

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98057-3356

In the matter of the petition of

AIRBUS

for an exemption from §§ 25.305(b) and
25.307 of Title 14, Code of Federal
Regulations

Regulatory Docket No. FAA-2009-0809

GRANT OF TIME-LIMITED EXEMPTION

By letter dated August 17, 2009, Yves Regis, Head of Product Integrity, and Francois Duclos, Chief Airworthiness Engineer LR, Airbus, petitioned the Federal Aviation Administration (FAA) on behalf of Airbus, 1 Rond-Point Maurice Bellonte, 31707 Blagnac Cedex, France, for an exemption. The proposed exemption seeks relief from §§ 25.305(b) and 25.307 of Title 14, Code of Federal Regulations (14 CFR), as they relate to installation of Pratt & Whitney PW4168A-1D engines without a fan cowl hinge upgrade on certain Airbus Model A330-223 and -323 airplanes. The exemption, if granted, would be time-limited to permit installation of Pratt & Whitney PW4168A-1D engines without a fan cowl hinge upgrade. Airbus will show that the current fan cowl hinge design complies with the regulations without an upgrade, or Airbus will retrofit design changes necessary to bring the design into full compliance with the regulations.

The petitioner requires relief from the following regulations:

Section 25.305(b) Strength and deformation, which requires:

“(b) The structure must be able to support ultimate loads without failure for at least 3 seconds. However, when proof of strength is shown by dynamic tests simulating actual load conditions, the 3-second limit does not apply. Static tests conducted to ultimate load must include the ultimate deflections and ultimate deformation induced by the loading. When

analytical methods are used to show compliance with the ultimate load strength requirements, it must be shown that—

- (1) The effects of deformation are not significant;
- (2) The deformations involved are fully accounted for in the analysis; or
- (3) The methods and assumptions used are sufficient to cover the effects of these deformations.”

Section 25.307 Proof of structure, which requires:

“(a) Compliance with the strength and deformation requirements of this subpart must be shown for each critical loading condition. Structural analysis may be used only if the structure conforms to those for which experience has shown this method to be reliable. The Administrator may require ultimate load tests in cases where limit load tests may be inadequate.

(b)—(c) [Reserved]

(d) When static or dynamic tests are used to show compliance with the requirements of Sec. 25.305(b) for flight structures, appropriate material correction factors must be applied to the test results, unless the structure, or part thereof, being tested has features such that a number of elements contribute to the total strength of the structure and the failure of one element results in the redistribution of the load through alternate load paths.”

The petitioner supports its request with the following information:

“At the beginning of 2009, Airbus and Pratt & Whitney planned to certify Advantage 70 engines (it includes PW4170 and PW4168A-1D) for A330-223/323 aircraft. The schedule was first to certify baseline production aircraft fitted with PW4170 (70,000 lbs thrust) and PW4168A-1D (68,800 lbs thrust), then to certify the retrofit configuration in the field by the end of September 2009. The certification of the production configuration for engines PW4170 and PW4168A-1D was made with fan cowl hinges reinforced to sustain PW4170 (3680 N1 rpm redline) new fan blade out loads. Decision was taken also to certify PW4168A-1D with reinforced hinges for commonality.”

“Pratt & Whitney originally anticipated that a fan cowl (forward and aft) hinge upgrade would only be required for the PW4170 engines, which operate to 3680 N1 rpm redline. The PW4168A-1 D engine hardware, with the lower 3600 N1 rpm red line, would not require the hinge upgrade. The retrofit configuration for PW4168A-1D was – at that time – defined without the fan cowl hinges upgrade. Accordingly, Pratt & Whitney was only working on a fan cowl hinge upgrade implementation plan to support PW4170 installation in the December 2009 time frame.”

“Only in June 2009 was the need for additional engineering substantiation identified for the certification of the PW4168A-1D engine configurations with the lower 3600 N1 rpm red line with the current fan cowl hinge design.”

“So the Airbus and Pratt & Whitney certification plan is:

- To certify the PW4168A-1D retrofit configurations with the fan cowl hinge upgrade (reinforce). This configuration is the same as the one for production and is fully compliant with the regulations.
- To petition for a temporary exemption in order to withhold the requirement for the upgrade of the fan cowl hinge design on a temporary basis. This will allow installation of PW4168A-1D without the fan cowl upgrade (reinforce) while the revised certification reports are being prepared.”

