

# Rules and Regulations

## Federal Register

Vol. 75, No. 91

Wednesday, May 12, 2010

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## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 25

[Docket No. NM427; Special Conditions No. 25-405-SC]

**Special Conditions: Rockwell Collins, Inc., Boeing Model 737-700/-700C/-800/-900 and -900ER Series Airplanes Equipped With Rockwell HGS-4000 Head-Up Guidance System With Enhanced Vision System Functionality**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Boeing Model 737-700/-700C/-800/-900 and -900ER series airplanes equipped with the Rockwell HGS-4000 Head-Up Guidance System. These airplanes, as modified by Rockwell Collins, Inc., will have a novel or unusual design feature associated with the Enhanced Vision System (EVS) functionality, to be added by Supplemental Type Certificate (STC). The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** The effective date of these special conditions is May 6, 2010. We must receive your comments by June 1, 2010.

**ADDRESSES:** You must mail two copies of your comments to: Federal Aviation Administration, Transport Airplane Directorate, Attn: Rules Docket (ANM-113), Docket No. NM427, 1601 Lind Avenue, SW., Renton, Washington, 98057-3356. You may deliver two

copies to the Transport Airplane Directorate at the above address. You must mark your comments: Docket No. NM427. You can inspect comments in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4 p.m.

**FOR FURTHER INFORMATION CONTACT:** Dale Dunford, FAA, Aircraft and Flight Crew Interface Branch, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98055-4056; telephone (425) 227-2239; facsimile (425) 227-1320; e-mail [dale.dunford@faa.gov](mailto:dale.dunford@faa.gov).

**SUPPLEMENTARY INFORMATION:** The FAA has determined that notice of, and opportunity for, prior public comment on these special conditions are impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected aircraft. In addition, the substance of these special conditions has been subject to the public-comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon issuance.

#### Comments Invited

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel concerning these special conditions. You can inspect the docket before and after the comment closing date. If you wish to review the docket in person, go to the address in the **ADDRESSES** section of this preamble between 7:30 a.m. and 4 p.m., Monday through Friday, except Federal holidays.

We will consider all comments we receive on or before the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change these special conditions based on the comments we receive.

If you want us to acknowledge receipt of your comments on this proposal, include with your comments a self-addressed, stamped postcard on which you have written the docket number. We will stamp the date on the postcard and mail it back to you.

#### Background

On September 22, 2008, Rockwell Collins applied to the FAA for approval of the installation of an EVS on the Boeing Model 737-700/-700C/-800/-900 and -900ER series aircraft with a Rockwell Collins Model HGS 4000 head-up display (HUD) that is able to display forward-looking infrared (FLIR) imagery.

On January 9, 2004, the FAA published revisions to operational rules in 14 CFR parts 1, 91, 121, 125 and 135 to allow aircraft to operate below certain altitudes during a straight-in instrument approach while using an Enhanced Flight Visibility System (EFVS) to meet certain visibility requirements. However the applicant does not seek approval of this EVS as an EFVS.

**Note:** The term “enhanced vision system” (EVS) in this document refers to a system comprised of a head-up display, imaging sensor(s), and avionics interfaces that display the sensor imagery on the HUD, and overlay that imagery with alpha-numeric and symbolic flight information. However, the term has also been commonly used in reference to systems that displayed the sensor imagery, with or without other flight information, on a head-down display. For clarity, the FAA created the term “enhanced flight visibility system” (EFVS) to refer to certain EVS systems that meet the requirements of the new operational rules—in particular, the requirement for a HUD and specified flight information—and which can be used to determine “enhanced flight visibility.” An EFVS can be considered a subset of a system otherwise labeled EVS.

The EVS uses new and novel technology for which the FAA has no certification criteria. Title 14 Code of Federal Regulations (14 CFR) 25.773 does not permit visual distortions and reflections that could interfere with the pilot’s normal duties, and was not written in anticipation of such technology. Because § 25.773 does not provide for alternatives or considerations for such a new and novel system, it is necessary to establish safety requirements that assure an equivalent level of safety and effectiveness of the pilot compartment view as intended by this rule. Other applications for

certification of such technology are anticipated in the near future and magnify the need to establish FAA safety standards that can be applied consistently for all such approvals. Special conditions are therefore prescribed under the provisions of § 21.16.

Compliance with this special condition is required for the EVS to be found acceptable to provide supplemental situational-awareness information particularly for the following intended functions:

- Verification of aircraft position during takeoff roll, approach, landing, and rollout;
- Verification of aircraft attitude during takeoff climb, enroute cruise, descent, approach, and landing;
- Terrain and obstacle awareness and avoidance during takeoff, climb, enroute cruise, descent, approach, landing, and rollout.

