13 letter in which you transmitted a draft notice of proposed rulemaking, "Revision to Minimum Altitudes for the Use of an Autopilot," and draft advisory circular, "Criteria for Operational Approval of Auto Flight Guidance Systems," produced by the Autopilot Engagement Requirements Working Group. I note that you recommend that rulemaking proceed and that the documents be published for public comment.

Please express my thanks to the Aviation Rulemaking Advisory Committee (ARAC) and particularly the Autopilot Engagement Requirements Working Group for its commendable efforts in completing the task assigned to the ARAC.

I have asked my staff to initiate a scheduled regulatory project using these documents. We will also present the recommendation to FAA management in the form of a principals' briefing so that a decision may be made on the recommendation.

Sincerely,

for Anthony J. Broderick
Associate Administrator for
Regulation and Certification

Recommendation

DRAFT

AC No.

Date:

Subject: CRITERIA FOR OPERATIONAL APPROVAL OF AUTO FLIGHT GUIDANCE SYSTEMS (AFGS)

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1. **PURPOSE.** This advisory circular (AC) states an acceptable means, but not the only means, for obtaining operational approval of the initial engagement or use of an Auto Flight Guidance System (AFGS).

2. **APPLICABILITY.** The criteria contained in this AC are applicable to operators using commercial turbojet and turboprop aircraft holding Federal Aviation Administrations (FAA) operating authority issued under Parts 121, 125, and 135 of the Federal Aviation Regulations (FAR). The FAA MAY approve~~s~~ the AFGS operation for the operators under these parts, where necessary, by amending the applicant's operations specifications (OPSPECS).

3. **BACKGROUND.**

a. Regulations had prohibited the use of autopilots at altitudes less than 500 feet above ground level during the takeoff and climb phases of flight. The purpose of this AC is to take advantage of technological improvements in the operational capabilities of autopilot systems, particularly at lower altitudes. This AC complements a rule change that would allow the use of an autopilot, certificated and operationally approved by the FAA, at altitudes less than 500 feet above ground level in the vertical plane and in accordance with Section 121.189 of the FAR, in the lateral plane.

4. **DEFINITIONS.**

Airplane Flight Manual (AFM) - A document (under Section 25.1581 of the FAR) which is used to obtain an FAA type certificate. This document contains the operating procedures and limitations and performance information applicable to a particular airplane type in order to safely operate that aircraft and conform to the type certificate. This document contains some but not all procedures and system description information.

Autopilot - An aircraft system and associated sensors designed to provide automatic control of the pitch, roll and in certain instances, yaw axis of an aircraft.

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Auto Flight Guidance System (AFGS) - Aircraft systems, such as an autopilot, autothrottles, displays, controls, etc. that are interconnected in such a manner to allow the crew to automatically control the aircraft's lateral and vertical flight path and speed. A flight management system (FMS) is sometimes associated with an AFGS.

Auto Throttle System (ATS) - A system selected by the crew to provide automatic engine thrust control, as required, to achieve and maintain desired aircraft speed or vertical flight profile.

Control Wheel Steering (CWS) - A selectable feature of some autopilots that directly relates control wheel displacement to a desired aircraft response. The pilot's force or displacement inputs of the control wheel/column or stick are transmitted by the autopilot into appropriate commands to the control surfaces to achieve the desired aircraft pitch, roll, or yaw response.

Flight Director (FD) - An instrument display system providing visual commands for aircraft control by displaying appropriate command indications on the primary flight display. The flight crew use these command indications to manually fly the aircraft or monitor the autopilot.

Flight Management Systems (FMS) - An integrated system used by flight crews for flight planning, navigation, performance management, aircraft guidance and flight progress monitoring.

Minimum Altitude for AFGS Engagement - Unless otherwise specified by the FAA, the minimum height relevant to the airport elevation, runway elevation, etc. over which the crew may either initially engage an AFGS for automatic flight after takeoff or allow the AFGS to remain engaged during approach and landing.

5. DISCUSSION.

a. AFGS capabilities have steadily increased and improved with time. Air carrier aircraft now routinely use autoflight features that are operational during takeoff and landing/roll-out (e.g. control wheel steering, automatic landing, automatic throttles, and wing-load alleviation).

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b. Some aircraft now have automatic features identified for operations specifically at low altitudes (e.g. for noise abatement) which when used, contribute to performance, workload, cost, noise, and safety benefits. Such features will be certificated on the aircraft by either type certification or supplemental type certification. Operators may obtain operational approval for in service use by following the guidance in this AC. This should meet the intent of Section 121.579, 125.329, and 135.93 of the FAR for existing aircraft and describe acceptable methods for demonstration of these systems for new or modified aircraft.

c. At present this would permit Principal Operations Inspectors (POI) to authorize the altitude specified in the Flight Standardization Board (FSB) report, if listed, otherwise the altitude that is listed in the Airplane Flight Manual (AFM). POI's would then revise the appropriate section of the operations specifications (OPSPECS). The expectation is that as technology continues to advance, additional operational and safety benefits can be derived from using improved autopilot technology. Such a benefit may eventually include the use of an AFGS from the beginning of the takeoff phase of flight.

6. OPERATIONAL CONCEPT.

a. The AFGS, as discussed in this AC, consists of an Autopilot (pitch, roll, and yaw) Flight Guidance System, which if used in conjunction with other available components such as FMS, autothrottle, etc., will enhance safety and ease pilot workload. Any or all of the many available automatic operational features are <u>selectable at the pilot's discretion</u> in modern transport aircraft. This allows a clear distinction to be made in contrast to the primary flight control system which may also be largely automatic and electronic but is not normally deselectable at the crew's discretion, e.g. such as the yaw dampners.

b. There are several functions of an AFGS that could be presented for operational approval. These functions could be used singularly or in combination with each other. They may be operationally approved by the Administrator through the certificate holder's training and maintenance programs. The following are examples of these functions:

(1) Setting takeoff thrust
(2) Initial climb
(3) Noise abatement profiles
(4) Engine failure recognition

c. Operational approval for use of the above functions may include the following:

- Airborne equipment
- Ground equipment
- Maintenance
  - Training
  - Equipment requirement
- Flight operations
  - Training
  - Operating procedures

7. **AIRPORT AND GROUND FACILITIES.** An applicant authorized to use an AFGS may have certain constraints related to airports or ground facilities specified in the operators OPSPECS where such specific provisions are necessary (e.g. operations based on special procedures at airports with adjacent mountainous terrain, operations requiring runway guidance information, etc.).

8. **AIRBORNE EQUIPMENT.** AFGS system criteria will be defined in the AFM.

9. **PILOT TRAINING AND PROFICIENCY PROGRAM.** The operator's training program for flight crewmembers should provide training in the following subjects:

a. **Airport and ground facilities** - as defined in the airborne equipment certification, AFM, and OPSPECS.

b. **Flight training program:**

(1) For pilot certification/type rating requirements [appendix E, part 121; subpart I, part 125; subpart H, part 135]:

(i) Required training should demonstrate the ability and limits of operation of the AFGS to the level of performance indicated by the AFM. This includes all normal and abnormal procedures.

(ii) The pilot applicant will be required to demonstrate to a satisfactory level of performance the use of the AFGS within the allowable parameters indicated by the AFM. Performance criteria should include all normal and abnormal procedures.

(2) Required pilot training for AFGS operations should be conducted in accordance with Parts 121, 125, and 135 of the FAR.

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(i) Pilot ground and flight training in the use of the AFGS, to established minima criteria for weather operations, will be authorized through OPSPECS.

(ii) Required pilot checking for initial authorization and at prescribed recurrent intervals for each air carrier should be established. Demonstration of normal and abnormal procedures should be included.

10. **OPERATIONS MANUAL AND PROCEDURES.** Procedures, instructions, and information to be used by flight crews are to be developed by each air carrier to include, as applicable, at least the following:

a. **Flight crewmember duties.** Flight crewmember duties during initial engagement or use of the AFGS are to be described in the operations manual. These duties should at least contain a description of the responsibilities and tasks for the pilot flying the aircraft and the pilot not flying the aircraft during all stages of operation. The duties of the third flight crewmember, if required, should also be explicitly defined.

b. **Training information.** Approved training requirements and procedures should be provided in the operator's manual or available to flight crews in an equivalent form for reference use.

11. **MAINTENANCE PROGRAM.** Each operator should establish a maintenance and reliability program, acceptable to the Administrator, to ensure that the airborne equipment will continue at a level of performance and reliability established by the manufacturer or the FAA. [subpart L, part 121; subpart G, part 125; subpart J, part 135] The program should include the following:

a. **Maintenance personnel training.** Each operator should establish an initial and recurrent training program, or arrange for contract maintenance that is acceptable to the Administrator, for personnel performing maintenance work on airborne systems and equipment. Personnel training records should be maintained.

b. **Test equipment and standards.** The operator's program for maintenance of line (ramp) test equipment, shop (bench) test equipment, and a listing of all primary and secondary standards utilized during maintenance of test equipment which relates to airborne system operation should be submitted to the Administrator for determination of adequacy. Emphasis should be placed on standards associated with flight directors, automatic flight control systems, maintenance techniques and procedures of associated redundant systems.

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c. **Maintenance procedures.** Any changes to maintenance procedures, practices, or limitations established in the qualification for airborne system operations are to be submitted to the Administrator for acceptance before such changes are adopted.

12. **ENGINEERING MODIFICATIONS.** Titles and numbers of all modifications, additions, and changes that were made to qualify aircraft systems performance should be provided to the Administrator. [subparts D and E, part 21]

Initiated by:

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

DRAFT

14 CFR parts 121, 125, and 135

[Docket No. ; Notice No. 93-]

RIN: 2120-xxxx

Revision to Minimum Altitudes for the Use of an Autopilot

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The Federal Aviation Administration proposes to amend regulations governing the use of approved flight control guidance systems with automatic capability (autopilot). Current regulations prohibit the use of an autopilot at altitudes less than 500 feet above ground level (AGL) during the takeoff and initial climb phases of flight. The proposed amendment would permit the use of approved autopilot systems for takeoff if the Administrator authorizes their use as stated in an air carrier's operations specifications. By permitting air carriers to take advantage of technological improvements in the operational capabilities of autopilot systems, safety will be enhanced by decreasing pilot workload during the critical takeoff phase of flight. This amendment is based on a recommendation from the Aviation Rulemaking Advisory Committee (ARAC).

