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DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 23

[Docket No. CE273; Special Conditions 23–213–SC

Special Conditions; Adam Aircraft Industries Model A700; External Fuel Tank Protection During Gear-Up or Emergency Landing

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued for the Adam Aircraft Industries Model A700 airplane. This airplane will have a novel or unusual design feature(s) associated with an External Centerline Fuel Tank (ECFT) that increases the total capacity of fuel by 184 gallons. The tank is located below the fuselage pressure shell immediately below the wing. The Adam A700 ECFT is a novel, unusual and a potentially unsafe design feature that may pose a hazard to the occupants during a gear-up or emergency landing due to fuel leakage and subsequent fire. Traditional aircraft construction places the fuel tanks in a protected area within the wings and/or fuselage. Fuel tanks located in these areas are well above the fuselage skin and are inherently protected by the wing and fuselage structure. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: *Effective Date:* December 26, 2007.

FOR FURTHER INFORMATION CONTACT: Peter L. Rouse, Federal Aviation Administration, Aircraft Certification Service, Small Airplane Directorate, ACE–111, 901 Locust, Room 301, Kansas City, Missouri 64106; 816–329–4135, fax 816–329–4090.

SUPPLEMENTARY INFORMATION:

Background

On April 12, 2004, Adam Aircraft Industries applied for a type certificate for their new model A700. The model A700 aircraft is a 6–8 seat pressurized, retractable-gear, carbon composite structure, airplane with two turbofan engines mounted on the aft fuselage. The A700 aircraft is a design evolution of the previously certificated Adam A500, with the aft fuselage mounted turbofan engines replacing the two centerline thrust, turbocharged, reciprocating engines. To maintain a max cruise range similar to the A500 and consistent with other aircraft in the same class as the A700, an external fuel tank located below the fuselage pressure shell and immediately below the wing, has been incorporated in to the A700 design. The A700 and its external fuel tank location are shown in Figure 1:

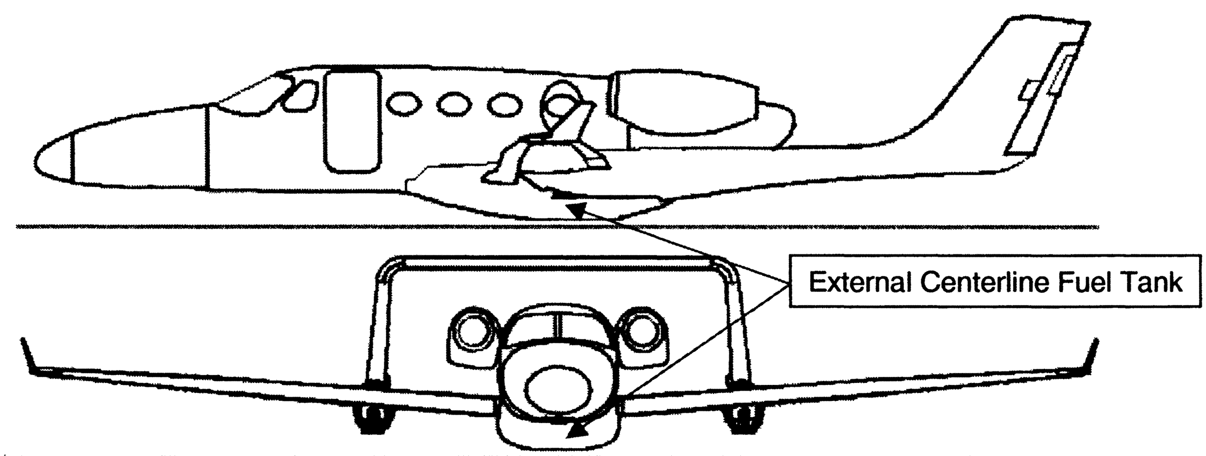

Figure 1 – A700 Side and Front View

The Adam A700 ECFT is a novel, unusual and a potentially unsafe design feature that may pose a hazard to the occupants during a gear-up or emergency landing due to fuel leakage and subsequent fire. Conventional aircraft construction places the fuel tanks in a protected area within the wings and/or fuselage. Fuel tanks located in these areas are well above the fuselage skin and are inherently protected by the wing and fuselage structure.

