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Airworthiness Directives: Boeing Model 727 Series Airplanes; Final Rules

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. 97–NM–232–AD; Amendment 39–12858; AD 2002–16–19]

RIN 2120–AA64

Airworthiness Directives; Boeing Model 727 Series Airplanes Modified in Accordance With Supplemental Type Certificate SA1767SO or SA1768SO

AGENCY: Federal Aviation Administration, DOT.

ACTION: Final rule.

SUMMARY: This amendment adopts a new airworthiness directive (AD), applicable to certain Boeing Model 727 series airplanes that have been converted from a passenger- to a cargo-carrying (''freighter'') configuration, that requires, among other actions, installation of a fail-safe hinge, redesigned main deck cargo door warning and power control systems, and 9g crash barrier. This amendment is prompted by the FAA's determination that the main deck cargo door hinge is not fail-safe; that certain main deck cargo door control systems do not provide an adequate level of safety; and that the main deck cargo barrier is not structurally adequate during an emergency landing. The actions specified by this AD are intended to prevent structural failure of the main deck cargo door hinge or failure of the cargo door system, which could result in the loss or opening of the cargo door while the airplane is in flight, and consequent rapid decompression of the airplane, including possible loss of flight control or severe structural damage; and to prevent failure of the main deck cargo barrier during an emergency landing, which could injure occupants.

DATES: Effective September 19, 2002.

ADDRESSES: Information pertaining to this amendment may be examined at the Federal Aviation Administration (FAA), Transport Airplane Directorate, Rules Docket, 1601 Lind Avenue, SW., Renton, Washington; or at the FAA, Atlanta Aircraft Certification Office, One Crown Center, 1895 Phoenix Boulevard, Suite 450, Atlanta, Georgia.

FOR FURTHER INFORMATION CONTACT: Paul Sconyers, Associate Manager, Airframe and Propulsion Branch, ACE–117A, FAA, Atlanta Aircraft Certification Office, One Crown Center, 1895 Phoenix Boulevard, Suite 450, Atlanta, Georgia 30349; telephone (770) 703–6076; fax (770) 703–6097.

SUPPLEMENTARY INFORMATION: A proposal to amend part 39 of the Federal Aviation Regulations (14 CFR part 39) to include an airworthiness directive (AD) that is applicable to certain Boeing Model 727 series airplanes that have been converted from a passenger- to a cargo-carrying (''freighter'') configuration was published in the **Federal Register** on November 12, 1999 (64 FR 61554). That action proposed to require, among other actions, installation of a fail-safe hinge, redesigned main deck cargo door warning and power control systems, and 9g crash barrier.

Background

For the convenience of the reader, certain excerpts and information, below, from the following sections of the preamble of the notice of proposed rulemaking (NPRM) are provided in this final rule: Discussion, Main Deck Cargo Door Hinge, Main Deck Cargo Door Systems, and Cargo Restraint Barrier.

Discussion

Supplemental Type Certificate (STC) SA1767SO (held by FedEx) specifies a design for a main deck cargo door, associated cargo door cutout, and door systems. STC SA1768SO (held by FedEx) specifies a design for a Class ''E'' cargo interior with a cargo restraint barrier net. As discussed in NPRM, Rules Docket No. 97–NM–09–AD (the final rule, AD 98–26–18, amendment 39–10961, was published in the **Federal Register** on January 12, 1999 (64 FR 1994)), which is applicable to certain Boeing Model 727 series airplanes that have been converted from a passenger- to a cargo-carrying (''freighter'') configuration, the FAA has conducted a design review of Boeing Model 727 series airplanes modified in accordance with STCs SA1767SO and SA1768SO and has identified several potential unsafe conditions. (Results of this design review are contained in ''FAA Freighter Conversion STC Review, Report Number 2, dated October 16–18, 1996,'' hereinafter referred to as ''the Design Review Report,'' which is included in the Rules Docket 97–NM–232–AD.) This NPRM proposes corrective action for three of those potential unsafe conditions that relate to the following three areas: main deck cargo door hinge, main deck cargo door systems, and main deck cargo barrier.

Main Deck Cargo Door Hinge

In order to avoid catastrophic structural failure, it has been a typical industry approach to design outward opening cargo doors and their attaching structure to be fail-safe (*i.e.*, designed so that if a single structural element fails, other structural elements are able to carry resulting loads). Another potential design approach is safe-life, where the critical structure is shown by analyses and/or tests to be capable of withstanding the repeated loads of variable magnitude expected in service for a specific service life. Safe-life is usually not used on critical structure because it is difficult to account for manufacturing or in-service accidental damage. For this reason, plus the fact that none of the STC holders have provided data in support of this approach, the safe-life approach will not be discussed further regarding the design and construction of the main deck cargo door hinge.

Structural elements such as the main deck cargo door hinge are subject to severe in-service operating conditions that could result in corrosion, binding, or seizure of the hinge. These conditions, in addition to the normal operational loads, can lead to early and unpredictable fatigue cracking. If a main deck cargo door hinge is not a fail-safe design, a fatigue crack could initiate and propagate longitudinally undetected, which could lead to a complete hinge failure. A possible consequence of this undetected failure is the opening of the main deck cargo door while the airplane is in flight. Service experience indicates that the opening of a cargo door while the airplane is in flight can be extremely hazardous in a variety of ways including possible loss of flight control, severe structural damage, or rapid decompression, any of which could lead to loss of the airplane.

The design of the main deck cargo door hinge must be in compliance with Civil Air Regulations (CAR) part 4b, including CAR § 4b.270, which requires, in part, that catastrophic failure or excessive structural deformation, which could adversely affect the flight characteristics of the airplane, is not probable after fatigue failure or obvious partial failure of a single principal structural element. One common feature of a fail-safe hinge design is a division of the hinge into multiple segments such that, following failure of any one segment, the remaining segments would support the redistributed load.

The main deck cargo door installed in accordance with STC SA1767SO is supported by latches along the bottom of the door and one continuous hinge along the top. This single-piece hinge is considered a critical structural element for this STC. A crack that initiates and propagates longitudinally along the hinge line of the continuous hinge will eventually result in failure of the entire hinge, because there is no segmenting of

the hinge to interrupt the crack propagation and support the redistributed loads. Failure of the entire hinge can result in the opening of the main deck cargo door while the airplane is in flight.

As discussed in the Design Review Report, an inspection of one Boeing Model 727 series airplane modified in accordance with STCs SA1767SO and SA1768SO revealed a number of fasteners with both short edge margins and short spacing in the cargo door cutout external doublers. Some edge margins were as small as one fastener diameter. Fasteners that are placed too close to the edge of a structural member or spaced too close to an adjacent fastener can result in inadequate joint strength and stress concentrations, which may result in fatigue cracking of the skin. If such defects were to exist in the structure of the door or the fuselage to which the main deck cargo door hinge is attached, the attachment of the hinge could fail, and consequently cause the door to open while the airplane is in flight.

Main Deck Cargo Door Systems

In early 1989, two transport airplane accidents were attributed to cargo doors coming open during flight. The first accident involved a Boeing 747 series airplane in which the cargo door separated from the airplane, and damaged the fuselage structure, engines, and passenger cabin. The second accident involved a McDonnell Douglas DC–9 series airplane in which the cargo door opened but did not separate from its hinge. The open door disturbed the airflow over the empennage, which resulted in loss of flight control and consequent loss of the airplane. Although cargo doors have opened occasionally without mishap during takeoff, these two accidents serve to highlight the extreme potential dangers associated with the opening of a cargo door while the airplane is in flight.

As a result of these cargo door opening accidents, the Air Transport Association (ATA) of America formed a task force, including representatives of the FAA, to review the design, manufacture, maintenance, and operation of airplanes fitted with outward opening cargo doors, and to make recommendations to prevent inadvertent cargo door openings while the airplane is in flight. A design working group was tasked with reviewing 14 CFR 25.783 (and its accompanying Advisory Circular (AC) 25.783–1, dated December 10, 1986) with the intent of clarifying its contents and recommending revisions to enhance future cargo door designs. This design group also was tasked with providing specific recommendations regarding design criteria to be applied to existing outward opening cargo doors to ensure that inadvertent openings would not occur in the current transport category fleet of airplanes.

The ATA task force made its recommendations in the ''ATA Cargo Door Task Force Final Report,'' dated May 15, 1991 (hereinafter referred to as ''the ATA Final Report''). On March 20, 1992, the FAA issued a memorandum to the Director-Airworthiness and Technical Standards of ATA (hereinafter referred to as ''the FAA Memorandum''), acknowledging ATA's recommendations and providing additional guidance for purposes of assessing the continuing airworthiness of existing designs of outward opening doors. The FAA Memorandum was not intended to upgrade the certification basis of the various airplanes, but rather to identify criteria to evaluate potential unsafe conditions demonstrated on in-service airplanes. Appendix 1 of this AD contains the specific paragraphs from the FAA Memorandum that set forth the criteria to which the outward opening doors should be shown to comply.