#### Type Certification Basis

Under the provisions of 14 CFR 21.101, Rockwell Collins, Inc., must show that the Boeing Model 737-700/-700C/-800/-900 and -900ER series airplanes meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. A16WE, or the applicable regulations in effect on the date of application for the change. The regulations incorporated by reference in the type certificate are commonly referred to as the "original type certification basis."

The regulations incorporated by reference in Type Certificate No. A16WE are as follows:

Title 14 CFR part 25, as amended by Amendment 25-1 through Amendment 25-77, for Boeing Model 737-700, and -800 series airplanes, with the exceptions listed on the type certificate; part 25, as amended by Amendment 25-1 through Amendment 25-91, for Boeing Model 737-700C and -900 series airplanes, with the exceptions listed on the type certificate; and part 25, as amended by Amendment 25-1 through Amendment 25-108, for the Boeing model 737-900ER series airplanes, with the exceptions listed on the type certificate.

In addition, the certification basis includes certain special conditions, exemptions, or later amended sections of the applicable parts that are not relevant to these special conditions.

If the regulations incorporated by reference do not contain adequate or appropriate safety standards for the Boeing Model 737-700/-700C/-800/-900 and -900 ER series airplanes because of a novel or unusual design

feature, special conditions are prescribed under § 21.16.

In addition to the applicable airworthiness regulations and special conditions, the Boeing Model 737-700/-700C/-800/-900 and -900 ER series airplanes must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36.

#### Novel or Unusual Design Features

The Rockwell Collins, Inc., STC to add EVS capability to the HGS-400 Head-Up Guidance System uses new and novel technology that displays video raster imagery in the field of view regulated by § 25.773. This rule does not permit distortions and reflections in the pilot compartment view that can interfere with normal duties, and was not written in anticipation of such technology. The video image potentially interferes with the pilot's ability to see the natural scene in the center of the forward field of view.

Unlike the pilot's natural forward vision, the EVS image is infrared-based, monochrome, two-dimensional (*i.e.* no depth perception), and of lower resolution. While the pilot may be readily able to see around and through small, individual, stroke-written symbols on the HUD, the pilot may not be able to see around or through the image that fills the display without some interference of the outside view. Nevertheless, the EVS may be capable of meeting an equivalent level of safety when considering the combined view of the image and the outside scene which is visible to the pilot through the image. It is essential that the pilot can use this combination of image and natural view of the outside scene as safely and effectively as the pilot compartment view currently available without the EVS image.

#### Discussion

Since § 25.773 does not expressly provide for alternatives or considerations for such a new and novel system, it is necessary to establish safety requirements that assure an equivalent level of safety and effectiveness of the pilot compartment view as intended by that rule. The purpose of this special condition is to provide the unique pilot compartment view requirements for the EVS installation.

#### Applicability

As discussed above, these special conditions are applicable to the Boeing Model 737-700/-700C/-800/-900 and -900ER series airplanes. Should Rockwell Collins, Inc., apply at a later

date for a STC to modify any other model included on Type Certificate No. A16WE to incorporate the same novel or unusual design feature, the special conditions would apply to that model as well.

#### Conclusion

This action affects only certain novel or unusual design features on one model series of airplanes. It is not a rule of general applicability and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

#### List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

- The authority citation for these special conditions is as follows:

**Authority:** 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

#### The Special Conditions

- Accordingly, the Federal Aviation Administration (FAA) proposes the following special conditions as part of the type-certification basis for Boeing Model 737-700/-700C/-800/-900 and -900ER series airplanes equipped with Rockwell HGS-400 Head-Up Guidance Systems modified by Rockwell Collins to add EVS functionality:

■ 1. EVS imagery on the HUD must not degrade the safety of flight or interfere with the effective use of outside visual references for required pilot tasks during any phase of flight in which it is to be used. Use of the EVS during approach operations, though not intended for use as an Enhanced Flight Visibility System (EFVS), according to 14 CFR 91.175 (l), must not degrade the pilot's outside view of visual references, the forward visibility, nor the pilot's ability to assess the aircraft position for a safe landing. EVS imagery of the apparent airport and runway environment must not be misleading, create pilot confusion, nor increase pilot workload.

■ 2. To avoid unacceptable interference with the safe and effective use of the pilot compartment view, the EVS device must meet the following requirements:

■ a. EVS design must minimize unacceptable display characteristics or artifacts (*e.g.* noise, "burlap" overlay, running water droplets) that obscure the desired image of the scene, impair the pilot's ability to detect and identify visual references, mask flight hazards, distract the pilot, or otherwise degrade task performance or safety.