The A700 ECFT must meet the inherent qualities associated with the protection of the fuel system as provided by 14 CFR part 23. The FAA requires Adam Aircraft to address the following areas with their ECFT design:

1. Load Path: Conventional design approaches establish independent load paths from the keel/skid plate to the airframe major structure where the fuel tanks are isolated from reacting to the gear-up or emergency landing loads. The A700 ECFT design must react to the gear-up or emergency landing loads in a similar manner.

2. Fuel Management: Conventional design approaches use fuel tanks located outside of the wings, or wing centerbox, as auxiliary fuel tanks, and not primary fuel tanks. The fuel in the auxiliary fuel tanks is depleted before the primary fuel tanks, thus the auxiliary tanks are usually empty upon landing. In a similar manner, the A700 ECFT must be an auxiliary fuel tank, and not primary fuel tank. The A700 must deplete the fuel in the ECFT before depleting the fuel in the primary fuel tanks.

3. Location/Geometry: A700 must preclude the scenario where the fuel tank is the first point of contact with the ground in a gear-up or emergency landing.

Regulatory Review and Discussion

14 CFR parts 11, 21, 23 and 25 regulations that pertain to the regulatory authority for special conditions, certification of unsafe conditions, structural design criteria, testing and location of the ECFT are §§ 11.19, 21.16, 21.21(b)(2), 23.303, 23.473(d), 23.561, 23.721, 23.967, 23.994 and 25.963.

The following rules provide a regulatory framework in which to apply additional requirements, beyond the existing requirements, in order to address novel, unusual and potentially unsafe design features.

A special condition is defined in 14 CFR part 11, § 11.19:

Section 11.19

A special condition is a regulation that applies to a particular aircraft design. The FAA issues special conditions when we find that the airworthiness regulations for an aircraft, aircraft engine, or propeller design do not contain adequate or appropriate safety standards, because of a novel or unusual design feature.

A special condition is applied via the criteria defined in 14 CFR part 21, § 21.16:

Section 21.16

If the Administrator finds that the airworthiness regulations of this subchapter do not contain adequate or appropriate safety standards for an aircraft, aircraft engine, or propeller because of a novel or unusual design feature of the aircraft, aircraft engine or propeller, he prescribes special conditions and amendments thereto for the product. The special conditions are issued in accordance with part 11 of this chapter and contain such safety standards for the aircraft, aircraft engine or propeller as the Administrator finds necessary to establish a level of safety equivalent to that established in the regulations.

An unsafe condition is defined in 14 CFR part 21, § 21.21(b)(2):

Section 21.21

An applicant is entitled to a type certificate for an aircraft in the normal, utility, acrobatic, commuter, or transport category, or for a manned free balloon, special class of aircraft, or an aircraft engine or propeller, if—

(b) The applicant submits the type design, test reports, and computations necessary to show that the product to be certificated meets the applicable airworthiness, aircraft noise, fuel venting, and exhaust emission requirements of the Federal Aviation Regulations and any special conditions prescribed by the Administrator, and the Administrator finds—

(2) For an aircraft that no feature or characteristic makes it unsafe for the category in which certification is requested.

External fuel tank installations below the wing or fuselage were not envisioned in the development of 14 CFR part 23 fuel tank (and fuel system) regulations. As such, regulations that are not directly applicable to conventional fuel tank installations, but related to the novel, unusual and potentially unsafe design features were reviewed. The following 14 CFR part 23 certification requirements do contain regulatory language that can be used to determine the adequate or appropriate safety standards for novel, unusual and potentially unsafe design features of the Adam A700 ECFT.

Section 23.303

Unless otherwise provided, a factor of safety of 1.5 must be used.