Applying the applicable requirements of CAR part 4b and design criteria provided by the FAA Memorandum, the FAA has reviewed the original type design of major transport airplanes, including Boeing 727 airplanes equipped with outward opening doors, for any design deficiency or service difficulty. Based on that review, the FAA identified unsafe conditions and issued, among others, the following ADs:

- For certain McDonnell Douglas Model DC–9 series airplanes: AD 89–11–02, amendment 39–6216 (54 FR 21416, May 18, 1989);
- For all Boeing Model 747 series airplanes: AD 90–09–06, amendment 39–6581 (55 FR 15217, April 23, 1990);
- For certain McDonnell Douglas Model DC–8 series airplanes: AD 93–20–02, amendment 39–8709 (58 FR 471545, October 18, 1993);
- For certain Boeing Model 747–100 and –200 series airplanes: AD 96–01–51, amendment 39–9492 (61 FR 1703, January 23, 1996); and
- For certain Boeing Model 727–100 and –200 series airplanes: AD 96–16–08, amendment 39–9708 (61 FR 41733, August 12, 1996).

Using the criteria specified in the ATA Final Report and the FAA Memorandum as evaluation guides, the FAA conducted an engineering design review and inspection of an airplane modified in accordance with STCs SA1767SO and SA1768SO (held by FedEx). The FAA identified a number of unsafe conditions with the main deck cargo door systems of these STCs. The FAA design review team determined that the design data of these STCs did not include a safety analysis of the main deck cargo door systems.

As specified in the criteria contained in Appendix 1 of this AD, for powered lock systems on the main deck cargo door, it must be shown by safety analysis that inadvertent opening of the door after it is fully closed, latched, and locked is extremely improbable. However, the FAA is aware of two events in which the main deck cargo door open during flight. These events occurred on FedEx passenger/freighter conversion STCs in December 9, 1994, and March 1995. These events are referenced in the Design Review Report.

For airplanes modified in accordance with STC SA1767SO or SA1768SO, the FAA considers the following four specific design deficiencies of the main deck cargo door systems to be unsafe:

1. Indication System

The main deck cargo door indication system for STCs SA1767SO and SA1768SO uses a warning light at the door operator's control panel and a light at the flight engineer's panel. Both of these lights indicate directly the status of the cargo door latch and lock positions and indicate indirectly the cargo door open or closed status, if the down-sequence switch of the cargo door is operating correctly. All three conditions (*i.e.*, door closed, latched, and locked) must be monitored directly so that the door indication system cannot display either ''latched'' before the door is closed or ''locked'' before the door is latched. If a sequencing error caused the door to latch and lock without being fully closed, the subject indication system, as designed, would not alert the door operator or the flight engineer of this condition. As a result, the airplane could be dispatched with the main deck cargo door unsecured, which could lead to the cargo door opening while the airplane is in flight and possible loss of the airplane.

The light on the flight engineer's panel is labeled ''MAIN CARGO'' and is displayed in red since it indicates an event that requires immediate pilot action. However, if the flight engineer is temporarily away from his station, a door unsafe warning indication could be missed by the pilots. In addition, the flight engineer could miss such an indication by not scanning the panel. As a result, the pilots and flight engineer could be unaware of, or misinterpret, an unsafe condition and could fail to respond in the correct manner.

Therefore, an indicator light must be located in front of and in plain view of both pilots since one of the pilot's stations is always occupied during flight operations.

The main deck cargo door indication system of STCs SA1767SO and SA1768SO does not have a level of reliability that is considered adequate for safe operation. Many components are exposed to the environment during cargo loading operations and may be contaminated by precipitation, dirt, and grease, or damaged by foreign objects or cargo loading equipment. As a result, wires, switches, and relays can fail, jam, or short circuit and cause a loss of indication or a false indication to the door operator and flight crew. The design logic of the indication system (*i.e.,* lights which extinguish when the door is locked) will, in the event of a single point failure that would extinguish the light, result in an erroneous ''safe'' indication regardless of actual door status.

The design of STCs SA1767SO and SA1768S0 has a ''Press-to-Test'' red warning light on the control panel of the main deck cargo door located near the L–1 door. The design of the monitoring system of the main deck cargo door does not include separate lights to provide the door operator with door close, latch, and lock status. The electrical wiring design of the close, latch, and lock sensors of the door monitoring system are wired in parallel instead of in series. In parallel, two sensors could be sensing ''unsafe'' and the third sensor could be sensing ''safe.'' If this situation were to occur, the sensors would not illuminate the red warning light on the door control panel or at the flight engineer's panel. Therefore, the ''Press-to-Test'' feature is adequate to check the light bulb functionality, but is not adequate to check the cargo door closed, latched, and locked functions and status without annunciator lights for those three functions.

2. Means To Visually Inspect the Locking Mechanism

The single view port of the main deck cargo door installed in accordance with STC SA1767SO is intended to allow the flight crew to conduct a visual inspection of the door locking mechanism. This view port is used in conjunction with the door warning system and should provide a suitable ''back-up'' in the event that the main deck cargo door warning system malfunctions.

The door locking mechanism is an assembly comprised of multiple lock pins (one for each of the door latches) connected by linkages to a common lock shaft. Although an indicator flag attached to the lock shaft can be seen through the view port when the shaft is in the ''locked'' position, a failure between the shaft and the pins could go undetected, because this flag is attached to the lock shaft and not the actual lock pins. If such a failure goes undetected, the airplane may be dispatched with the main deck cargo door warning system inoperative and the door not fully closed, latched, and locked, which could lead to a main deck cargo door opening while the airplane is in flight and possible loss of the airplane. Therefore, the FAA finds that the subject view port is not a suitable back-up when the cargo door warning system malfunctions.

As discussed in the ATA Final Report and the FAA Memorandum, there must be a means of directly inspecting each lock or, at a minimum, the locks at each end of the lock shaft of certain designs, such that a failure condition in the lock shaft would be detectable.

3. Means to Prevent Pressurization to an Unsafe Level

Boeing 727–100 and –200 airplanes modified in accordance with STC SA1767SO are configured to utilize the existing fuselage pressurization outflow valve for the purpose of preventing pressurization of the airplane to an unsafe level in the event that the main deck cargo door is not closed, latched, and locked. The FAA design review of these modified Boeing 727–100 and –200 airplanes (documented in the Design Review Report) identified single point failures in the door control/outflow valve interface that could result in the valve not sensing and responding to an unsafe door condition. In addition, the FAA found no data to substantiate that the outflow valve location and size could prevent pressurization to an unsafe level.

With the current design, it is possible that the outflow valve or associated controllers may not perform their intended function when utilized for the purpose of preventing pressurization of the airplane in the event of an unsecured door. This condition could result in cabin pressurization forcing an unsecured door open while the airplane is in flight and possible loss of the airplane.

4. Powered Lock Systems

The main deck cargo door control system for STC SA1767SO that utilizes electrical interlock switches is designed to remove door control power (electrical and hydraulic) prior to flight and to prevent inadvertent door openings. The occurrence of an in-flight door opening event on airplanes modified in accordance with STC SA1767SO, as identified in the Design Review Report, indicates the likelihood that there may be latent and/or single point failures that can restore or continue to allow power to the door controls and cause inadvertent door openings. The failure modes may be found in the electrical portion of the door control panel, which, in turn, activates the door control hydraulics. The potential for the occurrence of these failure conditions is increased by the harsh operating environment of freighter airplanes. Door system components are routinely exposed to precipitation, dirt, grease, and foreign object intrusion, all of which increase the likelihood of damage. As a result, wires, switches, and relays have a greater potential to fail or short circuit in such a way as to allow the cargo door to be powered open without an operator's command and regardless of electrical interlock positions.

A systems safety analysis would normally evaluate and resolve the potential for these types of unsafe conditions. However, the design data for STC SA1767SO do not include a systems safety analysis to specifically identify these failure modes and do not show that an inadvertent opening is extremely improbable. The need for a system safety analysis is identified in the ATA Final Report and the FAA Memorandum.

Cargo Restraint Barrier

In order to ensure the safety of occupants during emergency landing conditions, the FAA first established in 1934, a set of inertia load factors used to design the structure for restraining items of mass in the fuselage. Because the airplane landing speeds have increased over the years as the fleet has transitioned from propeller to jet design, inertia load factors were changed as specified in CAR § 4b.260. Experience has shown that an airplane designed to this regulation has a reasonable probability of protecting its occupants from serious injury in an emergency landing. The 727 passenger airplane was designed to these criteria which specified an ultimate inertia load requirement of 9g in the forward direction. These criteria were applied to the seats and structure restraining the occupants, including the flight crew, as well as other items of mass in the fuselage.

