Exemption No. 13048

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

In the matter of the petition of **Airbus SAS** Section 25.841(a)(2)(i) and (ii), and (a)(3), Amendment 25-87 of Title 14, Code of Federal Regulations	**Regulatory Docket No. FAA-2015-0232**

PARTIAL GRANT OF EXEMPTION

By letter no. D21M15000084, dated January 6, 2015, Mr. Yves Regis, Vice President, Product Integrity (EIA), Airbus SAS, 1 Rond Point Maurice Bellonte, 31707 Blagnac Cedex, France, petitioned to exempt the Airbus Model A319-171n, A319-151n, A320-271n, A320-251n, A321-271n, and A321-251n, collectively referred to as the Single Aisle New Engine Option (SAneo) series airplanes, from the requirements of Title 14, Code of Federal Regulations (14 CFR) 25.841(a)(2)(i) and (ii), and (a)(3), as amended by Amendment 25-87, for certain types of uncontained engine failures. If granted, the exemption would relieve these airplanes, during a decompression caused by those types of failures of the engines, from the requirement that airplane cabin-pressure altitude not exceed 25,000 feet for more than 2 minutes or exceed 40,000 feet for any duration. In addition, on July 7, 2015, the FAA received supplemental material proprietary to Airbus that addressed specific questions pertaining to their petition. This information was used in the FAA's analysis of this exemption.

The petitioner requests relief from the following regulations:

Section 25.841(a)(2) at Amendment 25-87, requires that:

> The airplane must be designed so that occupants will not be exposed to a cabin pressure altitude that exceeds the following after decompression from any failure condition not shown to be extremely improbable:
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> (i) Twenty-five thousand (25,000) feet for more than 2 minutes; or
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> (ii) Forty thousand (40,000) feet for any duration.

Section 25.841(a)(3) at Amendment 25-87, requires that:

Fuselage structure, engine and system failures are to be considered in evaluating the cabin decompression.

The petitioner supports its request with the following information:

This section summarizes the relevant information from Airbus's request. Complete petition information is available at the Department of Transportation's *Federal Docket Management System*, on the Internet at http://www.regulations.gov, in docket no. FAA-2015-0232.

In addition, Airbus provided to the FAA proprietary information regarding the Model SAneo series airplanes, which addressed questions from the FAA pertaining to the Airbus petition.

The certification basis for the Airbus Model SAneo series airplanes (i.e., Model A319-151, A320-251, and A321-251 airplanes with new CFM International LEAP™ 1A engines; and the Airbus Model A319-171, A320-271, and A321-271 airplanes with new Pratt & Whitney PurePower® PW1100G-JM engines) consists of the certification basis for the original Model A319, A320, and A321 airplanes with Sharklets identified in Type Certificate Data Sheet (TCDS) no. A28NM, plus those requirements effective on the date of application that are generally related to the components and areas affected by the change. Components and areas that are affected by the change include those that are affected either directly or indirectly (e.g., those affected via systems interfaces and/or proximity to the changed area). Per the exceptions given in § 21.101(b), the applicant may propose to show compliance with an earlier amendment of a regulation for areas not affected by the change (§ 21.101(b)(2)), areas that are affected by the change where compliance to a later amendment may not contribute materially to the level of safety or would be impractical (§ 21.101(b)(3)), or for changes that are unrelated and not significant (§ 21.101(b)(1)). Due to the limited changes to structure and systems, and reliance upon previous structure and systems, the Model SAneo series airplanes structures and systems are not required to meet § 25.841(a)(2)(i) and (ii), and (a)(3), as amended by Amendment 25-87; rather, they are required to meet § 25.841 as amended by Amendment 25-56. However, due to the significant change in the engines, the Model SAneo series airplanes are required to meet § 25.841(a)(2)(i) and (ii), and (a)(3), as amended by Amendment 25-87, for the effect of engine failures not shown to be extremely improbable. Therefore, relief is sought from the requirements applied by FAA that compliance with § 25.841(a)(2)(i) and (ii) be shown for some uncontained engine rotor failure (UERF) scenarios.