DATE(S): Comments must be submitted on or before [xx days after publication in the Federal Register.]

ADDRESSES: Comments on this notice should be mailed, in triplicate, to: Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket (AGC-10), Docket No. xxxxx, 800 Independence Avenue, SW., Washington, DC 20591. Comments delivered must be marked Docket No. xxxxx. Comments may be examined in Room 915G weekdays between 8:30 a.m. and 5:00 p.m., except on Federal holidays.

FOR FURTHER INFORMATION CONTACT: Richard A. Temple, AFS-410, Flight Standards Service, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591, telephone (202) 267-5824.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, federalism, or economic impact that might result from adopting the proposals in this notice are also invited. Substantive comments should be accompanied by cost estimates. Comments should identify the regulatory docket or notice number and should be submitted in triplicate to the Rules Docket address specified above. All comments received on or before the closing date for comments specified will be considered by the Administrator before taking action on this proposed

rulemaking. The proposals contained in this notice may be changed in light of comments received. All comments received will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. A report summarizing each substantive public contact with FAA personnel concerned with this rulemaking will be filed in the docket. Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include a preaddressed, stamped postcard on which the following statement is made: "Comments to Docket No. xxxxx." The postcard will be date stamped and mailed to the commenter.

Availability of NPRMs

Any person may obtain a copy of this NPRM by submitting a request to the Federal Aviation Administration, Office of Public Affairs, Attention: Public Inquiry Center, APA-220, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267-3484. Communications must identify the notice number of this NPRM.

Persons interested in being placed on the mailing list for future NPRMs should request from the above office a copy of Advisory Circular (AC) No. 11-2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedure.

Background

Statement of the Problem

The FAA is proposing to amend §§ 121.579, 125.329, and 135.93 of the Federal Aviation Regulations (FAR) to permit certificate holders that operate under parts 121, 125, or 135 to obtain authorization to use an approved autopilot system for takeoff if authorized by the FAA as stated in the certificate holders's operations specifications. Section 121.579(a) currently states that no person may use an autopilot en route, including climb and descent, at an altitude above the terrain that is less than twice the maximum altitude loss specified in the Airplane Flight Manual for a malfunction of the autopilot under cruise conditions, or less than 500 feet, whichever is higher. Section 125.329(a) states that no person may use an autopilot at an altitude above the terrain which is less than 500 feet or less than twice the maximum altitude loss specified in the approved Airplane Flight Manual or equivalent for a malfunction of the autopilot, whichever is higher. Section 135.93(a) states that no person may use an autopilot at an altitude above the terrain which is less than 500 feet or less than twice the maximum altitude loss specified in the approved Airplane Flight Manual or equivalent for a malfunction of the autopilot, whichever is higher. Paragraphs (b) and (c) in § 121.579, paragraphs (b), (c) and (d) of § 125.329, and paragraphs (b), (c), and (d) in § 135.93 provide exceptions to this restriction for the approach and landing phases of flight.

However, the regulations prohibit the use of an autopilot system at altitudes below 500 feet AGL during the takeoff and initial climb phases of flight under any condition.

The current restrictions in the regulations regarding the use of an autopilot below 500 feet AGL have not been amended since 1965, when provisions for the landing phase of flight were incorporated into § 121.579. This change was incorporated into prt 135 when § 135.93 was recodified in 1978, and into part 125 when § 125.329 was established in 1980. Although significant improvements in autopilot technology have been made, the regulations have not been amended to permit the use of an autopilot system during the takeoff and initial climb phases of flight. In addition, the aviation industry anticipates further improvements in autopilot technology, particularly in relation to using the autopilot during the takeoff phase of flight.

The FAA proposes to amend §§ 121.579, 125.329, and 135.93 in this NPRM. The general discussion of the proposal is based, in part, on developments of autopilots used in part 121 operations. However, the autopilot technology, although used more widely by part 121 operators, is also used by parts 125 and 135 operators. In addition, the intent and safety considerations presented apply equally to parts 121, 125, and part 135 operations.

History of § 121.579 of the FAR

part 121, Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large

Aircraft, Subpart T – Flight Operations, was recodified into the FAR in 1964 from part 41 of the Civil Air Regulations. No substantive changes were made to minimum altitude requirements for the use of autopilot systems at that time.

The altitude restrictions of § 121.579 established minimum attitudes necessary to provide pilots with sufficient altitude for obstacle clearance and the reaction time needed to disengage the autopilot should a malfunction occur. An example of a particularly critical malfunction is a "hard-over," which may occur as the result of an autopilot system failure in which, for example, the autopilot pitch control channel output commands a full deflection of the pitch control surfaces of the airplane, resulting in an abrupt change in the nose-down attitude of the airplane. Early autopilot systems used by part 121 and other operators did not provide the system redundancy and self-test features needed to automatically detect and compensate for the failure of critical autopilot components and to preclude airplane flight control surface "hard overs". In the event of such failures, pilots were required to disengage the autopilot and manually manipulate the airplane flight controls to recover from the effects of flight control hardovers. However, the capabilities of autopilot systems have increased significantly; many autopilots are now designed to detect all significant autopilot malfunctions and ensure zero deviation from the intended flight path (including zero altitude loss) in the event of autopilot malfunction.

The enhanced capabilities of autopilot systems and other flight instrumentation have facilitated a reduction in minimum visibility requirements for flight operations. In an effort to promote the increased use of an all-weather landing system, the FAA amended § 121.579 to permit the use of an autopilot equipped with an approach coupler to touchdown, as approved in the air carrier's operations specifications (Amendment 121-13, 30 FR 14781, November 22, 1965). This amendment facilitated the development of Category I, II, and III instrument landing systems (ILS). The use of these instrument approach systems increased the safety of routine flight and landing operations conducted in marginal weather. However, at the time the amendment was revised, the aviation industry did not anticipate that technological improvements would provide the ability to safely use an autopilot system during the takeoff and initial climb phases of flight. As a result, the amendment addressed only the approach and landing phases.

In March 1990, USAir petitioned the FAA for an exemption from § 121.579(a) of the FAR to allow the autopilot on USAir's Fokker 100 aircraft to be engaged during the takeoff phase of flight at an altitude of 100 feet AGL (Exemption No. 5449, Docket No. 26218, 55 FR 31021, July 30, 1990). In response to the petition for exemption, the FAA stated that it recognized the considerable improvements in the reliability and performance of autopilot systems in recent years. However, the FAA denied the petition on May 6, 1992, because USAir did not provide the FAA

with sufficient documentation of the operator's stated approval of the particular autopilot system. At that time, the FAA decided that the ARAC should consider the issue and make recommendations pertaining to regulatory changes.

The ARAC was chartered in February 1991 to provide recommendations to the FAA Administrator, through the Associate Administrator for Regulation and Certification and the Director of Rulemaking, on FAA rulemaking activity related to aviation safety issues such as air carrier operations. The ARAC Autopilot Engagement Requirements Working Group was established to determine the criteria for autopilot engagement and to address existing autopilot technology.

History of § 125.329 of the FAR

On October 2, 1980, the FAA issued regulations establishing certification and operations rules for large airplanes having a seating capacity of 20 or more passengers or a maximum payload capacity of 6,000 pounds or more when used in other than common carriage. [45FR67214] This rule was the outgrowth of an in-depth study of other than common carriage charter operations using large airplanes that began in 1970 at the direction of the Secretary of Transportation. The study recommended that regulations be developed for large airplanes, pressurized airplanes, and turbine-powered airplanes engaged in other than common carriage. Some of the requirements and restrictions

formerly codified in parts 121 and 135 were also included in part 125 if they were deemed essential for safety reasons; thus § 125.329 was codified. Its purpose is to provide passengers traveling on large airplanes operated in noncommon carriage with a level of safety similar to that provided by parts 121 and 135 for purposes of autopilot requirements.

History of FAR § 135.93

In 1978, part 135, Air Taxi Operators and Commercial Operators, was substantially revised (43 FR 46783, October 10, 1978) and the requirements of § 121.579 concerning autopilot use were substantially incorporated into § 135.93. The purpose of the revision was to provide passengers traveling on commuter air carrier or on-demand air taxi flights with a level of safety similar to the level of safety provided by part 121 operators. The amendment included minor language revisions to improve the clarity of the regulation. No significant changes have been made to the regulation since it was adopted.

General Discussion of the Proposal

The ARAC and some industry members have expressed that revised requirements to permit increased usage of autopilot engagement during takeoff would have certain benefits, such as allowing a pilot to focus more attention on details other than the cockpit instruments during the critical takeoff phase of flight. Based on past advances in autopilot technology, the expectation that technology will continue to advance, and the

safety benefits[1] that would result from using improved technology, the FAA has reevaluated the restrictions of the current regulations and proposes to amend the rules. The intent of the proposed rules is to permit authorization for the use of an autopilot during the takeoff and initial climb phases of flight; to enable part 121, 125, and 135 operators to use existing technology; and to further promote technological advances while increasing the level of public safety.

Use of Autopilot Systems Below 500 Feet

Several transport category aircraft are currently equipped with approved autopilot systems evaluated by the FAA during the aircraft certification process to determine the minimum safe altitude engagement at altitudes below 500 feet AGL, to include the takeoff and initial climb phases of flight. These autopilot systems are identified by make and model in the airplane flight manual (AFM) and the minimum safe autopilot engagement altitude for that particular make and model of autopilot is also stated in the AFM. However, this AFM authorization currently does not permit such autopilots to be used to the level of their demonstrated capability by certificate holders operating under parts 121, 125, or 135. In proposing this amendment, the FAA recognizes that airworthiness approval expressed in an airplane's AFM is a prerequisite to permitting these autopilot systems to be used during takeoff under the operating rules of parts 121, 125,

[1] See discussion under "Safety Benefits."

and 135. Examples of transport category aircraft that have autopilot systems identified in their AFMs that specify that such autopilots may be engaged below 500 feet AGL include the Boeing 747-400, which has been approved for autopilot engagement at 250 feet AGL after takeoff; the Boeing 757 and 767, which have been approved for autopilot engagement at 200 feet AGL; and the Fokker 100, which has been approved for autopilot engagement at 400 feet AGL. In order to obtain this certification, it was necessary for the manufacturer to demonstrate low altitude engagement of the autopilot, after takeoff, as safe and as part of the airworthiness certification of the particular system and autopilot on the airplane.

