



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

Advisory Circular

**Subject: MAINTENANCE OF EMERGENCY
EVACUATION SYSTEMS FOR
AIRCRAFT OPERATING UNDER
PART 121**

Date: 4/4/03

AC No: 43-208

Initiated by: AFS-300 Change:

1. What is the purpose of this advisory circular (AC)?

This AC provides information and guidance for the maintenance of emergency evacuation systems (EES) used on aircraft operating under the provisions of Title 14 of the Code of Federal Regulations (14 CFR) part 121. Additionally, this AC discusses the responsibilities and means of compliance for the air carrier and persons performing maintenance.

2. What systems are included in the EES?

The EES includes components of all aircraft slide-equipped exits affecting the emergency egress function (e.g., slides, slide/rafts, doors, door mechanisms, door opening assist mechanisms, tail cone release mechanisms, arm/disarm mechanisms, slide activation mechanisms, electronic slide monitoring systems, and slide-to-airframe attachments).

3. Who does this AC apply to?

This AC applies to 14 CFR part 121 air carriers.

BACKGROUND

4. Why was the Emergency Evacuation Task Force created?

a. The National Transportation Safety Board (NTSB) made safety recommendations A-99-99 through -103, relating to accidents/incidents where the failure of an EES component was a factor. Past efforts aimed at improving EES reliability did not result in significant improvements. Therefore, a comprehensive strategic plan was designed to improve aircraft EES reliability. The overall strategy is to increase awareness of the EES maintenance processes, for equipment installed on and taken off of the aircraft, and to develop new air carrier operations specifications for EES maintenance programs.

b. In 1985, the Public Technical Conference was held to solicit and review information on topics relating to the emergency evacuation of transport category airplanes. Participants included experts in aircraft design, manufacture, operations and maintenance, passenger safety, and aircraft emergency evacuation. During the conference, it became clear that an extended effort would be necessary to properly consider the issues raised by the participants. As a result, in September 1985, the Federal Aviation Administration (FAA) Administrator established the Emergency Evacuation Task Force, which consisted of FAA personnel, 14 CFR part 121 air carriers, 14 CFR part 145 repair stations, and manufacturers, to accomplish the following:

- (1) Pursue issues raised during the Public Technical Conference;
- (2) Reassess existing regulations on emergency evacuation of transport category airplanes; and
- (3) Prepare a public report of the findings and recommendations of the task force.

5. What issues did the Emergency Evacuation Task Force identify?

a. The Emergency Evacuation Task Force consisted of three technical working groups that were formed to consider the issues raised at the Public Technical Conference. The technical working groups were organized into the following disciplines: Design and Certification, Training and Operations, and Maintenance and Reliability. A complete record of the Emergency Evacuation Task Force proceedings is available in the U.S. Department of Transportation (DOT) FAA Report Number DOT/FAA/VS-86/1, Volumes I and II.

b. The Maintenance and Reliability group identified the following issues on the reliability of emergency evacuation slides and recommended the development of an AC to address them:

- (1) Improper maintenance;
- (2) Training and qualifications;
- (3) Mandatory reporting of malfunctions, defects, and failures of evacuation systems;
- (4) Required Inspection Items (RII);
- (5) Functional testing of evacuation systems on the aircraft; and
- (6) Inspection intervals.

c. A study and evaluation of slide maintenance facilities by the Emergency Evaluation Task Force revealed various deficiencies in current maintenance practices. These deficiencies can compromise the safe and reliable operation of EES and contribute to slide malfunctions and failures during emergency evacuations, emergency evacuation demonstrations, and functional testing. An analysis of Service Difficulty Reports (SDR) and accident/incident data involving aircraft evacuations disclosed the following problem areas:

- (1) Improper packing defects, which include:
 - (a) Slides not folded in accordance with packing instructions;
 - (b) Slides twisted in containers;
 - (c) Improper cover configuration;
 - (d) Nylon webbing installed around the slide after folding;

- (e) Improper routing of the inflation hose;
 - (f) Cross threading of the jet pump line;
 - (g) Improper routing of the firing lanyard;
 - (h) Improper packboard installation; and
 - (i) Incorrect frangible link installation.
- (2) Improper installation defects, which include:
- (a) Improperly routed firing inflation cable;
 - (b) Unattached girt bar release cable;
 - (c) Uninstalled slide cover retainer cable; and
 - (d) Improperly positioned slides.
- (3) Component failures/defects, which include:
- (a) Separated seams;
 - (b) Low pressure in inflation bottle;
 - (c) Bent slide fork fitting;
 - (d) Inflation tube failure;
 - (e) Worn girt bar latch;
 - (f) Torn fabric at girt bar attachment area;
 - (g) Broken pull handle cable assembly;
 - (h) Broken lanyard;
 - (i) Squib failure;
 - (j) Flapper valve failure; and
 - (k) Jammed girt bar.