Section 23.473(d)

The selected limit vertical inertia load factor at the center of gravity of the airplane for the ground load conditions prescribed in this subpart may not be less than that which would be obtained when landing with a descent velocity (V), in feet per second, equal to 4.4 $(W/S)^{1/4}$ except that this velocity need not be more than 10 feet per second and may not be less than seven feet per second.

Section 23.721

For commuter category airplanes that have a passenger seating configuration, excluding pilot seats, of 10 or more, the following general requirements for the landing gear apply:

(a) The main landing-gear system must be designed so that if it fails due to overloads during takeoff and landing (assuming the overloads to act in the upward and aft directions), the failure mode is not likely to cause the spillage of enough fuel from any part of the fuel system to constitute a fire hazard.

(b) Each airplane must be designed so that, with the airplane under control, it can be landed on a paved runway with any one or more landing-gear legs not extended without sustaining a structural component failure that is likely to cause the spillage of enough fuel to constitute a fire hazard.

(c) Compliance with the provisions of this section may be shown by analysis or tests, or both.

14 CFR part 23, §§ 23.303 and 23.473(d) relate to the associated margin of safety required above the limit loading condition and the required limit ground loading conditions. 14 CFR part 23, § 23.721 is applicable to commuter category airplanes; however, the intent is to ensure that the failure of the landing gear does not cause the spillage of enough fuel from any part of the fuel system to constitute a fire hazard. The location of the ECFT, in direct line behind the nose landing gear, makes it particularly vulnerable to failures of the nose landing gear.

14 CFR part 23 contains a limited scope of regulatory requirements pertaining to fuel tank (and fuel system) protection during a gear-up or emergency landing. These current regulations pertaining to the fuel tank (and fuel system) state:

Section 23.561(b)

The structure must be designed to [give each occupant every reasonable chance of escaping serious injury when—

(1) Proper use is made of seats, safety belts, and shoulder harnesses provided for in the design;

(2) The occupant experiences the static inertia loads corresponding to the following ultimate load factors—

(i) Upward, 3.0g for normal, utility, and commuter category airplanes, or 4.5g for acrobatic category airplanes;

(ii) Forward, 9.0g;
(iii) Sideward, 1.5g; and
(iv) Downward, 6.0g when certification to the emergency exit provisions of Sec. 23.807(d)(4) is requested; and
(3) The items of mass within the cabin, that could injure an occupant, experience the static inertia loads corresponding to the following ultimate load factors—
(i) Upward, 3.0g;
(ii) Forward, 18.0g; and
(iii) Sideward, 4.5g.

Section 23.561(c)

Each airplane with retractable landing gear must be designed to protect each occupant in a landing—
(1) With the wheels retracted;
(2) With moderate descent velocity; and
(3) Assuming, in the absence of a more rational analysis—
(i) A downward ultimate inertia force of 3g; and
(ii) A coefficient of friction of 0.5 at the ground.

Section 23.967(a)

Each fuel tank must be able to withstand, without failure, the vibration, inertia, fluid, and structural loads that it may be subjected to in operation.

Section 23.967(e)

Fuel tanks must be designed, located, and installed so as to retain fuel:
(1) When subjected to the inertia loads resulting from the ultimate static load factors prescribed in § 23.561(b)(2) of this part; and
(2) Under conditions likely to occur when the airplane lands on a paved runway at a normal landing speed under each of the following conditions:
(i) The airplane in a normal attitude and its landing gear retracted.
(ii) The most critical landing gear leg collapsed and the other landing gear legs extended.

Section 23.994

Fuel system components in an engine nacelle or in the fuselage must be protected from damage which could result in spillage of enough fuel to constitute a fire hazard as a result of a wheels-up landing on a paved runway.