When the 727 passenger airplane is converted to carry cargo on the main deck, a cargo barrier is required, since most cargo containers and the container-to-floor attaching devices are not

designed to withstand emergency landing loads. In fact, the FAA estimates that the container-to-floor attaching devices will only support approximately 1.5g's to 3g's in the forward direction. Without a 9g cargo barrier, it is probable that the loads associated with an emergency landing would cause the cargo to be unrestrained and impact the occupants of the airplane, which could result in serious injury or death.

The structural inadequacy of the cargo barrier was evident to the FAA during its review in October 1997 of a Boeing 727 modified in accordance with STC SA1767SO. The observations revealed that the design of the net restraint barrier floor attachment and circumferential supporting structure does not provide adequate strength to withstand the 9g forward inertia load generated by the main deck cargo mass, nor does it provide a load path to effectively transfer the loads from the restraint barrier to the fuselage structure of the airplane. These observations are supported by data contained in ''ER 2785, Structural Substantiation of the 50k 9g Bulkhead Restraint System in Support of STC SA1543SO PN 53–1292–401 for the 9g Bulkhead 53–1980–300 Assembly with Upper Attachment Structure, Lower Attachment Structure, Floor Shear Web Structure, Seat Track Splice Fittings, Seat Tracks, and Seat Track Splices,'' dated September 29, 1996, by M. F. Daniel. Although this report was specific to STC SA1543SO, the FAA has determined that the data are applicable to airplanes modified in accordance with STC SA1767SO because the design principles for attachment of the barriers in both STCs are the same. The report reveals that structural deficiencies were found in the net attach plates and floor attachment structure of the cargo barrier. The data show large negative margins of safety, which indicate that the inertia load capability of the cargo barrier is closer to 2g than the required 9g in the forward direction. From these analyses, it is evident that the cargo restraint barrier would not be capable of preventing serious injury to the occupants during an emergency landing event with the full allowable cargo load.

Comments

Interested persons have been afforded an opportunity to participate in the making of this amendment. Due consideration has been given to the comments received.

The FAA has received comments in response to the four NPRM actions (*i.e.,* Rules Dockets 97–NM–232–AD, 97–NM–233–AD, 97–NM–234–AD, and 97–NM–235–AD) that address the same subjects described above for four different sets of cargo modification STCs. Some of these comments addressed only one NPRM, while others addressed all four. Because in most cases the issues raised by the commenters are generally relevant to all four NPRMs, each final rule includes a discussion of all comments received.

Definition of Detailed Visual Inspection

One commenter provided Boeing's definition of a detailed visual inspection. The commenter requests that the FAA approve Boeing's definition as meeting the ''detailed visual inspection'' definition specified in Note 2 of the NPRM. The commenter states that it has incorporated Boeing's definition into its General Maintenance Manual (GMM), and that it is performing the detailed visual inspection of the main deck cargo door hinge in accordance with the GMM. The commenter also states that acceptance of the existing Boeing's definition will allow for work standardization and consistency.

The FAA partially concurs. The FAA concurs that, for the purpose of this AD, the definition provided by the commenter satisfies the intent of the definition contained in Note 2 of this AD. The detailed inspection definition specified in Note 2 of this AD is a standard definition that is used in all ADs that require a detailed inspection. Therefore, the FAA finds that no change to Note 2 of the final rule is necessary. However, for clarification purposes, the FAA has revised all references to a ''detailed visual inspection'' in the NPRM to ''detailed inspection'' in the final rule.

Main Deck Cargo Door Hinge

Two commenters request that the compliance time for accomplishing the detailed visual inspection required by paragraph (a) of the NPRM be revised. One commenter states that the compliance time should include a threshold of ''prior to the accumulation of five years since accomplishment of the original conversion.'' The commenter states that operators of newly modified airplanes should not have to accomplish the detailed visual inspection required by paragraph (a) of the NPRM because it would be unlikely that brand new hinges would develop cracks within 250 flight cycles after being installed. The other commenter states that the compliance time should be revised to ''at the next scheduled 'B' check, or 350 cycles after the effective date of the NPRM, whichever occurs first.'' The commenter states that such an extension would allow the inspection to be accomplished during a regularly scheduled ''B'' check and would not be disruptive of normal maintenance inspection scheduling.

The FAA partially concurs. The FAA does not concur that the compliance time should be extended from 250 flight cycles to 350 flight cycles. In developing an appropriate compliance time for the detailed inspection required by paragraph (a) of this AD, the FAA considered the degree of urgency associated with addressing the subject unsafe condition; the results from an FAA report, ''Damage Tolerance Analysis of 727 Cargo Door Hinge,'' dated October 10, 1997; and the practical aspect of accomplishing the required inspection within an interval of time that parallels the typical ''A'' check scheduled maintenance interval for the majority of affected operators.

However, the FAA concurs with the commenter about the unlikelihood of a newly modified airplane developing cracks within 250 flight cycles since installation. Based on the referenced FAA damage tolerance report, the FAA finds that it is unlikely that a significant crack would occur in the hinge within 4,000 flight cycles since installation. Therefore, the FAA finds that operators must accomplish the detailed inspection ''prior to accumulation of 4,000 flight cycles since accomplishment of the installation of the main deck cargo door, or within 250 flight cycles after the effective date of this AD, whichever occurs later.'' The FAA has revised paragraph (a) of the final rule accordingly.

One commenter requests that a high frequency eddy current (HFEC) inspection be required in paragraph (a) of the NPRM in lieu of the detailed visual inspection. The commenter states that an HFEC inspection should be used because there are no proposed repetitive inspections and a detailed visual inspection can only detect limited crack size.

The FAA does not concur. The FAA finds that accomplishment of the detailed inspection required by paragraph (a) of this AD, in conjunction with the detailed inspection required by paragraph (b)(1) of this AD and the modification required by paragraph (b)(2) of this AD, will ensure the integrity of the door and fuselage structure to which the hinge is attached. Therefore, no change to the final rule is necessary in this regard.

Two commenters request that the FAA revise paragraph (a) of the NPRM to specify that operators will be given ''credit'' for having previously accomplished the proposed detailed visual inspection of the main deck cargo

door hinge in accordance with a method approved by the appropriate Aircraft Certification Office (ACO) prior to the effective date of the final rule. One commenter states that operators who accomplished the subject inspection before the effective date of this AD should not be penalized by being forced to reinspect after the effective date of this AD.

The FAA does not consider that a change to the final rule is necessary to give operators such credit. Operators are given credit for work previously performed by means of the phrase in the ''Compliance'' section of the AD that states, ''Required as indicated, unless accomplished previously.'' Therefore, in the case of this AD, if the required detailed inspection has been accomplished prior to the effective date of this AD in accordance with a method approved by the FAA, this AD does not require that it be repeated.

One commenter requests that the detailed visual inspection required by paragraph (b)(1) of the NPRM be accomplished at the next ''C'' check after five years have elapsed since the airplane was converted from a passenger- to a cargo-carrying (''freighter'') configuration. The commenter also states that a ''C'' check would allow operators to accomplish the inspection during a heavy maintenance visit.

The FAA does not concur. The FAA finds that accomplishment of the detailed inspection required by paragraph (b)(1) of this AD prior to or concurrently with requirements of paragraph (b)(2) of this AD (*i.e.,* installation of a main deck cargo door hinge) will ensure the structural integrity of mating surfaces of the hinge. However, paragraph (g) of this AD does provide affected operators the opportunity to apply for an adjustment of the compliance time if data are presented to justify such an adjustment.

One commenter requests that the detailed visual inspection required by paragraph (b)(1) of the NPRM apply only to airplanes that have been in service for five or more years since installation of the cargo door, because the likelihood of damage increases with time in service. The commenter states that the compliance time specified in paragraph (b) of the NPRM should start from the date that the modification was installed on the airplane.

The FAA does not concur. The FAA finds that the potential for cracks in the hinge is primarily related to flight cycles (*i.e.,* number of fuselage pressure cycles) and, to a lesser extent, calendar time. Therefore, the FAA has determined that the compliance time specified in paragraph (b) of this AD should be related to flight cycles, not calendar time. No change to the final rule is necessary in this regard.

One commenter requests that the NPRM, Rules Docket 97–NM–234–AD, be revised to reference Kitty Hawk Service Bulletin KHA 727–004, Revision A, as an appropriate source of service information for accomplishing the detailed visual inspection required by paragraphs (a) and (b)(1) of the NPRM and the modification required by paragraph (b)(2) of that NPRM. The commenter states that this service bulletin has been submitted to the FAA for approval and should be approved by the FAA prior to the issuance of the NPRM.