Further, European civil aviation authorities have approved the engagement of particular autopilot systems on particular aircraft used in air carrier operations at altitudes below 500 feet AGL during takeoff. For example, the Dutch Ministry of Transport, Public Works and Water Management, Airworthiness Division, Aeronautical Inspection Directorate, approved the engagement of an Automatic Flight Control and Augmentation System (AFCAS) in the Fokker 100 at 35 feet AGL during takeoff.

Safety Benefits

In addition to permitting the use of autopilots with improved capabilities, the proposed amendments to §§ 121.579, 125.329, and 135.93, if adopted, would enhance public safety by decreasing pilot workload during the critical takeoff phase of flight. As a practical matter, this means that a pilot will

spend less time manipulating the controls and more time making other critical observations. Allowing the engagement of an autopilot during the takeoff phase of flight would enable the pilot to monitor the performance of the aircraft while performing other critical functions, such as remaining alert to the occurance of airplane malfunctions and the presence of other aircraft during takeoff. This is particularly important when the aircraft is in the terminal area and exposed to more traffic. The pilot's ability to devote more attention to the environment outside the cockpit supports the "see and avoid" concept.

In addition, the use of an autopilot ensures consistent flight maneuvers such as standardized climb profiles. Consistency in the performance of such maneuvers enables the flight crew to more readily identify any deviations from expected aircraft performance, thus improving the pilot's opportunity to quickly compensate for the deviation. Thus, since pilots may readily identify problems and have more time to take action to compensate for deviations, the level of safety would be increased.

Intent of the Proposal

The FAA and the aviation industry anticipate that further technological advances will lead to the evolution of autoflight systems that can safely be used from initiation of takeoff roll to completion of landing. Flexibility in the approval of minimum engagement altitudes would allow the industry to work toward this goal and at the same time would provide the authorization

requirements necessary to ensure that the industry meets or exceeds the level of safety established by the current regulation.

Related Activity

If this proposal is adopted, the FAA plans to issue an AC in conjunction with the publication of the final rule. The AC would provide guidelines for obtaining operational approval for the use of an approved autopilot system during the takeoff phase of flight. Approval would be based on the airworthiness approval of a particular autopilot system installed on a particular airplane and on the FAA's evaluation of the applicant's operational concepts, manuals, and procedures; airborne equipment; airport and ground facilities used in conjunction with the autopilot systems; flight crew training and proficiency programs; and aircraft and equipment maintenance programs. The operational aspects addressed in the AC would be similar to those addressed in AC No. 120-28, Criteria for Approval of Category III Landing Weather Minima (March 9, 1984), which provided guidance for obtaining the approval of Category III landing weather minima by amending the certificate holder's operations specifications, as permitted by § 121.579(c).

Proposed Amendment

Section 121.579

Section § 121.579 would be amended by adding a new paragraph (d), which would allow the Administrator to issue operations specifications that establish the minimum altitude permitted to engage/use an autopilot during the takeoff and initial climb phases of flight. In addition, § 121.579(a) would be amended by striking the words "paragraphs (b) and (c)" and inserting the words "paragraphs (b), (c), and (d)."

Section 125.329

Section 125.329 would be amended by adding paragraph (e) to allow the Administrator to issue operations specifications that establish the minimum altitude permitted to engage/use an autopilot during the takeoff and initial climb phases of flight. In addition, § 125.329(a) would be amended by striking the words "paragraphs (b), (c), and (d)" and inserting the words "paragraphs (b), (c), (d), and (e)."

Section 135.93

Section 135.93 would be amended by redesignating paragraph (e) as paragraph (f) and adding a new paragraph (e) to allow the Administrator to issue operations specifications that establish the minimum altitude permitted to engage/use an autopilot during the takeoff and initial climb phases of flight. In addition, § 135.93(a) would be amended by striking the words "paragraphs

(b), (c), and (d)" and inserting the words "paragraphs (b), (c), (d), and (e)."

Paperwork Reduction Act

The information collection requirements in the proposed amendment to §§ 121.579, 125.329, and 135.93 have previously been approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1980 (44 V.S.C. 3501 et seq.) and have been assigned OMB Control Number 2120-0008.

Economic Assessment

The FAA has determined that this rulemaking is not "major" as defined by Executive Order 12291, and therefore no Regulatory Impact Analysis is required. In accordance with Department of Transportation policies and procedures, when the impact of the proposed regulation would be minimal if adopted, a full regulatory evaluation does not need to be prepared. The following discussion provides an economic assessment of the proposal's anticipated costs and benefits.

Costs

The proposed amendment would allow air carriers and commercial operators to seek authorization for the use of autopilot systems at altitudes that would be prohibited under current regulations. Because the decision whether to seek authorization for the use of autopilot is optional, the proposed

amendment would not impose any additional costs on certificate holders that operate under parts 121, 125, or 135.

A certificate holder may obtain authorization to amend its operations specifications to use an approved autopilot system provided it is able to show that it either meets the guidelines in AC 120-AFGS or an acceptable alternate means. Once authorization is given, the air carrier or commercial operator would incur minimal training-related costs. Little, if any, additional pilot training would be required because system usage and procedures training for use of the system during the takeoff phase of flight is expected to mirror the current training requirements for the use of the autopilot system for Category I, II, and III instrument approaches. Completion of autopilot systems training is currently documented in pilot training records. However, it may be necessary to minimally modify pilot training programs and related documentation to specifically address the use of the autopilot system during the takeoff phase of flight. Furthermore, air carriers and commercial operators are expected to have little if any additional equipment costs because the autopilot equipment that would be used for the takeoff phase of flight would, in most cases, be the same equipment that is currently used to conduct Category I, II, and III approaches.

Benefits

This proposal would have only positive effects on the safety of air operations. As with any change to operations

specifications the FAA would reserve the right to determine whether suggested revisions to an air carrier's operations specifications meet the various criteria and guidelines that would ensure that the current level of safety is met or exceeded.

The use of the autopilot system below 500 feet AGL would enable the pilot to monitor the performance of the aircraft while performing other safety-related functions, such as scanning the outside area for other aircraft. Since less time is spent manipulating the controls, the use of the autopilot would also enable the flight crew to more readily identify any deviations from expected aircraft performance thus increasing the pilot's opportunity to quickly respond to any aircraft malfunctions. Increasing the pilot's opportunity to scan the area outside the aircraft for other airborne traffic, to detect aircraft malfunctions, and to more quickly respond to problems will increase the level of safety.

International Trade Impact Analysis

The FAA has determined that the proposed amendments to parts 121, 125, and 135, if adopted, would not have a significant impact on international trade. The proposal is expected to have no negative impact on trade opportunities for U.S. firms doing business overseas or foreign firms doing business in the United States.

Regulatory Flexibility Determination

Congress enacted the Regulatory Flexibility Act (RFA) of 1980 (Pub. L. 96-354) to ensure that small entities are not unnecessarily and disproportionately burdened by Government regulations. The RFA requires agencies to review proposed rules that may have a significant impact on a substantial number of small entities. The proposed rule would impose no additional costs on air carriers; therefore, it would not have a significant economic impact on small business entities.

Federalism Implications

The regulations proposed herein would not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient implications to warrant the preparation of a Federalism Assessment.

Conclusion

For the reasons discussed in the preamble, and based on the findings in the Regulatory Flexibility Determination and the International Trade Impact Analysis, the FAA has determined that this proposed regulation is not major under Executive Order 12291. In addition, the FAA certifies that this proposal, if adopted, would not have a significant economic impact,

2. Section 121.579 is amended by revising paragraph (a) and adding new paragraph (d) to read as follows:

§ 121.579 Minimum altitudes for use of autopilot.

(a) *En route operations.* Except as provided in paragraphs (b), (c), and (d) of this section, * * *

* * * * *

(d) *Takeoffs.* Notwithstanding paragraph (a) of this section, the Administrator issues operations specifications to allow the use during the takeoff maneuver, or a portion thereof, of an approved flight control guidance system with automatic capability in any case in which the Administrator finds that the use of the system will not otherwise affect the safety standards required by this section.

part 125--CERTIFICATION AND OPERATIONS: AIRPLANES HAVING A SEATING CAPACITY OF 20 OR MORE PASSENGERS OR A MAXIMUM PAYLOAD CAPACITY OF 6,000 POUNDS OR MORE

3. The authority citation for part 125 continues to read as follows:

Authority: 49 U.S.C. app. 1354, 1421 through 1430, and 1502; 49 U.S.C. 106(g), Revised Pub.L. 97-449, January 12, 1983.

4. Section 125.329 is amended by revising paragraph (a) and adding new paragraph (e) to read as follows:

§ 125.329 Minimum altitudes for use of autopilot.

positive or negative, on a substantial number of small entities under the criteria of the RFA.

List of Subjects

14 CFR part 121

Air carriers, Air transportation, Aircraft, Aircraft pilots, Airmen, Airplanes, Airports, Airworthiness directives and standards, Aviation safety, Pilots, Safety, Transportation.

14 CFR part 125

Air carriers, Air transportation, Aircraft, Airmen, Airworthiness, Aviation safety, Pilots, Safety.

14 CFR part 135

Air carriers, Air transportation, Aircraft, Airmen, Airworthiness, Aviation safety, Pilots, Safety.

THE PROPOSED AMENDMENT

In consideration of the foregoing, the Federal Aviation Administration proposes to amend parts 121, 125, and 135 of the Federal Aviation Regulations (14 CFR parts 121, 125, and 135) as follows:

part 121--CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT

1. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. app. 1354(a), 1355, 1356, 1357, 1401, 1421-1430, 1472, 1485, and 1502; 49 U.S.C. 106(g).