The Airbus Model SAneo series airplanes are designed to cruise at a maximum altitude of 41,000 feet pressure altitude. Due to the incorporation of new engines with higher bypass ratios and larger fan diameters, some decompressions are caused by uncontained engine-rotor failure (UERF) events for which Model SAneo series airplane cabin pressure altitudes, or time, or both, would exceed those limits in § 25.841(a)(2)(i) and (ii). Airbus provided justification in support of its petition for exemption, which includes cabin-decompression evaluations performed and reported by the Mechanical Systems Harmonization Working Group (MSHWG) under the auspices of the Aviation Rulemaking Advisory Committee (ARAC)[1].

[1] The Final Report of the MSHWG, dated August 2003, was approved by a majority of the members of ARAC's Transport Airplane Engine Issues Group (TAEIG). Seven members of TAEIG voted to submit the report as a recommendation to the FAA, two members voted against submitting the report, and one member abstained.

Airbus states that compliance with § 25.841(a)(2)(i) and (ii), and (a)(3) for UERF events, will likely have an adverse market impact on the Airbus Model SAneo series airplanes when operated in the United States airspace.

Airbus further submits that the difficulties, which the Airbus Model SAneo series airplanes will experience in meeting these requirements, are similarly shared by other manufacturers of regional and large transport-category airplanes with wing-mounted engines for which new or amended type certificates will be sought. In addition, Airbus states that for airplane designs incorporating wing-mounted engines, the FAA provides guidance that the "engine failures" that should be considered in evaluating the cabin decompression include a 1/3 fan disk tangentially penetrating the pressurized fuselage (consistent with [Joint Aviation Requirements] JAR/[Certification Specifications] CS/[14 CFR] 25.903(d)). For airplane designs incorporating wing-mounted engines, this tangential fuselage-strike scenario results, especially for cabin volumes of short- to medium-range airplanes, including the Airbus Model SAneo series airplanes, in a cabin depressurization fast enough to reach outside ambient pressure in the cabin in less than 10 seconds. Airbus states that with currently available technology it is impossible to descend a passenger airplane of Model SAneo size, at high take-off weight, from maximum cruise flight level down to 40,000 feet within 10 seconds, as required indirectly by § 25.841(a)(2)(ii).

In addition, Airbus states that, when considering pilot reaction time and the weight of the Model SAneo series airplanes, it is impossible to reach FL250 within 2 minutes (§ 25.841(a)(2)(i)) after a rapid decompression occurs at maximum cruise altitude shown in the type certificate. Also, Airbus states that as a practical matter, compliance to § 25.841(a)(2) and (3) can only be achieved for such airplanes by restricting flight ceilings. A limitation of the maximum operating altitude would prevent the Model SAneo series airplanes from operating competitively and economically as compared to existing airplane fleets in the U.S. airspace. To comply with the § 25.841(a)(2) regulation as written, the Model SAneo series airplanes would have to limit their maximum operating altitude to a level that would be far below FL400. The existing airplanes can cruise at higher altitudes where they are more fuel-efficient. Under typical operational conditions, a limitation of maximum flight level would cause either a significant range deficit or a major block fuel increase. Airbus states that granting this exemption does not set a precedent, as the facts and circumstances of this situation are similar to those that led the FAA to grant exemption no. 10228 for the Airbus A350XWB.

Airbus reports that relatively few accidents or incidents have occurred due to rotor burst during cruise. It is important to note that decompression incidents that have exposed an airplane cabin to pressure altitude profiles, with risk of injury to passengers, are very rare events. Decompression events resulting from engine-rotor burst are even more remote.

Airbus supplied data for the Model SAneo series airplanes, using estimated values of airplane rate of descent for several failure scenarios, as required in published FAA policy ANM-03-112-16, titled, *Interim Policy on High Altitude Cabin Decompression* (Reference Amendment 25-87), dated March 24, 2006. In addition, Airbus provided information on the likelihood of an uncontained engine-failure event. In its decompression analysis, Airbus included a measure of the severity of exposure for occupants, based on a Depressurization Exposure Integral (DEI) from the MSHWG report, along with data from the AIA report cited above. Airbus used the relationship between cabin pressure and the Depressurization Severity Indicator (DSI), which is a measure of the partial pressure of oxygen, as was proposed by the MSHWG. Airbus showed

that, for the worst-case failure modes reviewed for this exemption, the resultant DSI levels were much less than the critical value specified by the MSHWG.