MAINTENANCE REQUIREMENTS

6. What elements are essential for maintenance programs to reduce EES malfunctions and failures?

An air carrier's FAA-approved inspection program and FAA-approved continuous airworthiness maintenance program (CAMP) should contain the maintenance requirements for EES. The following program areas are identified as essential to an adequate maintenance program to reduce EES malfunctions and failures.

a. Maintenance Organization. The air carrier's maintenance organization is responsible to see that maintenance on the EES is performed in accordance with its manual. The organization will also ensure that competent personnel, adequate facilities, and equipment training is provided for EES maintenance. Air carriers using the maintenance services of a contractor will also

provide the contractor with a copy of current, complete, and accurate instructions from its maintenance manual.

b. Maintenance Manuals and Documents.

(1) Each service and maintenance facility will maintain current applicable maintenance manuals for the specific equipment being maintained. A maintenance manual control system will be used to see that all manuals are current, and include applicable manufacturers' service letters and bulletins.

(2) Minimum performance standards for emergency evacuation slides are provided in Technical Standard Order TSO-C69, Emergency Evacuation Slides, Ramps, and Slide/Rafts, as revised.

c. Training and Qualification. Because of the complexity and safety-critical nature of EES maintenance, the air carrier should see that each person performing maintenance or inspections on EES is properly trained and qualified and understands the current maintenance instructions. Inspection personnel training and documentation of EES maintenance should be part of the training program. In addition, the air carrier should consider including recurrent training as part of its training program and should determine the competency and currency of any contracted maintenance provider. The air carrier should also promote safety-critical awareness to any person who works with or in the vicinity of EES.

d. Records and Reports.

(1) The mechanic or repairman should accomplish maintenance recordkeeping and reporting requirements in accordance with applicable regulations and the air carrier's requirements.

(2) The air carrier is required to have airworthiness release procedures for any EES maintenance, in accordance with 14 CFR 121.709.

(3) The air carrier is required to have procedures for reporting the occurrence or detection of each failure, malfunction, or defect of any component of the EES, in accordance with 14 CFR 121.703. This includes any failure, defect, or malfunction identified during an actual emergency or during training, testing, maintenance, demonstrations, or inadvertent deployments.

e. Required Inspection Items (RII). The manufacturer should identify in its overhaul manual the critical tasks involved in packing, installing, and maintaining EES components. These tasks should be incorporated into the air carrier's manual as RII items.

f. Functional Testing.

(1) Functional testing of the evacuation slide while it is installed on the aircraft tests the complete EES. This includes the operation of door systems with the evacuation system engaged, as well as slide inflation and deployment. Air carriers may perform functional testing of the slides in conjunction with hands-on flight attendant training.

(2) Documentation of functional testing is necessary to determine that any malfunction or failure is adequately defined. This can identify potential maintenance and design changes to increase the reliability for the aircraft EES. Video recording is an effective method to use in documenting functional tests.

(3) All functional testing of the EES should be performed in accordance with the manufacturer's instructions and as approved in the air carrier's manual.

g. Maintenance Facility. Maintenance and testing facilities should be kept clean, environmentally regulated (e.g., temperature/humidity control), and equipped with appropriate air handling and vacuum systems. To prevent foreign object damage to the slide assembly, slide-servicing areas should be segregated from all other types of work areas.

7. What EES maintenance tasks should be conducted during scheduled maintenance?

a. Maintenance tasks should be performed in accordance with the air carrier's FAA-approved maintenance program, which is usually approved based on the manufacturer's instructions for continued airworthiness. For EES' continued airworthiness, manufacturers and air carriers should determine appropriate life limits of safety critical components.

b. The following are examples of EES maintenance tasks incorporated into a typical maintenance program:

(1) Check the evacuation slide assembly for proper inflation bottle pressure.

(2) Clean, inspect, and lubricate the girt bar and attachment latches.

(3) Check the slide assembly operation by deploying the slide from the aircraft.

Accomplish this check on a sampling inspection basis, so that continued maintenance requirements remain valid and include, as part of the sampling inspection, accidental slide deployment data. Accidental deployment data may be used to support revised inspection or overhaul times.

(4) Remove the slide from the aircraft and inspect the surrounding areas to determine that nothing could interfere with or prevent deployment.