Another commenter states that it has developed and submitted to the FAA for approval a modification that segments the hinge on existing cargo converted airplanes and installs a segmented hinge on the new conversion. From this comment, the FAA infers that the commenter is requesting that the NPRM, Rules Docket 97–NM–233–AD, be revised to reference this modification as a terminating action for the requirements of paragraphs (b) and (c) of that NPRM.

The FAA concurs with the commenters' requests to reference service bulletins that constitute compliance with the requirements of paragraphs (b) and (c) of ADs, Rules Dockets 97–NM–233–AD and 97–NM–234–AD. The FAA has reviewed and approved Kitty Hawk Service Bulletin KHA 727–004, Revision B, dated March 3, 1999, as opposed to the Revision A mentioned by one of the commenters. The FAA also has reviewed and approved Aeronautical Engineers Incorporated (AEI) Service Bulletin AEI01–01, Revision B, dated October 26, 2001. These service bulletins describe the following procedures:

1. Visual inspection of all areas of the hinge for cracks or other signs of damage;
2. Inspection of the mating surfaces of the main deck cargo door hinge and the external doubler for discrepancies (*i.e.,* scratches, gouges, or corrosion);
3. Repair of any crack, damage, or discrepancy, if necessary; and
4. Installation of a main deck cargo door hinge that complies with the applicable requirements of CAR part 4b, including fail-safe requirements.

In addition, the FAA has reviewed and approved Federal Express E.O. Revision Record 7–5230–7–5000, Revision B, release date December 18, 2001, and Pemco Service Bulletin 727–53–0006, Revision 1, dated December 4, 2001. The procedures in these service bulletins are similar to those described in AEI Service Bulletin AEI01–01, Revision B, and Kitty Hawk Service Bulletin KHA 727–004, Revision B.

The FAA finds that accomplishment of the actions specified in the four service bulletins described previously constitutes compliance with the requirements of paragraphs (b) and (c) of final rules, Rules Dockets 97–NM–232–AD, 97–NM–233–AD, 97–NM–234–AD, and 97–NM–235–AD; as applicable. Therefore, the FAA has revised those final rules to include a new note that references the subject service bulletins as a source of service information for accomplishing the actions required by paragraphs (b) and (c) of those final rules; as applicable.

One commenter requests that a subparagraph be added to paragraph (b) of the NPRM to require that the detailed visual inspection required by paragraph (b)(1) of the NPRM be accomplished just prior to final hinge installation during the process of converting an airplane from a passenger- to cargo-carrying (''freighter'') configuration. The commenter states that this revision would eliminate its concerns about the installation defects that could cause future problems.

The FAA does not concur. The FAA finds that any FAA-approved corrective action that satisfies the requirements of paragraph (b)(2) of this AD will also address the installation of a hinge during the process of converting a Boeing Model 727 series airplane from a passenger- to a cargo-carrying (''freighter'') configuration. Normally, good manufacturing procedures during production should preclude the necessity for the inspection. No change to the final rule is necessary in this regard.

One commenter notes that paragraph (b)(2) of the NPRM references CAR part 4b. The commenter asks, ''If the FAA, as evidenced by the awarding of an STC, certified the cargo door hinge, how can the current hinge not meet CAR requirements?'' The commenter also asks, ''Wasn't the original STC determined to be in compliance with those requirements? If so, what specifically needs to be done to eliminate the FAA safety concerns about hinges that do not appear to have a problem?'' The commenter suggests that paragraph (b)(2) of the NPRM be revised to require STC holders to design and make available an acceptable replacement hinge. The commenter states that this suggestion should be a condition for STC holders to continue to hold their STC approval.

From the commenter's questions, the FAA infers that the commenter believes

a main deck cargo door hinge with an approved STC is compliant with the requirements of CAR part 4b. The FAA finds that clarification is necessary. Generally, there is a presumption by operators that demonstrations of compliance with the requirements of CAR part 4b is a prerequisite for granting an STC. However, the applicant for any design approval is responsible for compliance with all applicable FAA regulations. The FAA has the discretion to review or otherwise evaluate the applicant's compliance to the degree the FAA considers appropriate in the interest of safety. The normal certification process allows for the review and approval of data by FAA designees. Consequently, the FAA office responsible for the certification of an airplane or modification to an airplane or an aeronautical appliance may not review all details regarding compliance with the appropriate regulations. As explained in the NPRM, the FAA has conducted design reviews and airplane inspections and has identified a potential unsafe condition that relates to the main deck cargo door hinge.

In addition, the FAA does not concur with the commenter's request to revise paragraph (b)(2) of the AD to require STC holders to design and make available an acceptable replacement hinge. The FAA finds that such a requirement is unnecessary, because as previously discussed, the FAA has revised this final rule to include a new note that references the applicable STC holder's service bulletin as a source of service information for accomplishing the actions required by paragraphs (b) and (c) of this final rule.

Main Deck Cargo Door Systems

One commenter requests that the compliance time for accomplishing the Airplane Flight Manual (AFM) revisions required by paragraph (d) of the NPRM be revised from ''within 60 days after the effective date of this AD'' to ''within 60 days after submission of the procedures to the FAA.'' The commenter states that operators should be able to design revisions to the AFM within the proposed 60 days. However, the commenter believes that the Atlanta ACO will not be able to approve every one of those AFM Supplements within that time period.

The FAA does not concur. Since the release of the NPRM, some of the affected STC holders and operators have already developed AFM procedures acceptable to the FAA. The FAA finds that a 60-day compliance time is sufficient to allow the remaining operators and STC holders to develop revisions to the applicable AFMs and their supplements and for the Atlanta ACO to review and approve those AFM revisions.

One commenter submitted procedures for accomplishing the requirements of paragraph (d) of NPRM, Rules Docket 97–NM–232–AD. The commenter requests that the FAA approve those procedures prior to issuance of the final rule and include those procedures in the final rule. The commenter states that it has completed a Safety Assessment Report for each of the door configurations currently operating in its fleet. The commenter believes the results of the report demonstrate that it is ''extremely improbable'' that the door will inadvertently open in flight for any reason. Although the analysis does not demonstrate compliance with the ''extremely improbable'' standard, the commenter states that for a limited time of 36 months the door system, as installed, provides a sufficient level of safety to be considered acceptable with no modification or change in operational procedures.

The FAA partially concurs. In order to gain a better understanding of the referenced Safety Assessment Report, the FAA had a telecon with the commenter on February 19, 2000, to discuss a series of questions, which were provided to the commenter prior to the telecon, about the report. (The minutes of this telecon are included in Rules Docket 97–NM–232–AD.) In addition to the information that it provided at the telecon, the commenter also provided an analysis of the Safety Assessment Report in a letter, dated February 16, 2000, and a revised table of the Safety Assessment Report in a letter, dated March 6, 2000. The analysis in these letters provided, for a variety of failure modes, the probability of the main deck cargo door not being in the closed, latched, and locked condition prior to dispatch. The analysis showed that the warning systems of the main deck cargo door and the means to prevent pressurization if the door is not closed, latched, and locked, only meet some of the requirements of CAR § 4b.606 and criteria specified in FAA memorandum, dated March 20, 1992 (referenced in the preamble of the NPRM). The commenter also provided Revision 16 of its Boeing B–727 Flight Manual, which further clarifies a change in the procedures for verifying that the main deck cargo door is closed, latched, and locked.

In light of the clarification provided by the commenter, the FAA concurs that the procedures submitted by the commenter provide an adequate level of safety until the requirements of paragraph (e) of this AD have been accomplished, considering the level of probability of occurrence of certain failures of the warning systems of the main deck cargo door and strict adherence to the door checking procedures and associated training requirements. Since issuance of the NPRM, the FAA has reviewed and approved Federal Express Service Bulletin FX727–2001–5230–01, dated July 30, 2001, which describes procedures for ensuring that the main deck cargo door is closed, latched, and locked prior to dispatch. Accomplishment of these actions constitutes compliance with the requirements of paragraph (d) of final rule, Rules Docket 97–NM–232–AD. Therefore, the FAA has revised the final rule, Rules Docket 97–NM–232–AD, to include a new note that references the subject service bulletin as a source of service information for accomplishing the actions required by paragraph (d) of that final rule.

One commenter provided procedures for accomplishing the requirements of paragraph (d) of NPRM, Rules Docket 97–NM–233–AD, on airplanes modified in accordance with STC SA1368SO, on which a vent door has not been installed, and on airplanes modified in accordance with STC SA1797SO, on which a vent door has been installed. The commenter states that its procedures will ensure that the main deck cargo door is properly closed, latched, and locked prior to flight.