(a) Except as provided in paragraphs (b), (c), (d), and (e) of this section, * * *

* * * * *

(e) Without regard to paragraph (a) of this section, the Administrator may issue operations specifications to allow the use during the takeoff maneuver, or a portion thereof, of an approved flight control guidance system with automatic capability if the Administrator finds that the use of the system will not otherwise affect the safety standards required by this section.

part 135--AIR TAXI OPERATORS AND COMMERCIAL OPERATORS

5. The authority citation for part 135 continues to read as follows:

Authority: 49 U.S.C. app. 1354(a), 1355(a), 1421 through 1431, and 1502; 49 U.S.C. 106(g).

6. Section 135.93 is amended by revising paragraph (a), redesignating paragraph (e) as paragraph (f), and adding new paragraph (e) to read as follows:

§ 135.93 Autopilot: Minimum altitudes for use.

(a) Except as provided in paragraphs (b), (c), (d), and (e) of this section, * * *

* * * * *

(e) Without regard to paragraph (a) of this section, the Administrator may issue operations specifications to allow the use during the takeoff maneuver, or any portion thereof, of an approved flight control guidance system with automatic capability

if the Administrator finds that the use of the system will not otherwise affect the safety standards required by this section.

(f) This section does not apply to operations conducted in rotorcraft.

Issued in Washington, D.C., on.

FAA Action

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR parts 121, 125, and 135

[Docket No. 27987, Notice No. 94–34]

RIN 2120–AF19

Revision to Minimum Altitudes for the Use of an Autopilot

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The Federal Aviation Administration proposes to amend regulations governing the use of approved flight control guidance systems with automatic capability (autopilot). Current regulations prohibit the use of an autopilot at altitudes less than 500 feet above ground level (AGL) during the takeoff and initial climb phases of flight. The proposed amendment would permit the use of approved autopilot systems for takeoff and initial climb phases of flight if the Administrator authorizes their use as stated in an air carrier's operations specifications. By permitting air carriers to take advantage of technological improvements in the operational capabilities of autopilot systems, safety will be enhanced by decreasing pilot workload during the critical takeoff phase of flight. This amendment is based on a recommendation from the Aviation Rulemaking Advisory Committee (ARAC).

DATES: Comments must be submitted on or before January 9, 1995.

ADDRESSES: Comments on this notice should be mailed, in triplicate, to: Federal Aviation Administration, Office of the Chief Counsel, Attention: Rules Docket (AGC–10), Docket No. 27987, 800 Independence Avenue, SW., Washington, DC 20591. Comments delivered must be marked Docket No. 27987. Comments may be examined in Room 915G weekdays between 8:30 a.m. and 5:00 p.m., except on Federal holidays.

FOR FURTHER INFORMATION CONTACT: Richard A. Temple, AFS–410, Flight Standards Service, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591, telephone (202) 267–5824.

SUPPLEMENTARY INFORMATION:

Comments Invited

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, federalism, or economic impact that might result from adopting the proposals in this notice are also invited. Substantive comments should be accompanied by cost estimates. Comments should identify the regulatory docket or notice number and should be submitted in triplicate to the Rules Docket address specified above. All comments received on or before the closing date for comments specified will be considered by the Administrator before taking action on this proposed rulemaking. The proposals contained in this notice may be changed in light of comments received. All comments received will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons. A report summarizing each substantive public contact with FAA personnel concerned with this rulemaking will be filed in the docket. Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include a preaddressed, stamped postcard on which the following statement is made: "Comments to Docket No. 27987." The postcard will be date stamped and mailed to the commenter.

Availability of NPRMs

Any person may obtain a copy of this NPRM by submitting a request to the Federal Aviation Administration, Office of Public Affairs, Attention: Public Inquiry Center, APA–220, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267–3484. Communications must identify the notice number of this NPRM.

Persons interested in being placed on the mailing list for future NPRMs should request from the above office a copy of Advisory Circular (AC) No. 11–2A, Notice of Proposed Rulemaking Distribution System, which describes the application procedure.

Background

Statement of the Problem

The FAA is proposing to amend §§ 121.579, 125.329, and 135.93 of the Federal Aviation Regulations (FAR) to permit certificate holders that operate under parts 121, 125, or 135 to obtain authorization to use an approved autopilot system for takeoff if authorized by the FAA as stated in the certificate holder's operations specifications. Section 121.579(a) currently states that no person may use an autopilot en route, including climb and descent, at an altitude above the terrain that is less than twice the maximum altitude loss specified in the Airplane Flight Manual for a malfunction of the autopilot under cruise conditions, or less than 500 feet, whichever is higher. Section 125.329(a) states that no person may use an autopilot at an altitude above the terrain which is less than 500 feet or less than twice the maximum altitude loss specified in the approved Airplane Flight Manual or equivalent for a malfunction of the autopilot, whichever is higher. Section 135.93(a) states that no person may use an autopilot at an altitude above the terrain which is less than 500 feet or less than twice the maximum altitude loss specified in the approved Airplane Flight Manual or equivalent for a malfunction of the autopilot, whichever is higher. Paragraphs (b) and (c) in § 121.579, paragraphs (b), (c) and (d) of § 125.329, and paragraphs (b), (c), and (d) in § 135.93 provide exceptions to this restriction for the approach and landing phases of flight. However, the regulations prohibit the use of an autopilot system at altitudes below 500 feet AGL during the takeoff and initial climb phases of flight under any condition.

The current restrictions in the regulations regarding the use of an autopilot below 500 feet AGL have not been amended since 1965, when provisions for the landing phase of flight were incorporated into § 121.579. This change was incorporated into part 135 when § 135.93 was recodified in 1978, and into part 125 when § 125.329 was established in 1980. Although significant improvements in autopilot technology have been made, the regulations have not been amended to permit the use of an autopilot system during the takeoff and initial climb phases of flight. In addition, the aviation industry anticipates further improvements in autopilot technology, particularly in relation to using the autopilot during the takeoff phase of flight.

The FAA proposes to amend §§ 121.579, 125.329, and 135.93 in this NPRM. The general discussion of the proposal is based, in part, on developments of autopilots used in part 121 operations. However, the autopilot technology, although used more widely by part 121 operators, is always used by parts 125 and 135 operators. In addition, the intent and safety considerations presented apply equally to parts 121, 125, and 135 operations.

History of § 121.579 of FAR

Part 121, Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft, Subpart T—Flight Operations, was recodified into the FAR in 1964 from part 41 of the Civil Air Regulations. No substantive changes were made to minimum altitude requirements for the use of autopilot systems at that time.

The altitude restrictions of § 121.579 established minimum attitudes necessary to provide pilots with sufficient altitude for obstacle clearance and the reaction time needed to disengage the autopilot should a malfunction occur. An example of a particularly critical malfunction is a "hard-over." This malfunction may occur as the result of an autopilot system failure where, for example, the autopilot pitch control channel output commands a full nose-down deflection of the pitch control surfaces of the airplane, resulting in an abrupt change in the attitude of the airplane. Early autopilot systems used by part 121 and other operators did not provide the system redundancy and self-test features that automatically detect and compensate for the failure of critical autopilot components and preclude airplane flight control surface "hard overs". In the event of such failures, pilots were required to disengage the autopilot and manually manipulate the airplane flight controls to recover from the effects of flight control hardovers. However, the capabilities of autopilot systems have increased significantly; many autopilots are now designed to detect all significant autopilot malfunctions and ensure zero deviation from the intended flight path (including zero altitude loss) in the event of autopilot malfunction

The enhanced capabilities of autopilot systems and other flight instrumentation have facilitated a reduction in minimum visibility requirements for flight operations. In an effort to promote the increased use of an all-weather landing system, the FAA amended § 121.579 to permit the use of an autopilot equipped with an approach coupler, to touchdown, as approved in the air carrier's operations specifications (Amendment 121–13, 30 FR 14781, November 22, 1965). This amendment facilitated the development of Category I, II, and III instrument landing system (ILS) The use of these instrument approach systems increased the safety of routine flight and landing operations conducted in marginal weather. However, at the time the regulation was amended, the aviation industry did not anticipate that technological improvements would provide the ability to safely use an autopilot system during the takoff and initial climb phases of flight. As a result, the amendment addressed only the approach and landing phases.

In March 1990, USAir petitioned the FAA for an exemption from § 121.579(a) of the FAR to allow the autopilot on USAir's Fokker 100 aircraft to be engaged during the takeoff phase of flight at an altitude of 100 feet AGL (Exemption No. 5449, Docket No. 26218, 55 FR 31021, July 30, 1990). In response to the petition for exemption, the FAA stated that it recognized the considerable improvements in the reliability and performance of autopilot systems in recent years. However, the FAA denied the petition on May 6, 1992, because USAir did not provide the FAA with sufficient documentation verifying the FAA's approval of that particular autopilot system. At that time, the FAA decided that the ARAC should consider the issue and make recommendations pertaining to regulatory changes.

The ARAC was chartered in February 1991 to provide recommendations to the FAA Administrator, through the Associate Administrator for Regulation and Certification and the Director of Rulemaking, on FAA rulemaking activity related to aviation safety issues such as air carrier operations. The ARAC Autopilot Engagement Requirements Working Group was established to determine the criteria for autopilot engagement and to address existing autopilot technology.

History of § 125.329 of the FAR

On October 2, 1980, the FAA issued regulations establishing certification and operations rules for large airplanes having a seating capacity of 20 or more passengers or a maximum payload capacity of 6,000 pounds or more when used in other than common carriage. [45FR67214] This rule was the outgrowth of an in-depth study of other than common carriage charter operations using large airplanes. That study began in 1970 at the direction of the Secretary of Transportation. The authors of the study recommended that regulations be developed for large airplanes, pressurized airplanes, and turbine-powered airplanes engaged in other than common carriage. Some of the requirements and restrictions formerly codified in parts 121 and 135 were also included in part 125 if they were deemed essential for safety reasons; thus § 125.329 was codified. Its purpose is to provide passengers traveling on large airplanes operated in noncommon carriage with a level of safety similar to that provided by parts 121 and 135 for purposes of autopilot requirements.

History of FAR § 135.93

In 1978, part 135, Air Taxi Operators and Commercial Operators, was substantially revised (43 FR 46783, October 10, 1978) and the requirements of § 121.579 concerning autopilot use were substantially incorporated into § 135.93. The purpose of the revision was to provide passengers traveling on commuter air carrier or on-demand air taxi flights with a level of safety similar to the level of safety provided by part 121 operators. The amendment included minor language revisions to improve the clarity of the regulation. No significant changes have been made to the regulation since it as adopted.