The regulatory requirements of § 23.967(e)(1) refer to § 23.561(b)(2), which is an occupant protection rule. The requirements of § 23.561(b)(2) do not have a downward component for non-commuter category airplanes. To comply with the requirements of § 23.967(e)(2), the moderate descent velocity identified in § 23.561(c)(2), which is also an occupant protection rule, has been used as an acceptable means of compliance for traditional fuel tank designs that do not have novel, unusual and potentially unsafe design features. These regulations have historically demonstrated an acceptable level of safety for traditional fuel tank designs that do not have novel, unusual and potentially unsafe design features. Existing aircraft designs with this satisfactory service history have the fuel tanks located well above the fuselage skin and are inherently protected by the wing and the fuselage structure, thus providing a ''crush zone.''

The intent of 14 CFR part 23, § 23.994 is to minimize the hazard to the airplane due to fuel system components that are affected (those which are traditionally located in the fuselage or engine nacelle) when the underside of the airplane contacts the ground in a wheels-up landing. The intent is applicable to those components below the fuselage.

14 CFR part 23 guidance materials recognize that there may be situations when the installation of an auxiliary fuel tanks will require special conditions because of a novel, unusual and potentially unsafe design feature. Advisory Circular (AC) 23–10, Auxiliary Fuel Systems for Reciprocating and Turbine Powered Part 23 Airplanes, states in paragraph 5:

5. Certification Basis

a. New Type Certificates. For the issuance of a new type certificate, an airplane must be shown to comply with the certification basis established in accordance with § 21.17 of the Federal Aviation Regulations (FAR). If the regulations do not provide adequate or appropriate standards because of a novel or unusual design feature, special conditions will be prescribed in accordance with § 21.16.

c. Unsafe Features or Characteristics. Notwithstanding compliance with the established certification basis, § 21.21 precludes approval if there is any feature or characteristic that makes the airplane unsafe. The applicant should recognize that it may be necessary, because of such a feature or characteristic, to impose special requirements which exceed the standards of the certification basis, to eliminate the unsafe condition.

Since 14 CFR part 23 airworthiness regulations do not contain adequate or appropriate safety standards for the external fuel tank design, a review of the safety standards contained in 14 CFR part 25 was conducted to evaluate their applicability to the novel, unusual and potentially unsafe design feature of the ECFT. 14 CFR part 25, § 25.963 has regulatory requirements that ensure that fuel tanks within the fuselage contour are in a protected position.

Section 25.963(d)

Fuel tanks within the fuselage contour must be able to resist rupture, and to retain fuel, under the inertia forces prescribed for the emergency landing conditions in Sec. 25.561. In addition, these tanks must be in a protected position so that exposure of the tanks to scraping action with the ground is unlikely.

Section 25.963(e)(1)

Fuel tank access covers must comply with the following criteria in order to avoid loss of hazardous quantities of fuel:
(1) All covers located in an area where experience or analysis indicates a strike is likely must be shown by analysis or tests to minimize penetration and deformation by tire fragments, low energy engine debris, or other likely debris.

14 CFR part 25, § 25.963(d) is applicable to transport category airplanes; however, the intent is to ensure that in the event of an emergency landing, the fuel tank is in a protected position so that exposure of the tank to scraping action with the ground is unlikely. The location of the ECFT, located below the fuselage, makes it particularly vulnerable to scraping action with the ground in the event of a gear-up landing.

14 CFR part 25, § 25.963(e) is applicable to transport category airplanes, and only applies to the access panels; however, the intent is to prevent a hazard as a result of the impact by tire fragments or debris. This philosophy would be applied to the ECFT (not just access panels) to prevent hazardous leakage of fuel in the event of impact from tire fragments or other likely debris.

14 CFR part 25 guidance materials also recognize the need to protect the auxiliary fuel tanks beyond the velocities used as an acceptable means of compliance. The first chapter of AC 25–8, Auxiliary Fuel Systems Installations, is titled ''Fuel System Installation Integrity and Crashworthiness'' and the first paragraph states the following:

''Survivable accidents have occurred at vertical descent velocities greater than the 5 feet per second (f.p.s.) referenced in § 25.561. The energy from such descents is absorbed by the structure along the lower fuselage. As the limits of survivable accidents are approached, structure under the main cabin floor is crushed and deformed and the volume below the floor, where the auxiliary fuel tanks are frequently located, may be reduced and reshaped. For this reason the tank material chosen by the applicant should provide resilience and flexibility; or, in the absence of these characteristics, the tank installation should provide extra clearance from structure that can be crushed or be protected by primary structure not likely to be crushed.''