From this comment, the FAA infers that the commenter is requesting that the FAA approve its procedures as an acceptable means of compliance to the requirements of paragraph (d) of the final rule, Rules Docket 97–NM–233–AD. The FAA does not concur. The FAA finds that any proposed operating procedure must have sufficient validation and verification that the procedures are realistic and designed to minimize possible human error. The procedure also must provide for adequate checks and balances in the event the procedure is not strictly followed. In addition, the commenter did not provide any validation of the operating procedure or results of a safety analysis. However, the FAA may approve requests for an alternative method of compliance (AMOC) under the provisions of paragraph (g) of AD, Rules Docket 97–NM–233–AD, if sufficient data are submitted to substantiate that such a operating procedure would provide an acceptable level of safety.

One commenter provided procedures for accomplishing the requirements of paragraph (d) of NPRM, Rules Docket 99–NM–234–AD. In support of its

procedures, the commenter states, among other items, that an internal direct visual inspection of the latching and locking system is not possible on Model 727 series airplanes affected by that NPRM because the latching and locking systems are covered by a protective guard/cover that prevents direct viewing of these systems. Removing these covers would expose the latching and locking systems to possible foreign object damage (FOD) or damage from shifting freight. The commenter states that this condition is far more dangerous than a failure of the latching and locking systems. The commenter also states that most of the affected airplanes are equipped with flip up sill protectors, which further block the visibility of the bottom of the cargo door area (latch and lock area). The commenter concludes that a visual inspection of the latching and locking mechanisms is not appropriate for the airplane type and would create severe operational disruption with no benefit.

The FAA concurs with the commenter's conclusion that a visual inspection of the latching and locking mechanisms is not appropriate for accomplishing the requirements of paragraph (d) of final rule, Rules Docket 97–NM–234–AD. The FAA notes that paragraph (d) of that final rule does not specifically require a visual inspection of the locking mechanisms of the main deck cargo door after the door is closed, as suggested by the commenter. Since issuance of the NPRM, the FAA has reviewed and approved Kitty Hawk Service Bulletin KHA 727–008, dated January 7, 2000, which describes procedures for ensuring that the main deck cargo door is closed, latched, and locked prior to dispatch. These procedures are identical to those procedures provided by the commenter. Accomplishment of these actions constitutes compliance with the requirements of paragraph (d) of final rule, Rules Docket 97–NM–234–AD. Therefore, the FAA has revised final rule, Rules Docket 97–NM–234–AD, to include a new note to reference the subject service bulletin as a source of service information for accomplishing the actions required by paragraph (d) of that final rule.

One commenter states that the requirements for ''a means to prevent pressurization to an unsafe level'' and ''direct visual examination of all locks'' are not included in the certification basis of Model 727 series airplanes and should not be required for the interim action.

From this comment, the FAA infers that the commenter is referring to the interim actions required by paragraph (d) of the NPRM and to extracts from Appendix 1 of this AD, which sets forth the industry-accepted criteria to which the outward opening doors must be shown to comply per paragraph (e) of the NPRM. The FAA does not concur. The commenter has misinterpreted the requirements of paragraph (d) of this AD. Paragraph (d) of this AD requires procedures to ensure that all power is removed from the main deck cargo door prior to dispatch and to ensure that the main deck cargo door is closed, latched, and locked prior to dispatch of the airplane. This paragraph does not specify or limit what means or actions would be acceptable to the FAA. Operators could submit a means to prevent pressurization to an unsafe level and direct visual inspection of the locks as possible ways to ensure that the main deck cargo door is secure, in accordance with paragraph (d) of this AD. In addition, to comply with paragraph (e) of this AD, the criteria specified in Appendix 1 of this AD must be applied, irrespective of the certification basis of the airplane. Therefore, no change to the final rule is necessary in this regard.

One commenter requests that the proposed compliance time specified in paragraph (e) of the NPRM be revised from ''within 36 months after the effective date of this AD'' to ''at the next 'C' check after the modifications are approved by the Manager, Atlanta ACO.'' The commenter states that such a compliance time would make everybody (*i.e.*, designer, operator, and FAA) share responsibility for time delays encountered during the modification design and approval process.

The FAA does not concur. Since issuance of the NPRM, the FAA has reviewed and approved two modifications (*i.e.*, National Aircraft Service, Inc. (NASI), STC ST01438CH and Pemco STC ST01270CH) as acceptable means for compliance with the requirements of paragraph (e) of final rules, Rules Dockets 97–NM–232–AD and 97–NM–235–AD; as applicable. Therefore, the FAA has revised the final rules, Rules Dockets 97–NM–232–AD and 97–NM–235–AD, to include a new note to reference the applicable STC as a source of service information for accomplishing the requirements of paragraph (e) of those final rules. The FAA finds that a 36-month compliance time for accomplishing the action specified in paragraph (e) of those final rules is not only sufficient for the design of the corrective actions, but also provides adequate time for operators to schedule the installation within an interval of time that parallels a heavy maintenance visit. However, under the provisions of paragraph (g) of final rules, Rules Dockets 97–NM–232–AD and 97–NM–235–AD, the FAA may approve requests for an adjustment of compliance times if data are submitted to substantiate that such an adjustment would provide an acceptable level of safety.

Main Deck Cargo Barrier

One commenter requests that, before issuance of the final rule, industry and the FAA form a review team to find a way of lowering the costs associated with accomplishing the proposed installation of a 9g crash barrier. The commenter suggests that lower costs could be achieved by fixing the existing barrier (*e.g.*, the loads could be spread by the addition of structural reinforcement attachment angles) or designing a new barrier. The commenter states that the Ventura Aerospace, Inc., cargo barrier STC ST00848LA, which is an approved means of compliance with the requirements of paragraph (f) of NPRMs, Rules Dockets 97–NM–233–AD, 97–NM–234–AD, and 97–NM–235–AD, is an adequate barrier; however, the parts and installation cost estimates for the installation in those NPRMs are too low. The commenter gave examples of various actions and associated work hours that would be necessary to accomplish the proposed installation of the Ventura 9g crash barrier.

The FAA does not concur with the commenter that a review team is necessary, and that the cost estimates of NPRM's, Rules Dockets 97–NM–233–AD, 97–NM–234–AD, and 97–NM–235–AD, for accomplishing the installation of a main deck cargo barrier are too low. The FAA acknowledges that installation of a Ventura Aerospace, Inc., cargo barrier STC ST00848LA is an approved means of compliance with the requirements of paragraph (f) of final rules, Rules Dockets 97–NM–233–AD, 97–NM–234–AD, and 97–NM–235–AD. However, the cost estimates in the subject NPRMs were not specifically for installation of the subject Ventura 9g crash barrier, but were for installation of a 9g crash barrier that complies with the applicable requirements of CAR part 4b. The installation cost estimate of the NPRMs was provided to the FAA by Pemco based on the best data available to date.

The FAA recognizes that, in accomplishing the requirements of any AD, operators may incur ''incidental'' costs in addition to the ''direct'' costs. The cost analysis in AD rulemaking actions, however, typically does not include incidental costs, such as the time required to gain access and close up; planning time; or time necessitated

by other administrative actions. Because incidental costs may vary significantly from operator to operator, they are almost impossible to calculate. Furthermore, because the FAA generally attempts to impose compliance times that coincide with operators' scheduled maintenance, the FAA considers it inappropriate to attribute the costs associated with aircraft ''downtime'' to the cost of the AD, because, normally, compliance with the AD will not necessitate any additional downtime beyond that of a regularly scheduled maintenance visit.

Public Meeting

Several commenters request that the FAA hold a public meeting prior to the issuance of the final rule in the event that the FAA does not find their procedures acceptable for compliance with the requirements of paragraph (d) of the NPRM. The commenters state that such a meeting would provide a forum for productive face-to-face discussions similar to the process used by industry's B–727 Working Group.

The FAA does not concur. As discussed previously, the FAA has accepted some of the procedures submitted by the commenters. Also, in consideration of the differing configurations of the main deck cargo door systems between the various affected STCs, a public meeting to discuss the AD may be significantly restricted in some cases because of the proprietary design and data issues. However, the FAA is available to discuss any particular proposal for procedures specific to the airplane configuration with each of the affected STC holders or operators. Further, the FAA may approve requests for an AMOC under the provisions of paragraph (g) of this AD if sufficient data are submitted to substantiate that such a procedure would provide an acceptable level of safety. Therefore, the FAA finds that no public meeting is necessary.

Issue Separate ADs

One commenter requests that the NPRM be split into separate ADs for each issue—main deck cargo door hinge, main deck cargo door systems, and 9g crash barrier. The commenter states that multiple actions addressed by a single AD make managing the actions very unwieldy and complicated.

The FAA does not concur. The FAA is not convinced that separate ADs for each issue would resolve the complexity of this AD. The FAA has determined that a less burdensome approach is to issue only one AD for each STC holder that addresses the potential unsafe conditions that relate to the main deck cargo door hinge, main deck cargo door systems, and main deck cargo barrier. In addition, operators have already initiated actions to accomplish the requirements of this AD without apparent complications.