(5) Visually check the slide packboard release and deployment mechanism.

(6) Perform an off-aircraft operational test of the slide to determine proper inflation and air retention, using facilities equipped for this type of testing.

(7) If a slide inadvertently falls from an aircraft, inspect it in accordance with the manufacturer's instructions and procedures before reinstallation. Internal damage, which may not be detectable by external inspections, may be present.

8. Why are maintenance time limitations needed?

a. Inspection periods for EES will determine the continued serviceability and immediate readiness of EES equipment for its intended emergency purpose. Major inspection periods are established to determine that all components of the equipment are complete and serviceable and may be expected to remain in this condition until either the next major inspection or actual use under emergency conditions.

b. Two types of inspection tasks are used in aircraft maintenance: failure-finding tasks, which identify functional failures, and failure prevention tasks, which identify potential failures. Therefore, an air carrier's maintenance time limitations should contain a list of EES tasks, consisting of on-aircraft inspections, measurements, or tests, from which a determination is made of the item's capability to immediately perform its intended emergency purpose. Deployment or

functional testing should be included and used on a sampling basis to validate the serviceability of each item of the EES. In the continuing analysis and surveillance system (CASS) process (see paragraph 8) for EES, an increase of failures during deployments or functional testing will initiate a corresponding increase in the sampling rate.

c. Scheduled deployments on the aircraft or during a combination of on-aircraft functional tests, inspections, and test-fixture usage may be used, provided the test-fixture replicates the aircraft installation. The number of scheduled deployment checks should be included for statistical validity. Inadvertent deployments, while a source of useful information, should not be considered or used as the sole source of reliability information.

d. The inspection and overhaul time limits for EES may be revised after an air carrier has gained service experience and has substantiating data to justify a revision. The inspection periods for EES will determine the continued service readiness for emergency use. Revisions to inspection and overhaul times should be accomplished in accordance with the manufacturer's recommendations and the air carrier's approved maintenance program, where appropriate.

9. What is the Continuing Analysis and Surveillance System (CASS)?

CASS is an air carrier quality assurance system. The FAA has introduced regulatory requirements that require air carriers to establish and use a system for the continued analysis and surveillance of the performance and effectiveness of inspection and maintenance programs.

10. What related documents are available?

a. **14 CFR.** Title 14 CFR, sections 121.309, 121.310, and 121.373.

b. **FAA Document.** Copies of U.S. Department of Transportation (DOT) FAA Report Number DOT/FAA/VS-86/1 (Volumes I and II), Task Force Report on Emergency Evacuation of Transport Airplanes (July 1986), may be obtained from the U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 by calling 1-800-553-6847.

c. **Advisory Circulars.** Copies of the following ACs may be obtained from the U.S. Department of Transportation, Subsequent Distribution Office, SVC-121.23, Ardmore East Business Center, 3341 Q 75th, Landover, MD 20785, or at http://www1.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/MainFrame?OpenFrameSet.

(1) AC 00-46, Aviation Safety Reporting Program, as revised.

(2) AC 20-41, Substitute Technical Standard Order (TSO) Aircraft Equipment, as revised.

(3) AC 20-62, Eligibility, Quality, and Identification of Aeronautical Replacement Parts, as revised.

(4) AC 20-77, Use of Manufacturers' Maintenance Manuals.

(5) AC 20-114, Manufacturers' Service Documents.

(6) AC 120-16, Continuous Airworthiness Maintenance Programs, as revised.

(7) AC 120-17, Maintenance Control by Reliability Methods, as revised.

(8) AC 121-1, Standard Operations Specifications Aircraft Maintenance Handbook, as revised.

(9) AC 121-22, Maintenance Review Board (MRB), as revised.

d. Other Documents. Technical Standard Order TSO-C69, Emergency Evacuation Slides, Ramps, and Slide/Rafts, as revised. Copies may be obtained from FAA, Office of Airworthiness, Aircraft Certification Service, Aircraft Technical Programs Branch (AIR-120), 800 Independence Ave., S.W., Washington, D.C. 20591.

11. How can one get copies of this and other FAA publications?

a. You can purchase the CFRs and those ACs from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. A list of all ACs is available at http://www1.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/MainFrame?OpenFrameSet. You can also obtain a copy of current regulations from the CFR online at <http://www.access.gpo.gov/ecfr/>.

b. You can request free ACs from the U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785.

c. You can be placed on FAA's mailing list for free ACs by contacting the U.S. Department of Transportation, SVC-121.21, Distribution Requirements Section, Washington, D.C. 20590.

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