The Model A320 airplane variants are unmodified with respect to the requirements of § 25.841 (a)(2)(i) and (ii), and (a)(3), for the consideration of system-failure events. An exemption is requested for cabin decompressions that can occur from uncontained engine-rotor failures that result in large holes in the fuselage (i.e., tangential cut from a 1/3 disc penetrating the pressurized fuselage, consistent with § 25.903(d)), which yields the total area of each maximum hole size of $A3_{\_CFM}$ = 8.95 ft^2 (0.832 m^2) and $A3_{\_PW}$ = 11.44 ft^2 (1.063m^2), for the CFM Leap 1-A engine and the PW1100G-JW engine, respectively. These values represent the effective area (i.e., a discharge coefficient of 0.5 has been used per guidance in AC 25-20). Airbus believes, based on fleet service experience, that these are rare events. The new engine option (NEO) introduced on the Model SAneo series airplanes, and associated modifications necessary for the integration, comply with the latest FAA requirements and, therefore, offer a significantly higher basic level of safety relative to previously certified transport-category airplanes.

In addition, Airbus states that the Model SAneo series airplanes use design features that facilitate rapid airplane descent from high altitudes to ensure that the occupants will not be subjected to pressure altitudes for durations longer than those given by the altitude-exposure-time relationship of the interim policy.

The following is quoted from the Airbus petition, with minor edits for clarity:

> In addition, the Model SAneo series airplanes incorporate design features to minimize cabin-decompression hazards for occupants:
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> - It is today a worldwide standard on all civil transport airplanes to have First Aid Oxygen onboard for occupant hypoxia treatment. As per JAR/CS/[14 CFR] 25.1443(d) and JAR/CS/[14 CFR] 121.333(e)(3), First Aid Oxygen needs to be carried in the cabin for at least two percent of the occupants, [and] able to provide an average flow of 3 litres of oxygen per minute for the entire flight after cabin depressurisation occurred. The purpose of First Aid Oxygen is to treat those occupants that have suffered from hypoxia by providing the maximum possible blood oxygen saturation level in order to ensure best possible recovery.
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> - [14 CFR] 25.1447(c)(3)(ii) requires [that] the flight crew be given pressure-demand type oxygen-dispensing equipment if decompressions that are not extremely improbable may expose the flight crew to cabin pressure altitudes in excess of 34,000 feet. Compliance with the rule ensures the flight crew will retain the ability to safely operate the airplane following a decompression.
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> - As per JAR/CS/[14 CFR] 25.1443(c), passengers and flight attendants need to be supplied with supplemental oxygen. Those means have been developed and introduced to sufficiently protect cabin occupants against [the] physiological harm of hypoxia. It has been shown by various tests that the supplemental oxygen system provides an adequate protection against hypoxia if masks are correctly used as shown during the safety briefing before each flight.
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> - Section 25.1441(d) requires that the oxygen flow rate, and the oxygen equipment used in airplanes operating at high altitudes, must be approved. The combination

of emergency descent rate documented in this petition, along with the FAA-approved oxygen masks and associated oxygen flow rates with which the Model SAneo series airplanes are equipped, are adequate to protect the passengers from adverse consequences of a worst case cabin decompression.

The petitioner's Statement of Public Interest:

The following is quoted from the Airbus petition, with minor edits for clarity:

> The [Model A320 airplane] variants are unmodified with respect to the requirements of 14 CFR 25.841(a)(2)(i) and (ii), and (a)(3), for the consideration of system failure events. An exemption is requested for cabin decompressions that can occur from uncontained engine-rotor failures that result in large holes in the fuselage. Airbus believes, based on fleet service experience, that these are rare events. The new engine option (neo) introduced on the [Airbus Model SAneo series airplanes], and associated modifications necessary for the integration, comply with the latest FAA requirements and, therefore, offer a significantly higher basic level of safety relative to previously certified transport-category aircraft.
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> - Approval for operation up to 41,000 feet will enable the air traffic system to provide more capacity, and hence more aircraft separation and safety, without adversely affecting the safety of the passengers.
> - Approval for flight at 41,000 feet will enable the [Model SAneo series airplane] to compete fairly with other existing aircraft that are not subject to the same requirements, without causing any adverse effects to the passengers.
> - Approval for operation up to 41,000 feet will also serve the public interest via the use of the newest generation of engines available today, and permit them to operate where they offer lower emissions, and higher fuel efficiency.
> - Approval for flight at 41,000 feet provides for more economical operation of the [Model SAneo series airplane] reducing the cost to the travelling public.
> - Airplanes not certificated under [14 CFR] would be able to achieve lower operating costs because they could be designed to higher maximum certified altitude. This may give a competitive advantage to non-FAA certificated airplanes, thus promoting a non-level playing field.