Due to the concern of the Adam A700 ECFT to potentially contact the ground in a gear-up or emergency landing, we contacted the FAA Office of Accident Investigation, Safety Analysis Branch to determine the number of incidents/accidents where an aircraft landed with the landing gear retracted or the landing gear collapsed on the ground. The search used was conducted over a 25 year period from January 1982 thru January 2007, and queried all N-registered aircraft that were not 14 CFR parts 121, 135, or 129 and that had at least one of the following occurrence codes:

Gear Collapsed
Main Gear Collapsed
Nose Gear Collapsed
Tail Gear Collapsed
Complete Gear Collapsed
Other Gear Collapsed
Gear Not Extended
Gear Not Retracted
Gear Retraction On Ground

During the queried timeframe, there were 740 reported incidents/accidents, which yields an average of 30 reported incidents/accidents per year. There were no injuries or fatalities associated with the 740 reported incidents/accidents. All of the reported incidents/accidents involved aircraft having fuel in the center section of the wing area confined by the front and rear spars and the side of body wing ribs. The data shows a high probability for a landing gear failure, malfunction or not being extended during landing and that there is a good safety record for configurations involved in these incidents/accidents. The certification standards for the Adam A700 ECFT need to consider the placement of the ECFT outside of the protective wing area confined by the front and rear spars and the side of body wing ribs configurations, and the high probability of the ECFT contacting the ground.

Because of the Adam A700 ECFT's novel, unusual and potentially unsafe design features, it is necessary to impose a specific vertical velocity requirement that exceed the 5 feet per second requirement normally imposed on conventional airplane fuel tank designs. Conventionally installed fuel tanks, located within the fuselage and wing primary structure, have used § 23.561(c)(2) as an acceptable means of compliance to the requirements of § 23.967(e)(2). Fuel tank installations are not bound by regulatory requirements to use § 23.561(c)(2) as an acceptable means of compliance to the requirements of § 23.967(e)(2). The standards contained in § 23.561(c)(2), which is an occupant protection rule, provided adequate or appropriate standards for conventionally installed fuel tanks. Initially, the FAA proposed to use the vertical velocity requirements (26.8 feet per second) contained in § 23.562 as a means of compliance to the requirements of § 23.967(e)(2), as this rule is also an occupant protection rule. The velocities cited in the two occupant protection rules range from 5 feet per second to 26.8 feet per second. The velocity cited in § 23.561(c)(2) is the velocity for a minor crash landing, where the velocity in § 23.562 is the upper limit of a survivable crash landing. The requirements contained in § 23.967(e)(2) allow for the conditions likely to occur, and the range of velocities likely to occur during a survivable crash landing (5 feet per second—26.8 feet per second). Given that there is a range of velocities that define a survivable crash landing, there is ample regulatory room in which to determine an acceptable means of compliance. The FAA proposal to use the vertical velocity requirements contained in § 23.562 as a means of compliance to the requirements of § 23.967(e)(2) for the initially proposed ECFT design, was withdrawn by the FAA due to Adam Aircraft proposing to redesign the ECFT. As such, the FAA researched the standards within 14 CFR part 23 to determine a vertical velocity within the range of velocities likely to occur that provide adequate or appropriate standards, mitigate potential unsafe conditions, and do not exceed the intent of the rule. The normal precision approach speed for the Adam A700 will be approximately 120 KIAS. This approach speed will result in a normal vertical descent velocity of 10.6 feet per second. The normal precision approach speed is a speed that falls within the speeds that are likely to occur when the airplane lands on a paved runway at a normal landing speed. 14 CFR part 23, § 23.473(d) requires that the aircraft be able to absorb a limit load imposed by a vertical descent velocity of 10 feet per second for landing conditions. Combining the velocity requirements of § 23.473(d) and a commensurate 1.5 factor of safety, as required by § 23.303, would result in a vertical descent velocity of 12.25 feet per second. The derivation used to determine the ultimate velocity based upon the § 23.473(d) limit vertical inertia load and the factor of safety defined in § 23.303 is shown below:

The relationship between velocity, acceleration and distance is shown by the equation:

$$V_2^2 = V_1^2 + 2\,a\,d$$

The relationship between force and acceleration is shown by the equation:

$$F = ma$$

The relationship between limit force (load) and ultimate force (load) is shown by the equation:

$$F_{Ultimate} = F_{Limit}\,C_{FactorofSafety}$$

Assuming a constant mass of the object, an ending velocity of zero and grouping the terms:

$$V_{Limit}^2 = 2\,\frac{F_{Limit}}{m}\,d \quad \text{and} \quad V_{Ultimate}^2 = 2\,\frac{F_{Limit}\,C_{Factor\ of\ Safety}}{m}\,d$$

Thus, the relationship between limit velocity and ultimate velocity is shown by the equation:

$$V_{Ultimate} = V_{Limit}\sqrt{C_{Factor\ of\ Safety}}$$

Conventional airplanes with fuel tanks located below the fuselage are designed such that the ground impact loads are not absorbed by the tanks. Fuel tanks in these locations are especially vulnerable to these ground impact loads if design precautions/mitigations are not taken. If the ECFT is designed such that it absorbs gear-up landing loads, a gear-up landing could damage the ECFT and result in the spillage of enough fuel to constitute a fire hazard. The location of the A700 ECFT must be evaluated for ground impact in a gear-up landing, and design precautions/mitigations must be taken such that load paths do not go through the fuel tanks. The location of the A700 ECFT must be evaluated for exposure of the tank to impact from runway debris or from fragments emanating from failures of the tires. The location of the ECFT, below and in direct line behind the nose landing gear, makes it particularly vulnerable to debris from failures of the nose landing gear tires.

The A700 ECFT, compared to other designs that have fuel tanks located outside of the wings, was the only design that contained a significant percentage of the total fuel quantity of fuel below the fuselage. Existing designs, that have fuel tanks located outside of the wings, have their relatively smaller percentage of the total fuel quantity in their lower fuselage tanks and it is transferred out to the primary fuel tanks, so they are emptied early in the flight. The existing designs, that have fuel tanks located outside of the wings, use the fuel tanks below the fuselage as auxiliary fuel tanks, and they do not feed the engines directly, but rather are used to replenish the primary fuel tanks. The A700 ECFT design indicates the ECFT is an auxiliary fuel tank, does not feed the engines directly, but rather is used to replenish the primary fuel tanks. If the ECFT design is an auxiliary fuel tank, and it does not feed the engines directly, but rather is used to replenish the primary fuel tanks, it would provide mitigation by using the fuel quantity located in the ECFT, thus the ECFT is emptied early in the flight.

Based on our current understanding of the A700 ECTF design, the FAA agrees that Adam Aircraft may have provided the following mitigating design features:

1. The keel and truss assembly that make up the protective structure in current A700 ECFT design configuration affords the equivalent level of protection as currently certificated aircraft with fuel tanks located in the wings, or wing centerbox. The keel and truss assembly provide a structurally independent load path that does not transmit the ground impact forces through the ECFT during a gear-up or emergency landing, and also protects the ECFT from ground contact by providing protective structure.

2. The ECFT is an auxiliary fuel tank, and it does not feed the engines directly, but rather is used to replenish the primary fuel tanks. The fuel in the ECFT will be used before the fuel in the wing tanks.

The mitigating features offered by Adam Aircraft: independent load path, fuel management, and location/geometry, coupled with dynamic drop testing and a subsequent rational structural analysis using static test results and the dynamic drop test results, provide the FAA with sufficient justification to reduce the descent velocity from 12.25 feet per second to no less then 5 feet per second.