General Discussion of the Proposal

The ARAC and some industry members have expressed their opinion that amending the regulation to permit increased usage of autopilot engagement during takeoff would have certain benefits, such as allowing pilots to focus proportionately more attention on duties other than the manual manipulation of the flight controls and constant surveillance of the cockpit instruments during the critical takeoff phase of flight. Based on current autopilot technology, the expectation that technology will continue to advance, and the safety benefits [1] that would result from using improved technology, the FAA has reevaluated the restrictions of the current regulations and proposes to amend the rules. The intent of the proposed rules is to permit authorization for the use of an autopilot during the takeoff and initial climb phases of flight; to enable part 121, 125 and 135 operators, when authorized, to use existing technology; and to further promote technological advancers while increasing the level of public safety.

Use of Autopilot Systems Below 500 Feet

Several transport category aircraft are currently equipped with approved autopilot systems evaluated by the FAA during the aircraft certification process to determine the minimum safe altitude engagement, for operational use at altitudes below 500 feet AGL. These autopilot systems are identified by make and model in the airplane flight manual (AFM) and the minimum safe autopilot engagement altitude for that particular make and model of autopilot is also stated in the AFM. However, because of

[1] See discussion under "Safety Benefits."

the restrictions in the applicable regulations, AFM authorization alone does not permit such autopilots to be used to the level of their demonstrated capability by certificate holders operating under parts 121, 125, or 135. In proposing this amendment, the FAA recognizes that airworthiness approval expressed in an airplane's AFM is a prerequisite to permitting these autopilot systems to be used during takeoff under the operating rules of parts 121, 125, and 135. Examples of transport category aircraft that have autopilot systems identified in their AFMs that specify that such autopilots may be engaged below 500 feet AGL include the Boeing 747–400, approved for autopilot engagement at 250 feet AGL after takeoff; the Boeing 757 and 767, approved for autopilot engagement at 200 feet AGL; and the Fokker 100, approved for autopilot engagement at 400 feet AGL. In order to obtain the certification, it was necessary for the manufacturer to demonstrate low altitude engagement for the autopilot, after takeoff, as safe and as part of the airworthiness certificate of the particular system and autopilot on the airplane.

Further, European civil aviation authorities have approved the engagement of particular autopilot systems on particular aircraft used in air carrier operations at altitudes below 500 feet AGL during takeoff. For example, the Dutch Ministry of Transport, Public Works and Water Management, Airworthiness Division, Aeronautical Inspection Directorate, approved the engagement of an Automatic Flight Control and Augmentation System (AFCAS) in the Fokker 100 at 35 feet AGL during takeoff.

Safety Benefits

In addition to permitting the use of autopilots with improved capabilities, the proposed amendments to §§ 121.579, 125.329, and 135.93, if adopted, would enhance public safety by decreasing pilot workload during the critical takeoff phase of flight. As a practical matter, this means that a pilot will spend less time manipulating the controls and more time making other critical observations. Allowing the engagement of an autopilot during the takeoff phase of flights would enable the pilot to monitor the performance of the aircraft while performing other critical functions, such as remaining alert to the occurrence of airplane malfunctions and the presence of other aircraft during takeoff. This is particularly important when the aircraft is in the terminal area and exposed to more traffic. The pilot's ability to devote more attention to the environment outside the cockpit supports the "see and avoid" concept.

In addition, the use of an autopilot ensures consistent flight maneuvers such as standardized climb profiles. Consistency in the performance of such maneuvers enables the flight crew to more readily identify any deviations from expected aircraft performance, thus improving the pilot's opportunity to quickly compensate for the deviation. Thus, since pilots may more readily identify problems and may have more time to take action to compensate for deviations, the level of safety should be increased.

Intent of the Proposal

The FAA and the aviation industry anticipate that further technological advances will lead to the evolution of autoflight guidance systems that can safely be used from initiation of takeoff roll to completion of landing. Flexibility in the approval of minimum engagement altitudes would allow the industry to work toward this goal and at the same time would provide the authorization requirements necessary to ensure that the industry meets or exceeds the level of safety established by the current regulation.

Related Activity

If this proposal is adopted, the FAA plans to issue an advisory circular (AC) in conjunction with the publication of the final rule. The AC would provide guidelines for obtaining operational approval for the use of an approved autopilot system during the takeoff phase of flight. Approval would be based on the airworthiness approval of a particular autopilot system installed on a particular airplane and on the FAA's evaluation of the applicant's operational concepts, manuals, and procedures; airborne equipment; airport and ground facilities used in conjunction with the autopilot systems; flight crew training and proficiency programs; and aircraft and equipment maintenance programs. The operational aspects addressed in the AC would be similar to those addressed in AC No. 120–28, Criteria for Approval of Category III Landing Weather Minima (March 9, 1984), which provided guidance for obtaining the approval of Category III landing weather minima by amending the certificate holder's operations specifications, as permitted by § 121.579(c).

Proposed Amendment

Section 121.579

Section 121.579 would be amended by adding a new paragraph (d), which would allow the Administrator to issue operations specifications that establish the minimum altitude permitted to engage/use an autopilot during the takeoff and initial climb phases of flight. In addition, § 121.579(a) would be amended by striking the words "paragraphs (b) and (c)" and inserting the words "paragraphs (b), (c), and (d)."

Section 125.329

Section 125.329 would be amended by adding paragraph (e) to allow the Administrator to issue operations specifications that establish the minimum altitude permitted to engage/use an autopilot during the takeoff and initial climb phases of flight. In addition, § 125.329(a) would be amended by striking the words "paragraphs (b), (c), and (d)" and inserting the words "paragraphs (b), (c), (d), and (e)."

Section 135.93

Section 135.93 would be amended by redesignating paragraph (e) as paragraph (f) and adding a new paragraph (e) to allow the Administrator to issue operations specifications that establish the minimum altitude permitted to engage/use an autopilot during the takeoff and initial climb phases of flight. In addition, § 135.93(a) would be amended by striking the words "paragraphs (b), (c), and (d)" and inserting the words "paragraphs (b), (c), (d), and (e)."

Paperwork Reduction Act

The information collection requirements in the proposed amendment to §§ 121.579, 125.329, and 135.93 have previously been approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.) and have been assigned OMB Control Number 2120–0008.

Economic Assessment

The FAA has determined that this rulemaking is not a significant rulemaking action as defined by Executive Order 12866, and therefore no assessment is required. In accordance with Department of Transportation Policies and Procedures [44 FR 11034; February 26, 1979] when the impact of the proposed regulation would be minimal if adopted, a full regulatory evaluation does not need to be prepared. The following discussion provides an economic assessment of the proposal's anticipated costs and benefits.

Costs

The proposed amendment would allow air carriers and commercial operators to seek authorization for the use of autopilot systems at altitudes that would be prohibited under current regulations. Because the decision whether to seek authorization for the use of autopilot is optional, the proposed amendment would not impose any additional costs on certificate holders that operate under parts 121, 125, or 135.

A certificate holder may obtain authorization to amend its operations specifications to use an approved autopilot system provided it is able to show that it either meets the guidelines in AC 120–AFGS or an acceptable alternate means. Once authorization is given, the air carrier or commercial operator would incur minimal training-related costs. No significant additional pilot training would be required because system usage and procedures training for use of the system during the takeoff phase of flight is expected to mirror the current training requirements for the use of the autopilot system for Category I, II, and III instrument approaches. Completion of autopilot systems training is currently documented in pilot training records. However, it may be necessary to minimally modify pilot training programs and related documentation to specifically address the use of the autopilot system during the takeoff phase of flight. Furthermore, air carriers and commercial operators are expected to have little if any additional equipment costs because the autopilot equipment that would be used for the takeoff phase of flight would, in most cases, be the same equipment that is currently used to conduct Category I, II, and III approaches.

Benefits

This proposal would have only positive effects on the safety of air operations. As with any change to operations specifications the FAA would reserve the right to determine whether suggested revisions to an air carrier's operations specifications meet the various criteria and guidelines that would ensure that the current level of safety is met or exceeded.

The use of the autopilot system below 500 feet AGL would enable the pilot to monitor the performance of the aircraft while performing other safety-related functions, such as scanning the outside area for other aircraft. Since less time is spent manipulating the controls, the use of the autopilot would also enable the flight crew to more readily identify any deviations from expected aircraft performance thus increasing the pilot's opportunity to quickly respond to any aircraft malfunctions. Increasing the pilot's opportunity to scan the area outside the aircraft for other airborne traffic, to detect aircraft malfunctions, and to more quickly respond to problems will increase the level of safety.

International Trade Impact Analysis

The FAA has determined that the proposed amendments to parts 121, 125, and 135, if adopted, would not have a significant impact on international trade. The proposal is expected to have no negative impact on trade opportunities for U.S. Firms doing business overseas or foreign firms doing business in the United States.

International Civil Aviation Organization and Joint Aviation Regulations

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with ICAO Standards and Recommended Practices (SARP) to the maximum extent practicable. In reviewing the SARP for air carrier operations and JAR–OPS 1, the FAA finds that there is not a comparable rule under either ICAO standards or the JAR.

Regulatory Flexibility Deterimination

Congress enacted the Regulatory Flexibility Act (RFA) of 1980 (Pub. L. 96–354) to ensure that small entities are not unnecessarily and dispropriationately burdened by government regulations. The RFA requires agencies to review proposed rules that may have a significant impact on a substantial number of small entities. The proposed rule would impose no additional costs on air carriers; therefore, it would not have a significant economic impact on small business entities.

Federalism Implications

The regulations proposed herein would not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government. Therefore, in accordance with Executive Order 12612, it is determined that this proposal would not have sufficient implications to warrant the preparation of a Federalism Assessment.

Conclusion

For the reasons discussed in the preamble, and based on the findings in the Regulatory Flexibility Determination and the International Trade Impact Analysis, the FAA has determined that this proposed regulation is not a significant rulemaking action under Executive Order 12866. This proposed rule is also considered nonsignificant under Department of Transportation Regulatory Policies and Procedures [44FR11034; February 26, 1979] In addition, the FAA certifies that this proposal, if adopted, would not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the RFA.