ACO Approval

One commenter requests that the actions required by the NPRM that must be accomplished in accordance with a method approved by the Manager, Atlanta ACO, be approved by the Manager, Transport Airplane Directorate. The commenter states that the affected Boeing Model 727 series airplanes are not small airplanes, and that the approving authority should be someone in an ACO from the Transport Airplane Directorate who understands structural repairs of transport category airplanes.

The FAA does not concur. Since the subject STCs were issued by the Atlanta ACO, that office has certificate responsibility for the airplanes affected by this AD. The Atlanta ACO is most cognizant of the design details of the subject STCs and, therefore, is more able to address each operator's specific issues for complying with paragraph (d) of this AD. The Manager of the Atlanta ACO will coordinate the review of the submittals with the Transport Airplane Directorate, which has established a team consisting of members from several ACOs to review all requests in accordance with paragraphs (b)(1), (b)(2), (c), (d), (e), and (f) of this AD.

Principal Maintenance Inspector (PMI) or Principal Operations Inspector (POI) Approval

One commenter requests that the FAA allow the individual operator's local PMI or POI to approve the AFM procedures for ensuring that the main deck cargo door is closed, latched, and locked required by the NPRM, or provide an option in the NPRM that allows the procedures to be added to the airplane operator manual (AOM), if applicable. The commenter states that such approval would ensure that the approval process is accomplished quickly.

The FAA does not concur. Paragraph (d) of this AD requires comprehensive engineering evaluation in consideration of the applicable requirements of CAR part 4b and the criteria specified in Appendix 1 of this AD. Consequently, the evaluation must be conducted by the Manager, Atlanta ACO, to determine an acceptable level of safety. The PMI or POI for the air carrier is normally not familiar with all the design considerations provided by the requirements of CAR part 4b and Appendix 1 of this AD.

Cost

One commenter requests that an industry/FAA team determine a less costly method to fix the existing barriers to satisfy the FAA's concerns. For example, the loads could be spread by the addition of structural reinforcement attachment angles. The commenter states that replacing the barrier is an extreme measure, and that there must be some kind of structural additions that could be made to the existing barrier to make it acceptable at a much lower cost.

The FAA partially concurs. The STC holders and operators are certainly free to form an industry team to find common solutions. However, the FAA's reason for participation would not be for the purpose of developing a less costly design, but rather to ensure that the final design is compliant with the applicable regulations.

One commenter requests that the FAA require STC holders to design the correction for the NPRM as a warranty issue. The commenter states that small operators, who do not have in-house engineering capability, will be at a great disadvantage when attempting to design remedies for this NPRM. The commenter also states that this NPRM places a substantial financial and operational burden on ''small entities'' just from the standpoint of not having a remedy already designed and approved.

The FAA does not concur. Any warranty agreements between the operator and an STC holder are not the responsibility of the FAA. The burden on small entities is addressed in the Regulatory Evaluation Summary and Regulatory Flexibility Analysis Section of this AD.

Descriptive Language of Preamble

One commenter states that it found the following four factual inaccuracies in the NPRM, Rules Docket 97–NM–232–AD, and requests that the FAA correct them.

1. The commenter notes that paragraph six under the heading ''Main Deck Cargo Door System'' reads, '' * * * However, the FAA is aware of two events in which the main deck cargo door opened during flight. These events occurred on FedEx passenger/freighter conversion STC's in October 1996, and March 1995.'' The commenter states that it does not have any information or records indicating that the main deck cargo door opened in flight in October 1996 or March 1995. In the March 1995 incident, the commenter contends that the door,

upon landing, was found to be closed and locked, and that the lock bar was found to be in the unlocked position. The commenter states that it found a control valve electrical connection of the main deck cargo door to be disconnected, and that the door operated normally once it was reconnected.

2. The commenter disagrees with the sentence under the heading ''1. Indication System'' in the preamble of the NPRM that reads, ''Both of these lights indicate the status of the cargo door latch and lock positions, but do not indicate either the door open or closed status.'' The commenter states that its system does monitor and indicate the door closed status. If the door closed switch is not depressed, the light will stay illuminated, even if the door lock latches have rolled and the lock bar has moved into place.

3. The commenter notes that paragraph two under the heading ''2. Means to Visually Inspect the Locking Mechanism'' reads, '' * * * Although an indicator flag attached to the lock shaft can be seen through the view port when the shaft is in the 'locked' position, a failure between the shaft and the pins could go undetected, because this flag is attached to the lock shaft and not the actual lock pins.''

The commenter states that the flag is attached to the lock bar on Model 727–100 series airplanes. The lock plates are also bolted directly to the lock bar (no linkages). Therefore, the commenter contends that both the flag and lock plates become integrated parts of the lock bar.

In addition, the commenter states that the flag is attached to a lock pin on Model 727–200 series airplanes, and that the lock pin linkage does not have springs or an actuator attached to it. The commenter also contends that movement would have to be transmitted through the lock bar. The commenter further states that the stress analysis for Model 727–200 series airplanes shows high margins of safety in yield, bending, and shear for the locking hinges and fasteners.

4. The commenter notes that paragraph three under the heading ''3. Means to Prevent Pressurization to an Unsafe Level'' in the preamble of the NPRM reads, ''Boeing 727–100 airplanes modified in accordance with the subject STC's have no means of preventing pressurization in the event that the main deck cargo door is not closed, latched, and locked, and therefore, have a higher risk of a cargo door opening while the airplane is in flight and possible loss of the airplane.'' The commenter states that the system used on Model 727–100 series airplanes has a relay that drives the ground venturi system, which in turns opens the outflow valve when the main deck cargo door is not closed and locked, hence pressurization is not possible.

For item 1 above, the FAA partially agrees with the commenter. In the preamble of the NPRM, the FAA incorrectly referenced October 1996 as a date of a door opening event. The correct date is December 9, 1994. The pilots' report (which is included in Rules Docket 97–NM–232–AD) on this event states that shortly after takeoff the warning light for the main deck cargo door illuminated. Following the open in-flight procedures for the main deck cargo door, the flight crew safely returned the airplane to the departure airport. The post-flight inspection revealed that the main deck cargo door opened approximately two feet. Also, in reference to the March event where the commenter states that the door did not open in flight, a verbal report (i.e., ''FAA Freighter Conversion STC Review Report Number 2, dated October 16–18, 1996,'' which is included in Rules Docket 97–NM–232–AD) from the organization of the commenter's company states that the main deck cargo door was unlocked, and that the door was flush with the exterior of the airplane. The report on this latter event states that, following departure and at 17,000 feet, the warning light of the main deck cargo door came on followed by cabin altitude climbing. While it is not clear to the FAA whether or not the main deck cargo door opened while the airplane was in flight, the condition for possible door opening (*i.e.,* rotation of the lock bar to the unlocked position inflight) did occur, which could have led to a door opening while the airplane is in flight. Therefore, the FAA has revised the ''Background'' (''Main Deck Cargo Door Systems'' subsection) Section in the preamble of final rule, Rules Docket 97–NM–232–AD, to correct the date of the subject event.

For items 2. and 4. above, the FAA agrees with the commenter's correction to items 2. and 4. above and has revised the ''Background'' Section (''Indication System'' and ''Means to Prevent Pressurization to an Unsafe Level'' subsections) in the preamble of final rule, Rules Docket 97–NM–232–AD, accordingly. However, we find that the correction to item 2. does not alleviate the unsafe design features that were single point failures in the door control/outflow valve interface, which could result in the valve not sensing and responding to an unsafe door condition. With the current design, it is possible that the outflow valve or associated controllers may not perform their intended function when utilized for the purpose of preventing pressurization of the airplane in the event of an unsecured door. This condition could result in cabin pressurization forcing an unsecured door open while the airplane is in flight and possible loss of the airplane.

Further, we find that the correction to item 4. does not alleviate the safety concern regarding the design feature where ALL three conditions (i.e., door closed, latched, and locked) are not directly monitored. If a sequencing error caused the door to latch and lock without being fully closed, the subject indication system, as designed, would not directly alert the door operator or the flight engineer of this condition. As a result, the airplane could be dispatched with an unsecured main deck cargo door, which could lead to the cargo door opening while the airplane is in flight and possible loss of the airplane.

For item 3. above, the FAA does not concur that the attachment of the ''flag'' to the lock bar on Model 727–100 series airplanes is sufficient to indicate the position of the lock pins, even though the lock pins are bolted to the lock bar. The FAA has determined that any failure condition of a lock pin would not be detected when observing the position of the flag through the view port.

Explanation of Change to Unsafe Condition

To more accurately reflect the identified unsafe condition of this AD, the FAA has revised the final rule where applicable to read, ''to prevent structural failure of the main deck cargo door hinge or failure of the cargo door system, which could result in the loss or opening of the cargo door while the airplane is in flight and consequent rapid decompression of the airplane, including possible loss of flight control or severe structural damage; and to prevent failure of the main deck cargo barrier during an emergency landing, which could injure occupants.''