Type Certification Basis

Under the provisions of 14 CFR 21.17, Adam Aircraft Industries must show that the model A700 meets the applicable provisions of 14 CFR part 23, as amended by Amendments 23–1 through 23–55 thereto.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 23) do not contain adequate or appropriate safety standards for the model A700 because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

In addition to the applicable airworthiness regulations and special conditions, the Model model A700 must comply with the fuel vent and exhaust emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36, and the FAA must issue a finding of regulatory adequacy pursuant to § 611 of Public Law 92–574, the ''Noise Control Act of 1972''.

Special conditions, as appropriate, as defined in § 11.19, are issued in accordance with § 11.38, and become part of the type certification basis in accordance with § 21.17(a)(2).

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, the special conditions would also apply to the other model under the provisions of § 21.101(a)(1).

Novel or Unusual Design Features

The model A700 will incorporate the following novel or unusual design features:

External Centerline Fuel Tank (ECFT)

Discussion of Comments

Notice of proposed special conditions No. 23–07–03–SC for the Adam Aircraft Industries Model A700 airplanes was published in the **Federal Register** on Tuesday, September 18, 2007, Vol. 72, No. 180. No comments were received, and the special conditions are adopted as proposed.

Applicability

As discussed above, these special conditions are applicable to the Adam Aircraft Industries Model A700. Should Adam Aircraft Industries apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well under the provisions of § 21.101(a)(1).

[For Final Special Conditions Effective Upon Issuance]

Under standard practice, the effective date of final special conditions would be 30 days after the date of publication in the **Federal Register**; however, as the certification date for the Adam Aircraft Industries Model A700 is imminent, the FAA finds that good cause exists to make these special conditions effective upon issuance.

Conclusion

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

List of Subjects in 14 CFR Part 23

Aircraft, Aviation safety, Signs and symbols.

Citation

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

Authority: 49 U.S.C. 106(g), 40113 and 44701; 14 CFR 21.16 and 21.17; and 14 CFR 11.38 and 11.19.

The Special Conditions

■ Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Adam Aircraft Industries Model A700 airplanes.

1. SC 23.561(c): Each airplane with retractable landing gear and external fuel tank system(s) located beneath the fuselage must be designed to protect each occupant in a landing—

1. With the wheels retracted;

2. With descent velocity of 12.25 feet per second UNLESS mitigating design features are incorporated that address:

i. Independent load path

ii. Fuel management

iii. Location/Geometry

iv. Other safety enhancing design features as proposed by the applicant.

If adequate mitigation is demonstrated for all the above design features, the FAA will reduce the descent velocity to no less then 5 feet per second; and

3. By defining, based on a rational analysis, supported by tests:

i. A downward ultimate inertia force; and

ii. A coefficient of friction of 0.5, or a rational analysis for a coefficient of friction, at the ground.

Compliance with SC 23.561(c)(2) will be demonstrated by dynamic drop test.

2. SC 23.721: The following general requirements for the landing gear apply:

1. The landing-gear system must be designed so that if it fails due to overloads during takeoff and landing (assuming the overloads to act in the upward and aft directions), the failure mode is not likely to cause the spillage of enough fuel from any part of the external fuel tank system(s) located beneath the fuselage to constitute a fire hazard.

2. The airplane must be designed so that, with the airplane under control, it can be landed on a paved runway with any one or more landing-gear legs not extended without sustaining a structural component failure that is likely to cause the spillage of enough fuel to constitute a fire hazard.

3. Compliance with the provisions of this section may be shown by analysis or tests, or both.

3. SC 23.994: Fuel system components in external fuel tank system(s) located beneath the fuselage must be protected from damage which could result in spillage of enough fuel to constitute a fire hazard as a result of a wheels-up landing on a paved runway.