“The following elements will be taken into account in the certification report for the installation of the PW4168A-1D engine onto the current forward and aft fan cowl propulsion system design:

B.1 - Operating Condition Consistency

Previous assumptions led to engine operating conditions that were outside of the engine operating envelope. Indeed a review of fan cowl temperature assumptions in the strength assessments identified inconsistencies with the engine operating speeds assumed for the fan blade off event. An increased reserve factor for the fan cowl is predicted when applying the correct combination of speed and temperature.

B.2 - Dynamic Loading and Material Properties

The fan blade off event is a highly dynamic event with large unbalance loads causing relative motion between the fan cowls and the adjacent mating components. This part-to-part contact and rubbing will result in system damping. Damping at the fan cowl landings was not addressed in the original analysis. The analysis will be corrected with the inclusion of system damping and the resulting reduction of hinge loads. Additionally the analysis will be updated utilizing high strain rate material strengths; this is due to the dynamic nature of the event.

B.3 - Material Capability in Bending

The previous analyses conservatively compared compressive material allowable in the presence of a pure bending load. Pratt & Whitney and Airbus's experience is that material-bending strength is typically much higher than compressive strength. As a result, Pratt & Whitney will update the analyses to address bending capability.”

“Pratt & Whitney will update the analysis to be consistent with the above mentioned influences on reserve factors. Improvement factors per above paragraph B.1 and B.2 are currently under reviewed between Airbus and Pratt & Whitney. The benefit of the studies described in above paragraph will allow increasing the reserve factor above 1.0. This updated analysis will support the inclusion of the existing hinge system.”

“Based on the above engineering study, it will be demonstrated that the upgrade of the fan cowl hinge is not required for PW4168A-1D engine configuration with the lower 3600 N1 rpm red line. It is estimated that the subject engineering activity will be complete at the end of 2009.”

Public interest

“Airbus presents the argument that the granting of this exemption will be in the public interest by allowing Pratt & Whitney to sell spare PW4168A-1D engines and by reducing the Aircraft On Ground risk for operators under FAA regulations.”

“Pratt & Whitney reviewed the worldwide situation for spare engines. Near term forecast through the end of the year requires additional PW4168A-1 D spare engines to support the fleet as soon as early October 2009. This is specifically the case with NWA (more than 30 A330 with Pratt & Whitney engines) to fulfill the need for three additional spare engines associated with their shop visit forecast and also to avoid aircraft grounding in case of unexpected failure.”

“If this exemption is allowed, U.S. operators of the Airbus A330 airplanes fitted with Pratt & Whitney propulsion systems will be able to avoid flight cancellations due to spare engine shortages by operating new PW4168A-1D engines without upgraded fan cowl hinges.”

“A grant of temporary exemption would be in public interest because it addresses the needs of the U.S. customers as well as the manufacturers and operators.”

Federal Register publication:

A summary of the petition was published in the Federal Register on September 15, 2009 (74 FR 47304). The FAA determined that good cause existed for publishing the summary because the requested exemption would set a precedent, any delay incurred by soliciting public comment was warranted, and it would not be detrimental to Airbus, Pratt & Whitney, or Northwest Airlines (NWA). NWA submitted a comment clarifying that the exemption should apply to Airbus Model A330-223 and -323 airplanes.

The FAA’s analysis is as follows:

Background

As noted earlier by the petitioner, additional engineering substantiation is needed to certify the PW4168A-1D engine configurations with the lower 3600 N1 rpm red line with the existing fan cowl hinge design (without the upgraded hinges). Airbus was not able to demonstrate compliance with §§ 25.305(b) and 25.307 for the existing fan cowl design. These requirements relate to the structural strength, deformation, and failure of the fan cowl as it is loaded during a fan blade off event.