The petitioner's Reasons Why Granting an Exemption would not Adversely Affect Safety:

The following is quoted from the Airbus petition, with minor edits for clarity:

> The [Airbus Model SAneo series airplanes] making re-use of the cabin-pressure control system from the Airbus conventional engine option (i.e. the legacy A320 family of aircraft, further referred to as "CEO") complies with FAA requirements issued at the date of the A320 CEO regarding cabin decompression but due to engine modification of the [Airbus Model SAneo series airplanes], the compliance with the latest amendment of 14 CFR [part] 25 has to be re-assessed for some extremely rare UERF event scenarios. Calculations can be used to show an increase in theoretical "risk" to passengers if these extremely rare scenarios are followed.

- However, an examination of the basis for these risk assessments as described in the available physiological data shows that this very small theoretical increase in risk is far smaller than, and certainly within the variability of results from examination of available physiological data. There is, therefore, no basis for assessing a real increase in risk from the conditions that prevail with a grant of this exemption.

- For such rare UERF scenarios, the FAA has published a policy, titled, *Interim Policy on High Altitude Cabin Decompression* (Reference Amendment 25-87), which provides from a safety point of view acceptable exposure time limits for high-altitude cabin decompressions from any failure not shown to be extremely improbable before permanent physiological damage would occur.

- By showing information about emergency-descent rates as requested by the policy, including any design features that increase such rates, other design features that offset the inherent increased risk of exposure to high-altitude cabin pressure, and operational procedures, Airbus concludes the theoretical risk from such decompressions to passengers be acceptably minimised.

In addition, the [Airbus Model SAneo series airplanes] will have third generation high-bypass ratio engines that will have improved design features and maintenance procedures in place to minimize the occurrence of uncontained engine failures.

Federal Register publication

A summary of the petition was published in the *Federal Docket Management System* on February 2, 2015. No comments were received.

The FAA requested and received on July 7, 2015, supplemental material, proprietary to Airbus, that addressed specific questions pertaining to their petition. This information provided additional clarification and confirmed data used in their decompression analysis; information on fuel consumption and emission reduction to support the public interest; and confirmed the maximum aircraft operating (cruise) altitude. The FAA requested this material to complete the FAA's analysis of the Airbus petition for exemption, and a non-proprietary summary of this information was placed in the docket.

The FAA's Analysis

1. Need for exemption

Airbus requests relief from § 25.841(a)(2)(i), which specifies that cabin pressure altitude may not exceed 25,000 feet for more than 2 minutes after decompression from any failure condition not shown to be extremely improbable. A grant of exemption from this regulation for certain engine failures would allow the Model SAneo series airplanes to take longer than 2 minutes to descend from 41,000 feet to 25,000 feet after such decompression.

Airbus also requests relief from § 25.841(a)(2)(ii), which specifies that cabin pressure altitude may not exceed 40,000 feet for any duration after decompression from any failure condition not shown to be extremely improbable. A grant of exemption from this regulation would allow Model SAneo series airplane cabin pressure altitude to exceed 40,000 feet after such decompression from certain engine failures.

Based upon data received from Airbus, the FAA's analysis confirms that, for some UERF that result in pressure-vessel penetration by fragments, the design of the Model SAneo series airplane does not meet the requirements of § 25.841(a)(2)(i) and (ii). A grant of exemption from this regulation would allow the Model SAneo series airplane to operate up to 41,000 feet, which could briefly expose cabin occupants to this altitude in the event of a worst-case decompression.