List of Subjects

14 CFR Part 121

Air carriers, Air transportation, Aircraft, Aircraft pilots, Airmen, Airplanes, Airports, Airworthiness directives and standards, Aviation safety, Pilots, Safety, Transportation.

14 CFR Part 125

Air carriers, Air transportation, Aircraft, Airmen, Airworthiness, Aviation safety, Pilots, Safety.

14 CFR Part 135

Air carriers, Air transportation, Aircraft, Airmen, Airworthiness, Aviation safety, Pilots, Safety.

The Proposed Amendment

In consideration of the foregoing, the Federal Aviation Administration proposes to amend parts 121, 125, and 135 of the Federal Aviation Regulations (14 CFR parts 121, 125, and 135) as follows:

PART 121—CERTIFICATION AND OPERATIONS: DOMESTIC, FLAG, AND SUPPLEMENTAL AIR CARRIERS AND COMMERCIAL OPERATORS OF LARGE AIRCRAFT

1. The authority citation for part 121 continues to read as follows:

Authority: 49 U.S.C. app. 1354(a), 1355, 1356, 1357, 1401, 1421–1430, 1472, 1485, and 1502; 49 U.S.C. 106(g).

2. Section 121.579 is amended by revising the phrase "paragraph (b) and (c)" in paragraph (a) to read "paragraph (b), (c), and (d)" and adding new paragraph (d) to read as follows:

§ 121.579 Minimum altitudes for use of autopilot.

* * * * *

(d) *Takeoffs.* Notwithstanding paragraph (a) of this section, the Administrator issues operations specifications to allow the use of an approved autopilot system with automatic capability during the takeoff

and initial climb phase of flight provided:

(1) The system is not engaged prior to the minimum engagement certification restriction specified in the Airplane Flight Manual; and

(2) The Administrator finds that the use of the system will not otherwise affect the safety standards required by this section.

PART 125—CERTIFICATION AND OPERATIONS: AIRPLANES HAVING A SEATING CAPACITY OF 20 OR MORE PASSENGERS OR A MAXIMUM PAYLOAD CAPACITY OF 6,000 POUNDS OR MORE

3. The authority citation for part 125 continues to read as follows:

Authority: 49 U.S.C. app. 1354, 1421 through 1430, and 1502; 49 U.S.C. 106(g). Revised Pub. L. 97–449, January 12, 1983.

4. Section 125.329 is amended by revising the phrase "paragraph (b), (c), and (d)" in paragraph (a) to read "paragraph (b), (c), (d), and (e)" and adding new paragraph (e) to read as follows:

§ 125.329 Minimum altitudes for use of autopilot.

* * * * *

(e) Notwithstanding paragraph (a) of this section, the Administrator issues operations specifications to allow the use of an approved autopilot system with automatic capability during the takeoff and initial climb phase of flight provided:

(1) The system is not engaged prior to the minimum engagement certification restriction specified in the Airplane Flight Manual; and

(2) The Administrator finds that the use of the system will not otherwise affect the safety standards required by this section.

PART 135—AIR TAXI OPERATORS AND COMMERCIAL OPERATORS

5. The authority citation for part 135 continues to read as follows:

Authority: 49 U.S.C. app. 1354(a), 1355(a), 1421 through 1431, and 1502; 49 U.S.C. 106(g).

6. Section 135.93 is amended by revising the phrase "paragraph (b), (c), and (d)" in paragraph (a) to read "paragraphs (b), (c), (d), and (e)," redesignating and republishing paragraph (e) as paragraph (f), and adding new paragraph (e) to read as follows:

§ 135.93 Autopilot: Minimum altitudes for use.

* * * * *

(e) Notwithstanding paragraph (a) of this section, the Administrator issues operations specifications to allow the use of an approved autopilot system with automatic capability during the takeoff and initial climb phase of flight provided:

(1) The system is not engaged prior to the minimum engagement certification restriction specified in the Airplane Flight Manual; and

(2) The Administrator finds that the use of the system will not otherwise affect the safety standards required by this section.

(f) This section does not apply to operations conducted in rotorcraft.

Issued in Washington, D.C., on December 2, 1994.

Thomas C. Accardi,

Director, Flight Standards Service.

Subject: Criteria for Operational Approval of Auto Flight Guidance Systems (AFGS)

1. Purpose

This advisory circular (AC) states an acceptable means, but not the only means, for obtaining operational approval of the initial engagement or use of an Auto Flight Guidance System (AFGS).

2. Applicability

The criteria contained in this AC are applicable to operators using commercial turbojet and turboprop aircraft holding Federal Aviation Administrations (FAA) operating authority issued under Parts 121, 125, and 135 of the Federal Aviation Regulations (FAR). The FAA may approve the AFGS operation for those operators, where necessary, by amending the applicant's operations specifications (OPSPECS).

3. Background

a. There are now exceptions to the general regulations prohibiting the use of autopilots at altitudes less than 500 feet above ground level during the takeoff and climb phases of flight. This AC provides guidance to certificate holders seeking FAA operational approval of the initial engagement or use of an AFGS in order to take advantage of technological improvements in the operational capabilities of autopilot systems, particularly at lower altitudes. This AC complements a rule change that would allow the use of an autopilot, certificated and operationally approved by the FAA, at altitudes less than 500 feet above ground level in the vertical plane and in accordance with Sections 121.189(d)(2) or 135.367(a)(3) of the FAR, in the lateral plane.

4. Definitions

Airplane Flight Manual (AFM)—A document (under Section 25.1581 of the FAR) which is used to obtain an FAA type certificate. This document contains the operating procedures and limitations and performance information applicable to a particular airplane type in order to safely operate that aircraft and conform to the type certificate.

Autopilot—An aircraft system and associated sensors designed to provide automatic control of the pitch, roll and in certain instances, yaw axis of an aircraft.

Auto Flight Guidance System (AFGS)—Aircraft systems, such as an autopilot, autothrottles, displays, and controls, that are interconnected in such a manner to allow the crew to automatically control the aircraft's lateral and vertical flight path and speed. A flight management system (FMS) is sometimes associated with an AFGS.

Auto Throttle System (ATS)—A system selected by the crew to provide automatic engine thrust control, as required, to achieve and maintain desired aircraft speed or vertical flight profile.

Control Wheel Steering (CWS)—A selectable feature of some autopilots that directly relates control wheel displacement to a desired aircraft response. The pilot's force or displacement inputs of the control wheel/column or stick are transmitted by the autopilot into appropriate commands to the control surfaces to achieve the desired aircraft pitch, roll, or yaw response.

Flight Director (FD)—An instrument display system providing visual commands for aircraft control by displaying appropriate command indications on the primary flight display. The flight crew use these command indications to manually fly the aircraft or monitor the autopilot.

Flight Management Systems (FMS)—An integrated system used by flight crews for flight planning, navigation, performance management, aircraft guidance and flight progress monitoring.

Minimum Altitude for AFGS Engagement—Unless otherwise specified by the FAA, the minimum height relevant to certain factors including the airport elevation and runway elevation over which the crew may either initially engage an AFGS for automatic flight after takeoff or allow the AFGS to remain engaged during approach and landing.

5. Discussion

a. AFGS capabilities have steadily increased and improved with time. Flight crews now routinely use autoflight features that are operational during takeoff and landing/roll-out (e.g. control wheel steering, automatic landing, automatic throttles, and wing-load alleviation).

b. Some aircraft now have automatic features identified for operations specifically at low altitudes (e.g. for noise abatement) which when used, contribute to performance, workload, cost, noise, and safety benefits. Such features are certificated on the aircraft by either type certification or supplemental type certification. Operators may obtain operational approval for service use by following the guidance in this AC. This guidance should meet the intent of Section 121.579, 125.329, and 135.93 of the FAR for operational approval for existing aircraft and describe acceptable methods for demonstration of these systems for new or modified aircraft.

c. Initial engagement of the AFGS at the altitude specified in the Airplane Flight Manual (AFM) may be authorized upon approval by the principal operations inspector (POI) for the certificate holder. POI's would revise the appropriate section of the operations specifications (OPSPECS). The expectation is that as technology continues to advance, additional operational and safety benefits can be derived from using improved autopilot technology. Such a benefit may eventually include the use of an AFGS from the beginning of the takeoff phase of flight.

6. Operational Concept

a. The AFGS, as discussed in this AC, consists of an Autopilot (pitch, roll, and yaw) Flight Guidance System, that if used in conjunction with other available components such as FMS, autothrottle, etc., will enhance safety and ease pilot workload. Any or all of the many available automatic operational features are *selectable at the pilot's discretion* in modern transport aircraft. This allows a clear distinction to be made in contrast to the primary flight control system that may also be largely automatic and electronic but is not normally deselectable at the crew's discretion, e.g. such as the yaw dampners.

b. There are several functions of an AFGS that could be presented for operational approval. These functions could be used singularly or in combination with each other. They may be operationally approved by the Administrator through the certificate holder's training and maintenance programs. The following are examples of these functions:

(1) Setting takeoff thrust
(2) Initial climb
(3) Noise abatement profiles
(4) Engine failure recognition

c. Operational approval for use of the above functions may include the following:

—Airborne equipment
—Ground equipment
—Maintenance
  Training
  Equipment requirement
—Flight operations
  Training
  Operating procedures

7. Airport and Ground Facilities

An applicant authorized to use an AFGS may have certain constraints related to airports or ground facilities specified in the operators OPSPECS where such specific provisions are necessary (e.g. operations based on special procedures at airports with adjacent mountains terrain, operations requiring runway guidance information, etc.).

8. Airborne equipment

AFGS system criteria will be defined in the AFM.

9. Pilot Training and Proficiency Program

The operator's training program for flight crewmembers should provide training in the following subjects:

a. Airport and ground facilities—as defined in the airborne equipment certification, AFM, and OPSPECS.

b. Flight training program:

(1) For pilot certification/type rating requirements [appendix E, part 121; subpart I, part 125; subpart H, part 135]:

(i) Training should demonstrate the ability and limits of operation of the AFGS to the level of performance indicated by the AFM. This includes all normal and abnormal procedures.