■ b. Control of EVS display brightness must be sufficiently effective, in dynamically changing background

(ambient) lighting conditions, to prevent full or partial blooming of the display that would distract the pilot, impair the pilot's ability to detect and identify visual references, mask flight hazards, or otherwise degrade task performance or safety. If automatic control for image brightness is not provided, it must be shown that a single manual setting is satisfactory for the range of lighting conditions encountered during a time-critical, high-workload phase of flight (e.g., low-visibility instrument approach).

- c. A readily accessible control must be provided that permits the pilot to immediately deactivate and reactivate display of the EVS image on demand without removing the pilot's hands from the primary flight controls (yoke or equivalent) or thrust control.
- d. The EVS image on the HUD must not impair the pilot's use of guidance information or degrade the presentation and pilot awareness of essential flight information displayed on the HUD, such as alerts, airspeed, attitude, altitude and direction, approach guidance, wind shear guidance, Traffic Alert and Collision Avoidance System (TCAS) resolution advisories, and unusual-attitude recovery cues.
- e. The EVS image and the HUD symbols, which are spatially referenced to the pitch scale, outside view and image, must be scaled and aligned (i.e., conformal) to the external scene and, when considered singly or in combination, must not be misleading, cause pilot confusion, or increase workload. Airplane attitudes or cross-wind conditions may cause certain symbols, such as the zero-pitch line or flight path vector, to reach field-of-view limits such that they cannot be positioned conformably with the image and external scene. In such cases, these symbols may be displayed, but with an altered appearance which makes the pilot aware that they are no longer displayed conformably (for example, "ghosting").
- f. A HUD system used to display EVS images must, if previously certified, continue to meet all of the requirements of the original approval.

- 3. The safety and performance of the pilot tasks associated with the use of the pilot compartment view must be not be degraded by the display of the EVS image. Pilot tasks which must not be degraded by the EVS image include:
  - a. Detection, accurate identification, and maneuvering, as necessary, to avoid traffic, terrain, obstacles, and other hazards of flight.
  - b. Accurate identification and utilization of visual references required

for every task relevant to the phase of flight.

- 4. Appropriate limitations must be stated in the Operating Limitations section of the airplane flight manual. The airplane flight manual must prohibit the use of the EVS for functions that have not been found to be acceptable.

Issued in Renton, Washington, on May 6, 2010.

**Ali Bahrami,**

*Manager, Transport Airplane Directorate, Aircraft Certification Service.*

[FR Doc. 2010-11309 Filed 5-11-10; 8:45 am]

**BILLING CODE 4910-13-P**

30432)<sup>1</sup> that adopted corrections and editorial changes to 14 CFR parts 119, 121, and 135. The amendment included one to § 119.21, which revised then paragraph (a) to remove (a)(3)(i) and (a)(3)(ii). The FAA should also have amended § 119.49 to remove the two obsolete subparagraphs referenced in paragraph (b)(11). The FAA is issuing today's action to correct that oversight.

This action makes the appropriate amendatory change to remove two obsolete subparagraphs in current § 119.49(b)(11). With this amendatory change, the reference to subparagraphs § 119.21(a)(3)(i) and (a)(3)(ii) will be removed from § 119.49(b)(11). This amendment will not impose any additional restrictions on operators affected by these regulations.

#### Technical Amendment

The technical amendment will remove the reference to § 119.21(a)(3)(i) and (a)(3)(ii) from § 119.49(b)(11).

#### List of Subjects in 14 CFR Part 119

Administrative practice and procedure, Air carriers, Aircraft, Aviation safety, Charter flights, Reporting, and recordkeeping requirements.

- Accordingly, Title 14 of the Code of Federal Regulations (CFR) part 119 is corrected by making the following correcting amendment:

#### PART 119—CERTIFICATION: AIR CARRIERS AND COMMERCIAL OPERATORS

- 1. The authority citation for part 119 continues to read as follows:

**Authority:** 49 U.S.C. 106(g), 1153, 40101, 40102, 40103, 40113, 44105, 44106, 44111, 44701–44717, 44722, 44901, 44903, 44904, 44906, 44912, 44914, 44936, 44938, 46103, 46105.

- 2. Amend § 119.49 by revising paragraph (b) to read as set forth below.

#### § 119.49 Contents of operations specifications.

\* \* \* \* \*

(b) Each certificate holder conducting supplemental operations must obtain operations specifications containing all of the following:

- (1) The specific location of the certificate holder's principal base of operations, and, if different, the address that shall serve as the primary point of

<sup>1</sup> This 1996 final rule entitled "Operating Requirements: Domestic, Flag, Supplemental, Commuter, and On-Demand Operations: Corrections and Editorial Changes" was adopted to make corrections and editorial changes to the "Commuter Operations and General Certification and Operations Requirements" final rule (60 FR 65832; December 20, 1995).

**SUPPLEMENTARY INFORMATION:** The Federal Aviation Administration (FAA) published a final rule in the **Federal Register** on June 14, 1996 (61 FR