2. Conformance with applicable FAA policy

The FAA reviewed this petition in the context of the MSHWG final report on § 25.841(a)(2) and (3), and of our interim policy on Amendment 25-87 requirements. The interim policy applies only to those decompression events which are due to UERF. The basis of the interim policy is data from research on the response of humans and other primates to changes in ambient pressure. Evaluation of this data indicates a direct correlation between the alveolar partial pressure of oxygen time integral, and the likelihood of fatalities or permanent physiological damage to those exposed to such pressure changes. That is, as the value of the integral increases, the likelihood of fatalities or permanent physiological damage also increases. However, to simplify the FAA accepted "pass/fail criteria," the FAA has issued a final version of our interim policy, which uses a table of altitudes and cumulative exposure times in lieu of the pressure-time integral. Note that the values of altitude and time in the table, and the results of the pressure-time integral method, are in agreement.

Accordingly, our interim policy focuses on minimizing the likelihood that, if a person is exposed to high-altitude cabin pressure from any failure not shown to be extremely improbable, they will suffer permanent physiological damage. To analyze petitions for exemption from § 25.841(a)(2), the FAA requires information about emergency-descent rates, any design features that increase such rates, other design features that offset the inherent increased risk of exposure to high-altitude cabin pressure, and operational procedures.

As stated above and in our interim policy, the FAA acknowledges a lack of relevant data on the effects of exposure to high-altitude cabin pressure following decompression and, particularly, those effects on people of various ages; and on people with circulatory or respiratory diseases, or certain other medical conditions.

The FAA supports a research program to gather additional information on the effects of exposure to high-altitude cabin pressure. The FAA Office of Aerospace Medicine's Civil Aerospace Medical Institute (CAMI) has developed a physiological model to determine the impact of hypoxia on occupants. The FAA has completed an altitude-chamber study to support validation of their physiological model. This research is an integral part with our rulemaking to develop a new standard for cabin pressure altitude following decompression.

Our review of the Airbus petition indicates that Airbus used the methodology recommended in the FAA's interim policy. The FAA believes that this methodology is conservative in the sense that it assumes a lower partial pressure of oxygen than would likely be present during decompression at 41,000 feet.

Airbus provided descent profiles for the Model SAneo series airplanes, based on conservative estimates of descent performance for certain engine-failure scenarios, as described in the FAA's interim policy. The descent profiles indicate that the Model SAneo series airplanes can descend rapidly from 41,000 feet altitude to below 25,000 feet and meet the pass/fail criteria within our policy.

Airbus also performed a depressurization analysis, based upon maximum-cruise flight conditions, and defined the envelope of vulnerability of passengers following failures that result in a decompression, and identified design and operational features of the Model SAneo series airplanes that would mitigate the effects of an increase in cabin pressure altitude.

The decompression analysis used several measures recommended in the final report of the ARAC MSHWG. Specifically, Airbus estimated the severity of exposure to high-altitude cabin pressure for occupants, based on calculation of a DEI. The analysis also considers the relationship between cabin pressure and the DSI, a measure of the partial pressure of oxygen. The analysis indicates that the physiological effect of a slight increase in the length of time spent above 25,000 feet is within the uncertainty band of available physiological data. The Airbus analysis also shows that, for all of the failures modes reviewed for this exemption, resultant DSI levels were much less than the critical value recommended by the MSHWG.

The FAA reviewed information provided by Airbus about design features and operational procedures that would increase the descent capability and occupant survival of the Model SAneo series airplanes. We concluded that the design features and operational procedures associated with rapid decompression, followed by an emergency descent, support this partial grant of exemption.

3. Review of historical data and research

The FAA reviewed databases from its own National Aviation Safety Data Analysis Center (now called the Aviation Safety Information Analysis and Sharing (ASIAS) database), containing data gathered between the years 1959 to 2006. Within that time, data surveyed show approximately 3,000 instances of cabin-pressure loss. The vast majority of these have been caused by system failures (e.g., cabin-pressurization-controller failures, valve failures, etc.) and structural failures (e.g., door-seal failures), which typically have been recognized at low altitude within a few minutes after takeoff. Pilot error also has contributed to the number of events. The majority of these events have not subjected the occupants to exposures above 25,000 feet (an altitude considered physiologically significant). The cabin pressure altitude in most events did not exceed 15,000 feet (the cabin pressure altitude at which passenger oxygen masks are deployed).

Similarly, UERF tend to be very rare. A simple calculation shows that grouping all engines and transport airplanes together yields an average probability of a UERF at cruise of approximately $1x10^{-7}$ per engine hour. New engine designs appear to reduce this probability by an order of magnitude. We found, as noted in the MSHWG report on § 25.841(a), that no fatalities from hypoxia were due to in-flight rapid decompression events as envisioned by Amendment 25-87. The data indicate that decompression is not a significant cause of fatalities. It is because these events are so rare that the FAA considers the risk of flight above 40,000 feet pressure altitude to be acceptable.