(ii) The pilot applicant should demonstrate to a satisfactory level of performance the use of the AFGS within the allowable parameters indicated by the AFM. Performance criteria should include all normal and abnormal procedures.

(2) Pilot training for AFGS operations should be conducted in accordance with Parts 121, 125, and 135 of the FAR.

(i) Pilot ground and flight training in the use of the AFGS, to establish minima criteria for weather operations, will be authorized through OPSPECS.

(ii) Pilot checking for initial authorization and at prescribed recurrent intervals for each air carrier should be established. Demonstration of normal and abnormal procedures should be included.

10. Operations Manual and Procedures

Procedures, instructions, and information to be used in flight crews should be developed by each air carrier to include, as applicable, the following.

a. Flight crewmember duties. Flight crewmember duties during initial engagement or use of the AFGS should be described in the operations manual. These duties should contain a description of the responsibilities and tasks for the pilot flying the aircraft and the pilot not flying the aircraft during all stages of operation. The duties of the third flight crewmember, if required, should also be defined.

b. Training information. Approved training requirements and procedures should be provided in the operator's manual or available to flight crews in an equivalent form for reference use.

11. Maintenance Program

Each operator should establish a maintenance and reliability program, acceptable to the Administrator, to ensure that the airborne equipment will continue at a level of performance and reliability established by the manufacturer or the FAA. [subpart L, part 121; subpart G, part 125; subpart J, part 135] The FAA would accept a program that had the following elements:

a. Maintenance personnel training. Each operator should establish an initial and recurrent training program, or arrange for contract maintenance that is acceptable to the Administrator, for personnel performing maintenance work on airborne systems and equipment. Personnel training records should be maintained.

b. Test equipment and standard. The operator's program for maintenance of line (ramp) test equipment, shop (bench) test equipment, and a listing of all primary and secondary standards utilized during maintenance of test equipment which relates to airborne system operation should be submitted to the Administrator for determination of adequacy. Emphasis should be placed on standards associated with flight directors, automatic flight control systems, maintenance techniques and procedures of associated redundant systems.

c. Maintenance procedures. Any changes to maintenance procedures, practices, or limitations established in the qualification for airborne system operations should be submitted to the

Administrator for acceptance before such changes are adopted.

12. Engineering Modifications

Titles and numbers of all modifications, additions, and changes that were made to qualify aircraft systems performance should be provided to the Administrator. [subparts D and E, part 21]

Subject: Criteria for Operational Approval of Auto Flight Guidance Systems (AFGS)

1. Purpose

This advisory circular (AC) states an acceptable means, but not the only means, for obtaining operational approval of the initial engagement or use of an Auto Flight Guidance System (AFGS).

2. Applicability

The criteria contained in this AC are applicable to operators using commercial turbojet and turboprop aircraft holding Federal Aviation Administrations (FAA) operating authority issued under Parts 121, 125, and 135 of the Federal Aviation Regulations (FAR). The FAA may approve the AFGS operation for those operators, where necessary, by amending the applicant's operations specifications (OPSPECS).

3. Background

a. There are now exceptions to the general regulations prohibiting the use of autopilots at altitudes less than 500 feet above ground level during the takeoff and climb phases of flight. This AC provides guidance to certificate holders seeking FAA operational approval of the initial engagement or use of an AFGS in order to take advantage of technological improvements in the operational capabilities of autopilot systems, particularly at lower altitudes. This AC complements a rule change that would allow the use of an autopilot, certificated and operationally approved by the FAA, at altitudes less than 500 feet above ground level in the vertical plane and in accordance with Sections 121.189(d)(2) or 135.367(a)(3) of the FAR, in the lateral plane.

4. Definitions

Airplane Flight Manual (AFM)—A document (under Section 25.1581 of the FAR) which is used to obtain an FAA type certificate. This document contains the operating procedures and limitations and performance information applicable to a particular airplane type in order to safely operate that aircraft and conform to the type certificate.

Autopilot—An aircraft system and associated sensors designed to provide automatic control of the pitch, roll and in certain instances, yaw axis of an aircraft.

Auto Flight Guidance System (AFGS)—Aircraft systems, such as an autopilot, autothrottles, displays, and controls, that are interconnected in such a manner to allow the crew to automatically control the aircraft's lateral and vertical flight path and speed. A flight management system (FMA) is sometimes

Auto Throttle System (ATS)—A system selected by the crew to provide automatic engine thrust control, as required, to achieve and maintain desired aircraft speed or vertical flight profile.

Control Wheel Steering (CWS)—A selectable feature of some autopilots that directly relates control wheel displacement to a desired aircraft response. The pilot's force or displacement inputs of the control wheel/column or stick are transmitted by the autopilot into appropriate commands to the control surfaces to achieve the desired aircraft pitch, roll, or yaw response.

Flight Director (FD)—An instrument display system providing visual commands for aircraft control by displaying appropriate command indications on the primary flight display. The flight crew use these command indications to manually fly the aircraft or monitor the autopilot.

Flight Management Systems (FMS)—An integrated system used by flight crews for flight planning, navigation, performance management, aircraft guidance and flight progress monitoring.

Minimum Altitude for AFGS Engagement—Unless otherwise specified by the FAA, the minimum height relevant to certain factors including the airport elevation and runway elevation over which the crew may either initially engage an AFGS for automatic flight after takeoff or allow the AFGS to remain engaged during approach and landing.

5. Discussion

a. AFGS capabilities have steadily increased and improved with time. Flight crews now routinely use autoflight features that are operational during takeoff and landing/roll-out (e.g. control wheel steering, automatic landing, automatic throttles, and wing-load alleviation).

b. Some aircraft now have automatic features identified for operations specifically at low altitudes (e.g. for noise abatement) which when used, contribute to performance, workload, cost, noise, and safety benefits. Such features are certificated on the aircraft by either type certification or supplemental type certification. Operators may obtain operational approval for in service use by following the guidance in this AC. This guidance should meet the intent of Section 121.579, 125.329, and 135.93 of the FAR for operational approval for existing aircraft and describe acceptable methods for demonstration of these systems for new or modified aircraft.

c. Initial engagement of the AFGS at the altitude specified in the Airplane Flight Manual (AFM) may be authorized upon approval by the principal operations inspector (POI) for the certificate holder. POI's would revise the appropriate section of the operations specifications (OPSPECS). The expectation is that as technology continues to advance, additional operational and safety benefits can be derived from using improved autopilot technology. Such a benefit may eventually include the use of an AFGS from the beginning of the takeoff phase of flight.

6. Operational Concept

a. The AFGS, as discussed in this AC, consists of an Autopilot (pitch, roll, and yaw) Flight Guidance System, that if used in conjunction with other available components such as FMS, autothrottle, etc., will enhance safety and ease pilot workload. Any or all of the many available automatic operational features are *selectable at the pilot's discretion* in modern transport aircraft. This allows a clear distinction to be made in contrast to the primary flight control system that may also be largely automatic and electronic but is not normally deselectable at the crew's discretion, e.g. such as the yaw dampners.

b. There are several functions of an AFGS that could be presented for operational approval. These functions could be used singularly or in combination with each other. They may be operationally approved by the Administrator through the certificate holder's training and maintenance programs. The following are examples of these functions:

(1) Setting takeoff thrust
(2) Initial climb
(3) Noise abatement profiles
(4) Engine failure recognition

c. Operational approval for use of the above functions may include the following:

—Airborne equipment
—Ground equipment

—Maintenance
Training
Equipment requirement
—Flight operations
Training
Operating procedures

7. Airport and Ground Facilities

An applicant authorized to use an AFGS may have certain constraints related to airports or ground facilities specified in the operators OPSPECS where such specific provisions are necessary (e.g. operations based on special procedures at airports with adjacent mountainous terrain, operations requiring runway guidance information, etc.).

8. Airborne Equipment

AFGS system criteria will be defined in the AFM.

9. Pilot Training and Proficiency Program

The operator's training program for flight crewmembers should provide training in the following subjects:

a. Airport and ground facilities—as defined in the airborne equipment certification, AFM, and OPSPECS.

b. Flight training program:

(1) For pilot certification/type rating requirements [appendix E, part 121; subpart I, part 125; subpart H, part 135]:

(i) Training should demonstrate the ability and limits of operation of the AFGS to the level of performance indicated by the AFM. This includes all normal and abnormal procedures.

(ii) The pilot applicant should demonstrate to a satisfactory level of performance the use of the AFGS within the allowable parameters indicated by the AFM. Performance criteria should include all normal and abnormal procedures.

(2) Pilot training for AFGS operations should be conducted in accordance with Parts 121, 125, and 135 of the FAR.

(i) Pilot ground and flight training in the use of the AFGS, to established minima criteria for weather operations, will be authorized through OPSPECS.

(ii) Pilot checking for initial authorization and at prescribed recurrent intervals for each air carrier should be established. Demonstration of normal and abnormal procedures should be included.

10. Operations Manual and Procedures

Procedures, instructions, and information to be used by flight crews should be developed by each air carrier to include, as applicable, the following:

a. Flight crewmember duties. Flight crewmember duties during initial engagement or use of the AFGS should be described in the operations manual. These duties should contain a description of the responsibilities and tasks for the pilot flying the aircraft and the pilot not flying the aircraft during all stages of operation. The duties of the third flight crewmember, if required, should also be defined.

b. Training information. Approved training requirements and procedures should be provided in the operator's manual or available to flight crews in an equivalent form for reference use.

11. Maintenance Program

Each operator should establish a maintenance and reliability program, acceptable to the Administrator, to ensure that the airborne equipment will continue at a level of performance and reliability established by the manufacturer or the FAA. [subpart L, part 121; subpart G, part 125; subpart J, part 135] The FAA would accept a program that had the following elements:

a. Maintenance personnel training. Each operator should establish an initial and recurrent training program, or arrange for contract maintenance that is acceptable to the Administrator, for personnel performing maintenance work on airborne systems and equipment. Personnel training records should be maintained.

b. Test equipment and standards. The operator's program for maintenance of line (ramp) test equipment, shop (bench) test equipment, and a listing of all primary and secondary standards utilized during maintenance of test equipment which relates to airborne system operation should be submitted to the Administrator for determination of adequacy. Emphasis should be placed on standards associated with flight directors, automatic flight control systems, maintenance techniques and procedures of associated redundant systems.

c. Maintenance procedures. Any changes to maintenance procedures, practices, or limitations established in the qualification for airborne system operations should be submitted to the Administrator for acceptance before such changes are adopted.