Conclusion

After careful review of the available data, including the comments noted above, the FAA has determined that air safety and the public interest require the adoption of the rule with the changes previously described. The FAA has determined that these changes will neither increase the economic burden on any operator nor increase the scope of the AD.

Regulatory Evaluation Summary

This analysis estimates the costs of AD, Rules Docket 97–NM–232–AD, that requires installation of a fail-safe hinge; redesigned warning and power control systems of the main deck cargo door; and a 9g crash barrier on Boeing Model 727 series airplanes that have been modified in accordance with certain STCs held by FedEx. As discussed above, the FAA has determined that:

1. The main deck cargo door hinge is not fail-safe;

2. Certain control systems of the main deck cargo door do not provide an adequate level of safety; and

3. The 9g crash barrier is not structurally adequate during a minor crash landing.

The AD will affect 120 U.S.-registered Boeing Model 727 series airplanes operated by FedEx. The following discussion addresses, in sequence, the actions in this rulemaking and the estimated cost associated with each of these actions. An analysis of the cost is also available in Rules Docket No. 97–NM–232–AD.

1. Main Deck Cargo Door Hinge

Since unsafe conditions have been identified that are likely to exist or develop on other modified Boeing Model 727 series airplanes, paragraph (a) of this AD requires, prior to the accumulation of 4,000 flight cycles since accomplishment of the installation of the main deck cargo door, or within 250 flight cycles after the effective date of this AD, whichever occurs later, a detailed inspection of the external surface of the main deck cargo door hinge to detect cracks. FedEx estimates that this inspection will take about 14 work hours per airplane. At a mechanic's burdened labor rate of $60 per work hour, the cost per airplane will be $840, or $100,800 for FedEx's fleet of 120 affected Boeing Model 727 series airplanes.

Paragraph (b)(1) of the AD requires, within 36 months or 4,000 cycles after the effective date of this AD, whichever occurs first, a detailed inspection of the mating surfaces of both the hinge and the door skin, and the hinge and external fuselage doubler underlying the hinge. The FAA estimates that compliance with this inspection will take 200 work hours per airplane, and that the average labor rate is $60 per work hour. The estimated cost will be $12,000 per airplane, or $1.4 million for the 120 affected Boeing Model 727 series airplanes.

Paragraph (b)(2) of the AD requires installation of a fail-safe door hinge. The compliance time for this installation is also within 36 months or 4,000 cycles after the effective date of the AD, whichever occurs first. The estimated cost to design and certificate such a hinge is $45,000. FedEx estimates that parts for a fail-safe door hinge will cost $2,600 per airplane, while installation will cost $11,520 per airplane, for 192 work hours of labor. Cost for parts and labor for 120 affected Boeing Model 727 series airplanes is estimated to be $1.7 million.

Paragraph (c) of the AD requires that, if any crack or discrepancy is detected during the inspection required by paragraph (a) or (b)(1) of the AD, a repair must be made prior to further flight. The cost of this repair is not attributable to this AD.

For purposes of analysis, the FAA assumes an effective date some time in the fourth quarter of 2002. The cost to comply with paragraphs (a) through (c) is $3.3 million, undiscounted, or $2.9 million discounted to present value. The FAA assumes that the installation of the main deck cargo door hinge (paragraph (b)(2) of this AD) will be accomplished at the same time as the detailed inspection of fastener holes (paragraph (b)(1) of this AD). The FAA also assumes that FedEx will perform these two activities uniformly throughout the 36-month compliance time. Finally, the certification cost for the main deck cargo door hinge is expected to be incurred within the first 6 months after the effective date of this AD.

2. Main Deck Cargo Door Systems

Work on the door systems relates to paragraphs (d) and (e) of the AD. Paragraph (d) of the AD requires, within 60 days after the effective date of this AD, the revising of the Limitations Section of the FAA-approved AFM Supplement to provide the flight crew with procedures for ensuring that all power is removed from the main deck cargo door prior to dispatch of the airplane, and that the main deck cargo door is closed, latched, and locked prior to dispatch of the airplane. In addition, paragraph (d) of the AD requires the installation of any associated placards.

FedEx assumes that an external inspection of the flushness of the main deck cargo door, combined with an ''enhanced B-check,'' will be an acceptable interim means to ensure that the cargo door is secured prior to dispatch. Concerning the external inspection, before redesigned door systems are installed (see paragraph (f) of this AD) FedEx estimates that it will take a mechanic 30 minutes to inspect for flushness of the main deck cargo door prior to dispatch. FedEx also estimates that there are 64 flights per day among the 120 affected Boeing Model 727 series airplanes, and that these airplanes fly 260 days per year. Consequently, the estimated cost per inspection, until the door systems are changed, is $30 or $4,133 per airplane, per year. In addition, FedEx estimates that the setup costs for the daily inspection (i.e., procedure materials for the cadre of mechanics to perform the inspection, and for training requirements) will be $50,000.

The occurrence of the ''enhanced B-checks'' on the affected Boeing Model 727 series airplanes is anticipated to occur twice a year. FedEx estimates that the incremental cost for maintenance during these ''enhanced B-checks'' is $11,700 per airplane, per year, until door systems are changed.

Consequently, based on the two activities described above, the FAA estimates the cost for satisfying the requirements of paragraph (d) of this AD at $5.8 million undiscounted, over 36 months, or $5.0 million discounted. These activities will occur until the incorporation of redesigned door systems. Again, the FAA assumes that these activities will occur uniformly over the 36-month compliance time.

Paragraph (e) of this AD requires, within 36 months after the effective date of the AD, incorporation of redesigned main deck cargo door systems. FedEx estimates that the development and certification of the systems will cost $212,000. FedEx estimates that modification parts will cost $110,000 per airplane, and that labor costs will be $34,560 per airplane. FedEx also estimates that 40 percent of the fleet will be modified during a scheduled maintenance visit. The remainder of the fleet will be out of service for an additional 4 days. Based on a lease rate of $6,100 per day, the FAA estimates that the cost of downtime for the fleet will be $1.8 million over the 36-month compliance time. Consequently, the estimated cost for incorporating redesigned door systems for the fleet of 120 affected Boeing Model 727 series airplanes (paragraph (d) of this AD) is $19.3 million. This includes $212,000 for design and certification costs, and $1.8 million for additional downtime.

The total cost to comply with the requirements for incorporating redesigned main deck cargo door systems is $25.1 million, undiscounted, or $21.9 million, discounted.

3. 9g Crash Barrier

Paragraph (f) of this AD requires, within 36 months or 4,000 flight cycles after the effective date of the AD, whichever occurs first, installation of a

main deck cargo barrier that complies with the applicable requirements of CAR part 4b. FedEx estimates that the development and certification of a 9g crash barrier will cost $94,500, that parts will cost $30,000 per airplane, and that labor will cost $23,040 per airplane.

The FAA assumes that FedEx will install 9g crash barriers in their affected fleet uniformly over the 36-month compliance time. Consequently, the total non-discounted cost for this item is estimated to be $6.4 million, or $5.6 million, discounted to present value.

4. AMOC and Special Flight Permits

Paragraph (g) of the AD allows an AMOC or adjustment of compliance time that provides an acceptable level of safety if approved by the Manager of the Atlanta ACO. The FAA is unable to determine the cost of an AMOC, but assumes that it will be less than the cost of complying with the provisions in paragraphs (a) through (f) of the AD.

Paragraph (h) of the AD allows special flight permits in accordance with the regulations to operate an affected airplane to a location where the requirements of the AD could be accomplished.

5. Total Cost of the AD

The FAA estimates that the total compliance cost of the AD will be $34.8 million, undiscounted, or $30.4 million, discounted to present value.

Regulatory Flexibility Analysis

The Regulatory Flexibility Act (RFA) of 1980 establishes as ''a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation.'' To achieve that principle, the RFA of 1980 requires agencies to solicit and consider flexible regulatory proposals and to explain the rationale for their actions. The RFA of 1980 covers a wide-range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions.

Agencies must perform an assessment of all rules to determine whether a proposed or final rule will have a significant economic impact on a substantial number of small entities. If the determination is that the rule will have such an impact, the agency must prepare a regulatory flexibility analysis as described in the RFA of 1980. However, if after an assessment of a proposed or final rule, an agency determines that a rule is not expected to have a significant economic impact on a substantial number of small entities, Section 605(b) of the RFA of 1980 provides that the head of the agency may so certify. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

The FAA conducted the required assessment of this rule, and determined that it will not have a significant impact on a substantial number of small entities. Only one operator, FedEx, is affected by this AD; and FedEx is not a small entity (it employs more than 1,500 people). Consequently, the FAA certifies that this AD will not have a significant economic impact on a substantial number of small entities.