4. SC 23.XXX: Fuel tanks within and below the fuselage contour must be installed in accordance with the requirements prescribed in Sec. 23.967. External fuel tank system(s) located beneath the fuselage must have the following design mitigations:

1. The external fuel tank system(s) must be in a protected position so that exposure of the tank to scraping action, or impact, with the ground is unlikely during a gear-up landing of the most critical landing gear or landing gears, when landing on a paved runway.

2. The external fuel tank system(s) must be protected by dedicated protective structure, and the protective structure load paths must be independent of the fuel system during a gear-up landing of the most critical landing gear or landing gears, when landing on a paved runway.

3. The hazard to the external fuel tank system(s) that results from impact by landing gear tire fragments or other likely debris must be minimized.

4. The fuel management of the external fuel tank system(s) must be such that fuel in the external fuel tank system(s) is to be emptied prior to fuel in the main tanks.

Issued in Kansas City, Missouri on December 26, 2007.

John Colomy,

Acting Manager, Small Airplane Directorate, Aircraft Certification Service.

[FR Doc. E7–25466 Filed 1–2–08; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA–2007–27230; Directorate Identifier 2007–NE–04–AD] Amendment 39–15322; AD 2007–26–20]

RIN 2120–AA64

Airworthiness Directives; Pratt & Whitney (PW) PW4164, PW4168, and PW4168A Turbofan Engines

AGENCY: Federal Aviation Administration (FAA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: The FAA is adopting a new airworthiness directive (AD) for PW PW4164, PW4168, and PW4168A turbofan engines with certain low pressure turbine (LPT) stage 4 disks, part number (P/N) 51N404, installed. This AD requires removing certain LPT stage 4 disks, listed by serial number at the next piece-part exposure or within 7,500 cycles-since-new (CSN). This AD results from a report of improperly manufactured LPT stage 4 disks. We are issuing this AD to prevent an uncontained engine failure due to low-cycle fatigue (LCF), which could result in damage to the airplane.

DATES: This AD becomes effective February 7, 2008.

ADDRESSES: The Docket Operations office is located at Docket Management Facility, U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building, Ground Floor, Room W12–140, Washington, DC 20590–0001.

FOR FURTHER INFORMATION CONTACT: V. Rose Len, Aerospace Engineer, Engine Certification Office, FAA, Engine & Propeller Directorate, 12 New England Executive Park, Burlington, MA 01803; telephone (781) 238–7772; fax (781) 238–7199.

SUPPLEMENTARY INFORMATION: The FAA proposed to amend 14 CFR part 39 with a proposed AD. The proposed AD applies to PW PW4164, PW4168, and PW4168A. We published the proposed AD in the **Federal Register** on May 21, 2007 (72 FR 28459). That action proposed to require removing certain LPT stage 4 disks, P/N 51N404, listed by serial number in the proposed AD, at the next piece-part exposure, or within 7,500 CSN, whichever occurs first.

Examining the AD Docket

You may examine the AD docket on the Internet at *http://www.regulations.gov;* or in person at the Docket Operations office between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this AD, the regulatory evaluation, any comments received, and other information. The street address for the Docket Operations office (telephone (800) 647–5527) is provided in the ADDRESSES section. Comments will be available in the AD docket shortly after receipt.

Comments

We provided the public the opportunity to participate in the development of this AD. We have considered the comment received.

Pratt & Whitney proposes that we not write an AD. Pratt & Whitney states that they performed additional testing for low-cycle fatigue (LCF). They state the testing shows the disks with the 1-hour heat treatment are equivalent to the disks treated with a 4-hour heat treatment. We do not agree. The data that PW presents to us doesn't conclusively show the 1-hour heat-treat LCF capability is equivalent to the 4-hour heat-treat disks. We didn't change the AD.

Conclusion

We have carefully reviewed the available data, including the comment received, and determined that air safety and the public interest require adopting the AD as proposed.

Costs of Compliance

We estimate that this AD will affect 11 engines installed on airplanes of U.S. registry. We also estimate that it will take about 250 work-hours per engine to perform the required action, if not done at piece-part exposure, and that the average labor rate is $80 per work-hour. Required parts will cost about $186,288