12. Engineering Modifications

Titles and numbers of all modifications, additions, and changes that were made to qualify aircraft systems performance should be provided to the Administrator. [subparts D and E, part 21]

[FR Doc. 94–30219 Filed 12–8–94; 8:45 am]
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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Advisory Circular 120–67; Criteria for Operational Approval of Auto Flight Guidance Systems

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Advisory circular.

SUMMARY: This advisory circular (AC), published with a related final rule amendment elsewhere in this separate part of the **Federal Register**, states an acceptable means, but not the only means, for obtaining operational approval of the initial engagement or use of an Auto Flight Guidance System (AFGS) under Title 14 of the Code of Federal Regulations (14 CFR) part 121, § 121.579(d); part 125, § 125.329(e); and part 135, § 135.93(e) for the takeoff and initial climb phase of flight. This advisory circular supports recent changes in the Title 14 that allow use of the autopilot at lower altitudes than previously allowed.

FOR FURTHER INFORMATION CONTACT: Richard A. Temple, AFS–410, Flight Standards Service, Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591, telephone (202) 267–5824.

SUPPLEMENTARY INFORMATION:

1. Purpose

This advisory circular (AC) states an acceptable means, but not the only means, for obtaining operational approval of the initial engagement or use of an Auto Flight Guidance System (AFGS) under Title 14 of the Code of Federal Regulations (14 CFR) part 121, § 121.579(d); part 125, § 125.329(e); and part 135, § 135.93(e) for the takeoff and initial climb phase of flight.

2. Applicability

The criteria contained in this AC are applicable to operators using commercial turbojet and turboprop aircraft holding Federal Aviation Administration (FAA) operating authority issued under SFAR 38–2 and 14 CFR parts 119, 121, 125, and 135. The FAA may approve the AFGS operation for the operators under these parts, where necessary, by amending the applicant's operations specifications (OPSPECS).

3. Background

The purpose of this AC is to take advantage of technological improvements in the operational capabilities of autopilot systems, particularly at lower altitudes. This AC complements a rule change that would allow the use of an autopilot, certificated and operationally approved by the FAA, at altitudes less than 500 feet above ground level in the vertical plane and in accordance with §§ 121.189 and 135.367, in the lateral plane.

4. Definitions

a. Airplane Flight Manual (AFM). A document (under 14 CFR part 25, § 25.1581) which is used to obtain an FAA type certificate. This document contains the operating procedures and limitations and performance information applicable to a particular airplane type in order to safely operate that aircraft and conform to the type certificate.

b. Autopilot. An aircraft system and associated sensors designed to provide automatic control of the pitch, roll, and, in certain instances, yaw axis of an aircraft.

c. Auto Flight Guidance System (AFGS). Aircraft systems, such as an autopilot, autothrottles, displays, and controls, that are interconnected in such a manner to allow the crew to automatically control the aircraft's lateral and vertical flightpath and speed. A flight management system (FMS) is sometimes associated with an AFGS.

d. Auto Throttle System (ATS). A system selected by the crew to provide automatic engine thrust control, as required, to achieve and maintain desired aircraft speed or vertical flight profile.

e. Control Wheel Steering (CWS). A selectable feature of some autopilots that directly relates control wheel displacement to a desired aircraft response. The pilot's force or displacement inputs of the control wheel/column or stick are transmitted by the autopilot into appropriate commands to the control surfaces to achieve the desired aircraft pitch, roll, or yaw response.

f. Flight Director (FD). An instrument display system providing visual commands for aircraft control by displaying appropriate command indications on the primary flight display. The flightcrew use these command indications to manually fly the aircraft or monitor the autopilot.

g. Flight Management Systems (FMS). An integrated system used by flightcrews for flight planning, navigation, performance management, aircraft guidance and flight progress monitoring.

h. Minimum Altitude for AFGS Engagement. Unless otherwise specified by the FAA, the minimum height relevant to the airport elevation, and runway elevation over which the crew may either initially engage an AFGS for automatic flight after takeoff or allow the AFGS to remain engaged during approach and landing.

5. Discussion

a. AFGS capabilities have steadily increased and improved with time. Air carrier crews now routinely use autoflight features that are operational during takeoff and landing/roll-out (e.g., control wheel steering, automatic landing, automatic throttles, and wingload alleviation).

b. Some aircraft now have automatic features identified for operations specifically at low altitudes (e.g., for noise abatement) which when used, contribute to performance, workload, cost, noise, and safety benefits. Such features will be certificated on the aircraft by either type certification or supplemental type certification. Operators may obtain operational approval for in service use by following the guidance in this AC. This should meet the intent of §§ 121.579, 125.329, and 135.93 for existing aircraft and describe acceptable methods for demonstration of these systems for new or modified aircraft.

c. In accordance with the regulations, §§ 121.579(d), 125.329(e), and 135.93(e), the autopilot system may not be engaged below the minimum engagement certification altitude specified in the AFM or an altitude specified by the Administrator, whichever is higher, and may not be engaged below that altitude without a finding by the Administrator that use of the system will not otherwise affect the safety standards required by those sections of the regulations. Additionally, the Flight Standardization Board (FSB) report for the aircraft may contain further conditions or limitations regarding AFGS engagement after takeoff. Inclusion of a specified altitude for use after takeoff in the AFM or the FSB report does not constitute approval to conduct operations. Authorization to engage the AFGS at the altitude specified in the AFM are made by a revision to the operator's OPSPECS. For aircraft with an AFM that specifies an AFGS engagement altitude for takeoff, principal operations inspectors (POI's) may issue OPSPECS authorizing the engagement of the AFGS after takeoff at or above the altitude specified in the AFM or as specified in the FSB report, whichever is higher. When an FSB report is not available, the FAA does not approve an altitude below that specified in the AFM or 200 feet, whichever is higher. The expectation is that as technology continues to advance, additional operational and safety

benefits can be derived from using improved autopilot technology. Such a benefit may eventually include the use of an AFGS from the beginning of the takeoff phase of flight, in which case the rules will have to be amended.

6. Operational Concept

a. The AFGS, as discussed in this AC, consists of an Autopilot (pitch, roll, and yaw) Flight Guidance System, which if used in conjunction with other available components such as FMS, autothrottle, etc. will enhance safety and ease pilot workload. Any or all of the many available automatic operational features are selectable at the pilot's discretion in modern transport aircraft. This allows a clear distinction to be made in contrast to the primary flight control system which may also be largely automatic and electronic, but is not normally deselectable at the flightcrew's discretion, such as the yaw dampers.

b. There are several functions of an AFGS that could be presented for operational approval. These functions could be used singularly or in combination with each other. The following are examples of these functions:

(1) Setting takeoff thrust.
(2) Initial climb.
(3) Noise abatement profiles.
(4) Engine failure recognition.
(5) Reduced climb performance profiles.

c. Approval for using any of the above functions may include changing equipment, equipment support, and operational procedures in the aircraft manufacturer's AFM and in the air carrier's operations manual. Approval may require adjustments to the air carrier's OPSPECS.

d. Once the new operation is developed and approved, maintenance and flightcrew training programs must be adjusted and approved. Qualification of maintenance personnel and flightcrews must be accomplished before flight operations with the new procedure can be implemented.

7. Airport and Ground Facilities

An applicant authorized to use an AFGS may have certain constraints related to airports or ground facilities specified in the operator's OPSPECS where such specific provisions are necessary (e.g., operations based on special procedures at airports with adjacent mountainous terrain, operations requiring runway guidance information, etc.).

8. Airborne Equipment

AFGS system criteria will be defined in the AFM.

9. Pilot Training and Proficiency Program

The operator's training program for flight-crews should provide ground and flight training in the following subjects:

a. Knowledge of airport and ground facilities—as defined in the airborne equipment certification, AFM, and/or Flight Operations Manual (FOM) to include new minima criteria for weather operations authorized through OPSPECS.

b. The use of the AFGS within the parameters indicated by the AFM and FOM. This should include all normal and abnormal procedures.

c. Training should include checking in the flight tasks (maneuvers and procedures) that have been adjusted in the manuals.

10. Operations Manual and Procedures

Procedures, instructions, and information to be used by flightcrews should be developed by each air carrier to include, as applicable, the following:

a. Flight Crewmember Duties. Flight crewmember duties during initial engagement or use of the AFGS should be described in the air carrier's operations manual. These duties should contain a description of the responsibilities and tasks for the pilot flying the aircraft and the pilot not flying the aircraft during all stages of operation. The duties of the third flight crewmember, if required, should also be explicitly defined.

b. Training Information. Training requirements and procedures should be provided in the operator's approved training program.

11. Maintenance Program

Each operator should establish a maintenance and reliability program, acceptable to the Administrator, to ensure that the airborne equipment will continue at a level of performance and reliability established by the manufacturer or the FAA. [part 121, subpart L; part 125, subpart G; and part 135, subpart J] The program should include the following:

a. Maintenance Personnel Training. Each operator should establish an initial and recurrent training program, or arrange for contract maintenance that is acceptable to the Administrator for personnel performing maintenance work on airborne systems and equipment. Personnel training records should be maintained.

b. Test Equipment and Standards. The operator's program for maintenance of line (ramp) test equipment, shop (bench) test equipment, and a listing of all primary and secondary standards utilized during maintenance of test equipment which relates to airborne system operation should be submitted to the Administrator for determination of adequacy. Emphasis should be placed on standards associated with flight directors, automatic flight control systems, maintenance techniques and procedures of associated redundant systems.

c. Maintenance Procedures. Any changes to maintenance procedures, practices, or limitations established in the qualification for airborne system operations are to be submitted to the Administrator for acceptance before such changes are adopted.

12. Engineering Modifications.

Titles and numbers of all modifications, additions, and changes that were made to qualify aircraft systems performance should be provided to the Administrator. [part 21, subparts D and E]

Dated: May 13, 1997.

W. Michael Sacrey,

Acting Deputy Director, Flight Standards Service.

[FR Doc. 97–13176 Filed 5–20–97; 8:45 am]

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