In addition, Airbus provided the FAA with proprietary data from its analysis of UERFs, and the size and number of holes in the fuselage resulting from such failures. Using historical data, Airbus performed decompression analysis for several scenarios. Airbus analyzed the probability of UERF and of penetration of the fuselage of the Model SAneo series airplanes from fragments of various sizes resulting from such failures. The FAA used this analysis to assess the threat to occupants in such an airplane event.

The FAA concurs with Airbus that UERFs are rare events, and this consideration had a bearing on the granting of the exemption. Our analysis in this case is in contrast to our analysis of an earlier petition for exemption from a different applicant for an airplane with a lower cruise altitude. The petition submitted by the previous applicant included estimates of the probability of occurrence of a UERF. In that case, the altitude excursion above 40,000 feet was less than 1,000 feet. We concluded that the risk associated with exposure of the occupants to the slightly higher altitude was essentially the same as the risk of exposure at 40,000 feet. In other words, the risk from exposure at altitude was essentially the same with or without the grant of the exemption. Therefore, the rarity of UERFs did not significantly enter into consideration regarding the previous grant of exemption.

4. Holes from UERF

The FAA evaluated the Airbus approach for determining the size of holes in the fuselage and/or wings caused by UERF. While we concluded that the method makes some assumptions which one could question, the presence of the assumptions is not of great significance because the FAA required Airbus to assume a failure in which a very large hole in the fuselage is produced, causing a sudden decompression. Airbus evaluated this scenario and provided the results in its petition.

5. Use of supplemental oxygen

As discussed in further detail below, the FAA has analyzed the Airbus petition in the context of those recommendations, the part 25 requirements pertaining to supplemental oxygen, and certain technical standards for supplemental-oxygen equipment.

Section 25.1441(d) requires approval of oxygen equipment for airplanes that are approved to operate above 40,000 feet altitude. Section 25.1443 specifies the minimum mass flow of supplemental oxygen for flightcrew and passenger oxygen systems up to a cabin altitude of 40,000 feet. Part 25 does not contain standards for oxygen systems above 40,000 feet. However, FAA Technical Standard Orders (TSOs) describe minimum performance standards for diluter demand pressure-breathing regulators (TSO-89) and demand oxygen masks (TSO-78) up to 45,000 feet. In addition, the Society of Automotive Engineers (SAE) Standard AS 8027 provides specifications for diluter demand pressure-breathing regulators up to 45,000 feet.

As part of the validation work on the Model SAneo series airplanes, the FAA requested that Airbus propose performance standards for fixed and portable oxygen systems for the flightcrew, flight attendants, and passengers to use between 40,000 and 41,000 feet cabin altitude. We also requested that Airbus substantiate the adequacy of the proposed performance standards. Airbus provided test results and analysis that substantiate that the proposed standards for oxygen pressure-breathing equipment would adequately protect the flightcrew in the event of decompression to 41,000 feet.

Flightcrew pressure-breathing equipment requires training to ensure effective use. Pressure breathing requires physical effort to exhale and minimal effort to inhale. This reversal of the normal breathing cycle can lead to hyperventilation. Training of passengers to use pressure-breathing equipment safely is considered impractical. The FAA determined that an acceptable means of compliance for the fixed- and portable-oxygen systems used by flight attendants and passengers would be to install oxygen equipment that is certificated to 40,000 feet, and limit exposure to the reduced pressure environment above 40,000 feet via airplane-descent

performance. The FAA believes that, ultimately, occupant survival during a decompression event depends upon swift descent to a lower altitude. In its review of Airbus's airplane-descent profile, the FAA finds that the Model SAneo series airplanes can descend at acceptable rates to alleviate occupant exposure to hypoxia.

6. FAA analysis conclusion

Permitting airplanes to fly above 40,000 feet does offer real and tangible benefits to the aerospace industry, the traveling public, and the U.S. economy by reducing congestion, improving fuel economy, and reducing pollution. If compliance with § 25.841 at Amendment 25-87 were to limit airplane operations to a maximum altitude of 40,000 feet, it would impose a significant disadvantage on newly designed airplanes that have many safety advantages over older airplanes currently allowed to operate at higher altitudes. This would delay the introduction of these airplanes and the benefits of their more advanced technology.