Airbus has since identified conservatism used in its structural analysis associated with assumed engine operating conditions during a fan blade off event, strain rate dependant material characteristics, and material strength properties. Airbus has made a preliminary assessment and

determined that it will likely be able to demonstrate compliance with §§ 25.305(b) and 25.307 for the existing fan cowl (without the upgraded hinges) once it has updated its structural analysis. The time-limited exemption sought by Airbus will allow installation of PW4168A-1D engines without the fan cowl hinge upgrade, while the revised certification reports are prepared by Airbus. If Airbus is unable to show that the existing fan cowl hinge design complies with these regulations, Airbus will retrofit design changes necessary to bring the fan cowl hinges into full compliance with the regulations.

Introduction

To obtain this exemption, the petitioner must show, as required by § 11.81(d), that granting the request is in the public interest, and, as required by § 11.81(e), that the exemption will not adversely affect safety or that a level of safety will be provided that is equal to that provided by the rules from which the exemption is sought.

Effect on safety

In support of its petition, Airbus and Pratt & Whitney have completed a safety risk analysis of a PW4000-100 fan blade out event. Airbus and Pratt & Whitney have predicted that the Pratt & Whitney powered A330 fleet could be operated for the next 20 years within acceptable Continuous Airworthiness Assessment Methodology (CAAM) level 3 or level 4 hazard ratios¹. Submittal of acceptable documentation of this analysis to the FAA will be made a condition for granting this exemption.

This grant of time-limited exemption inherently implies a somewhat greater uncertainty, and hence risk, than demonstrating full compliance with §§ 25.305(b) and 25.307. Nevertheless, we do not think that the subject designs are non-compliant. We think Airbus will be able to demonstrate compliance with §§ 25.305(b) and 25.307 for the existing fan cowl (without the upgraded hinges) once it has updated its structural analysis. Further, the per-flight-hour risk predicted by the petitioner is very low.

The petitioner will be required by the conditions for granting this time-limited exemption to report any information they acquire that might invalidate the justifications given for granting this exemption.

In consideration of the above, the FAA concludes that granting this exemption will not adversely affect safety.

¹ Advisory Circular 39-8, "Continued Airworthiness Assessments of Powerplant and Auxiliary Power Unit Installations of Transport Category Airplanes," dated September 8, 2003. Continued Airworthiness Assessment Methodologies (CAAM) are used to identify unsafe conditions and determine when an "unsafe condition is likely to exist or develop in other products of the same type design" before prescribing corrective action in accordance with 14 CFR part 39.

Public interest

For the reasons stated earlier by the petitioner, the FAA has determined that granting this time-limited exemption would be in the public interest and would not have an adverse effect on public safety.

The petitioner will be required by the conditions for granting this time-limited exemption to report any information they acquire which might invalidate the justifications given for granting this exemption. In consideration of this condition, the FAA concludes that granting this petition is in the public interest.

The FAA's decision

In consideration of the foregoing, I find that a time-limited grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 40113 and 44701, delegated to me by the Administrator, Airbus is granted a time-limited grant of exemption from §§ 25.305(b) and 25.307 to the extent necessary to permit installation of Pratt & Whitney PW4168A-1D engines without a fan cowl hinge upgrade on Airbus Model A330-223 and -323 airplanes, until Airbus can substantiate that the current fan cowl hinge design does not require the upgrade, or until Airbus can retrofit design changes necessary to bring the design into full compliance with the regulations. These requirements relate to the structural strength, deformation, and failure of the fan cowl as it is loaded during a fan blade off event. This time-limited grant of exemption is subject to the following conditions and limitations:

1. Airbus must provide an acceptable safety risk analysis for the PW4168A-1D engine fan blade out event.
2. Airbus must report to the FAA any information they acquire that might invalidate the justifications given for granting this exemption.
3. The granting of this exemption does not relieve any regulatory obligation to identify and correct unsafe conditions related to the engine fan cowl design.

This exemption terminates on March 31, 2010, unless sooner superseded or rescinded. Upon termination of this exemption, any certification approval issued by the FAA in consideration of this exemption shall be void unless the Administrator has found compliance with the regulations for which this exemption was granted.

Issued in Renton, Washington, on October 1, 2009

/s/

Ali Bahrami
Manager, Transport Airplane Directorate
Aircraft Certification Service