Unfunded Mandates

The Unfunded Mandates Reform Act of 1995 (the Act), enacted as Public Law 104–4 on March 22, 1995, is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local, and tribal governments.

Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of $100 million or more (adjusted annually for inflation) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector. Such a mandate is deemed to be a ''significant regulatory action.''

This AD does not contain such a mandate. Therefore, the requirements of Title II of the Act do not apply.

Federalism Assessment

The regulations of this AD will not have a substantial direct effect 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 13132, it is determined that this AD will not have sufficient federalism implications to warrant the preparation of a federalism assessment.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Safety.

Adoption of the Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, the Federal Aviation Administration amends part 39 of the Federal Aviation Regulations (14 CFR part 39) as follows:

PART 39—AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

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

§ 39.13 [Amended]

2. Section 39.13 is amended by adding the following new airworthiness directive:

2002–16–19 Boeing: Amendment 39–12858. Docket 97–NM–232–AD.

Applicability: Model 727 series airplanes that have been converted from a passenger- to a cargo-carrying (''freighter'') configuration in accordance with Supplemental Type Certificate (STC) SA1767SO or SA1768SO; certificated in any category.

Note 1: This AD applies to each airplane identified in the preceding applicability provision, regardless of whether it has been otherwise modified, altered, or repaired in the area subject to the requirements of this AD. For airplanes that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must request approval for an alternative method of compliance in accordance with paragraph (g) of this AD. The request should include an assessment of the effect of the modification, alteration, or repair on the unsafe condition addressed by this AD; and, if the unsafe condition has not been eliminated, the request should include specific proposed actions to address it.

Compliance: Required as indicated, unless accomplished previously.

To prevent structural failure of the main deck cargo door hinge or failure of the cargo door system, which could result in the loss or opening of the cargo door while the airplane is in flight, and consequent rapid decompression of the airplane, including possible loss of flight control or severe structural damage; and to prevent failure of the main deck cargo barrier during an emergency landing, which could injure occupants; accomplish the following:

Actions Addressing the Main Deck Cargo Door Hinge

(a) Prior to the accumulation of 4,000 flight cycles since accomplishment of the installation of the main deck cargo door, or within 250 flight cycles after the effective date of this AD, whichever occurs later, perform a detailed inspection of the external surface of the main deck cargo door hinge (both fuselage and door side hinge elements) to detect cracks.

Note 2: For the purposes of this AD, a detailed inspection is defined as: ''An intensive visual examination of a specific structural area, system, installation, or assembly to detect damage, failure, or irregularity. Available lighting is normally supplemented with a direct source of good lighting at intensity deemed appropriate by the inspector. Inspection aids such as mirror, magnifying lenses, etc., may be used. Surface cleaning and elaborate access procedures may be required.''

(b) Within 36 months or 4,000 flight cycles after the effective date of this AD, whichever occurs first, accomplish paragraphs (b)(1) and (b)(2) of this AD.

(1) Perform a detailed inspection of the mating surfaces of both the hinge and the door skin and external fuselage doubler underlying the hinge to detect cracks or other discrepancies (e.g., double or closely drilled holes, corrosion, chips, scratches, or gouges). The detailed inspection shall be accomplished in accordance with a method approved by the Manager, Atlanta Aircraft Certification Office (ACO), FAA. The requirements of this paragraph may be accomplished prior to or concurrently with the requirements of paragraph (b)(2) of this AD.

(2) Install a main deck cargo door hinge that complies with the applicable requirements of Civil Air Regulations (CAR) part 4b, including fail-safe requirements, in accordance with a method approved by the Manager, Atlanta ACO.

(c) If any crack or discrepancy is detected during the detailed inspection required by either paragraph (a) or (b)(1) of this AD, prior to further flight, repair in accordance with a method approved by the Manager, Atlanta ACO.

Note 3: Accomplishment of the actions in accordance with Federal Express E.O. Revision Record 7–5230–7–5000, Revision B, release date December 18, 2001, constitutes compliance with the requirements of paragraphs (b) and (c) of this AD.

Actions Addressing the Main Deck Cargo Door Systems

(d) Within 60 days after the effective date of this AD, revise the Limitations Section of the FAA-approved Airplane Flight Manual (AFM) Supplement by inserting therein the procedures specified in paragraphs (d)(1) and (d)(2) of this AD, and install any associated placards. The AFM revision procedures and installation of any associated placards shall be accomplished in accordance with a method approved by the Manager, Atlanta ACO.

(1) Procedures to ensure that all power is removed from the main deck cargo door prior to dispatch of the airplane.

(2) Procedures to ensure that the main deck cargo door is closed, latched, and locked prior to dispatch of the airplane.

Note 4: Accomplishment of the procedures for ensuring that the main deck cargo door is closed, latched, and locked prior to dispatch, in accordance with Federal Express Service Bulletin FX727–2001–5230–01, dated July 30, 2001, constitutes compliance with the requirements of paragraph (d) of this AD.

(e) Within 36 months after the effective date of this AD, incorporate redesigned main deck cargo door systems (*e.g.*, warning/monitoring, power control, view ports, and means to prevent pressurization to an unsafe level if the main deck cargo door is not closed, latched, and locked), including any associated procedures and placards, that comply with the applicable requirements of CAR part 4b and criteria specified in Appendix 1 of this AD; in accordance with a method approved by the Manager, Atlanta ACO.

Note 5: The design data submitted for approval should include a Systems Safety Analysis and Instructions for Continued Airworthiness that are acceptable to the Manager, Atlanta ACO.

Note 6: Installation of National Aircraft Service, Inc. (NASI), Vent Door System STC ST01438CH, is an acceptable means of compliance with the requirements of paragraph (e) of this AD.

Actions Addressing the Main Deck Cargo Barrier

(f) Within 36 months or 4,000 flight cycles after the effective date of this AD, whichever occurs first, install a main deck cargo barrier that complies with the applicable requirements of CAR part 4b, in accordance with a method approved by the Manager, Atlanta ACO.

Note 7: The maximum main deck total payload that can be carried is limited to the lesser of the approved cargo barrier weight limit, weight permitted by the approved maximum zero fuel weight, weight permitted by the approved main deck position weights, weight permitted by the approved main deck running load or distributed load limitations, or approved cumulative zone or fuselage monocoque structural loading limitations (including lower hold cargo).

Alternative Methods of Compliance

(g) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, Atlanta ACO. Operators shall submit their requests through an appropriate FAA Principal Maintenance Inspector, who may add comments and then send it to the Manager, Atlanta ACO.

Note 8: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Atlanta ACO.

Special Flight Permits

(h) Special flight permits may be issued in accordance with §§ 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

Effective Date

(i) This amendment becomes effective on September 19, 2002.

Appendix 1

Excerpt from an FAA Memorandum to the Director-Airworthiness and Technical Standards of ATA, dated March 20, 1992

''(1) *Indication System:*

(a) The indication system must monitor the closed, latched, and locked positions, directly.

(b) The indicator should be *amber* unless it concerns an outward opening door whose opening during takeoff could present an immediate hazard to the airplane. In that case the indicator must be *red* and located in plain view in front of the pilots. An aural warning is also advisable. A display on the master caution/warning system is also acceptable as an indicator. For the purpose of complying with this paragraph, an immediate hazard is defined as significant reduction in controllability, structural damage, or impact with other structures, engines, or controls.

(c) Loss of indication or a false indication of a closed, latched, and locked condition must be improbable.

(d) A warning indication must be provided at the door operators station that monitors the door latched and locked conditions directly, unless the operator has a visual indication that the door is fully closed and locked. For example, a vent door that monitors the door locks and can be seen from the operators station would meet this requirement.

(2) *Means to Visually Inspect the Locking Mechanism:*

There must be a visual means of directly inspecting the locks. Where all locks are tied to a common lock shaft, a means of inspecting the locks at each end may be sufficient to meet this requirement provided no failure condition in the lock shaft would go undetected when viewing the end locks. Viewing latches may be used as an alternate to viewing locks on some installations where there are other compensating features.

(3) *Means to Prevent Pressurization:*

All doors must have provisions to prevent initiation of pressurization of the airplane to an unsafe level, if the door is not fully closed, latched and locked.

(4) *Lock Strength:*

Locks must be designed to withstand the maximum output power of the actuators and maximum expected manual operating forces treated as a limit load. Under these conditions, the door must remain closed, latched and locked.

(5) *Power Availability:*

All power to the door must be removed in flight and it must not be possible for the flight crew to restore power to the door while in flight.

(6) *Powered Lock Systems:*

For doors that have powered lock systems, it must be shown by safety analysis that inadvertent opening of the door after it is fully closed, latched and locked, is extremely improbable.''

Issued in Renton, Washington, on August 6, 2002.

Vi Lipski,

Manager, Transport Airplane Directorate, Aircraft Certification Service.

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