Based upon its evaluation of the data and analysis provided by Airbus, the FAA has determined that Airbus has sufficient justification for a partial grant of exemption from § 25.841(a)(2)(i) and (ii) for certain engine failures.

The partial grant of exemption from § 25.841(a)(2)(ii) will permit cabin pressure altitude to exceed 40,000 feet for 1 minute (but not to exceed 41,000 feet for any duration) after decompression from any UERF condition not shown to be extremely improbable. The partial grant of exemption from § 25.841(a)(2)(i) will permit cabin pressure altitude to exceed 25,000 feet for more than 2 minutes (but not more than 3 minutes) after decompression from any UERF condition not shown to be extremely improbable, allowing time for the airplane to descend from an altitude of 41,000 feet to 25,000 feet.

In addition, this partial grant of exemption is predicated on the requirement that Airbus successfully demonstrates compliance to §§ 25.1441, 25.1443, 25.1445, 25.1447, and 25.1449 for all supplemental oxygen systems used on the Model SAneo series airplanes.

This partial grant of exemption takes into account operating rules in 14 CFR parts 91, 121, and 135 requiring that:

- each flightcrew member has a quick-donning type of oxygen mask, or that the pilot at the controls must wear and use an oxygen mask when operating above 25,000 feet altitude, and
- an adequate quantity of oxygen is provided for crew operations.

This partial grant of exemption is also premised on the condition that:

- in the instructions for continued airworthiness (ICAs), the airplane manufacturer and the airline operator include any required maintenance and checks of supplemental-oxygen systems prior to each flight. Airbus also helps operators understand the details of the ICAs to facilitate each operator's incorporation of this information into their maintenance procedures.
- if dispatch is deemed appropriate with a malfunctioning system that is required to ensure that the airplane is capable of performing an emergency descent (i.e., spoilers fully deployed, if appropriate; maximum descent rate; maximum operating limit V_{MO}/M_{MO} speed), the Master Minimum Equipment List (MMEL) must limit dispatch to a maximum

flight altitude of 40,000 feet, unless other regulations or limitations require a lower altitude. Though V_{MO}/M_{MO} is normally the best speed for a rapid-decompression descent, the pilots should follow the recommended emergency-descent procedures in the Airplane Flight Manual (AFM). Airbus typically accounts for non-standard conditions, such as rapid decompression and emergency descent, in developing appropriate dispatch criteria with a malfunctioning system in the MMEL. For example, if Airbus determines that dispatch is possible with a malfunctioning system that contributes to the airplane's ability to perform an emergency descent, Airbus could propose that the MMEL limit dispatch to a lower maximum flight altitude. Rather than identify an MMEL dispatch limitation as an explicit condition of granting the exemption, the FAA has determined that it is appropriate for the FAA Flight Operations Evaluation Board to evaluate the matter of dispatch with a malfunctioning system.

- the applicable rapid-decompression procedures for the flightcrew must be included in the emergency procedures section of the AFM. The FAA further recommends that this information should also be included in the Airbus flightcrew operating manual.
- initial and recurrent emergency training for all crewmembers, in accordance with §§ 121.397, 121.417, and 121.427, must include training for a rapid decompression and donning of oxygen masks.

The FAA's decision

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest, regarding § 25.841(a)(2)(i) and (ii), as amended by Amendment 25-87. Therefore, pursuant to the authority contained in 49 U.S.C. 40113 and 44701, delegated to me by the Administrator, the Airbus petition for exemption from the requirements of § 25.841(a)(2)(i) and (ii), as amended by Amendment 25-87, is granted.

Regarding the provisions of § 25.841(a)(3), as established by the certification basis, Airbus is required to evaluate compliance to § 25.841(a)(2) for engine failures. However, due to the certification basis, the Model SAneo series airplane is not required to meet § 25.841(a)(2) and (3), as amended by Amendment 25-87, for all system failures and structural failures. Therefore, relief from this requirement is not necessary.

The partial grant of exemption from § 25.841(a)(2)(ii) will permit cabin pressure altitude to exceed 40,000 feet for 1 minute, but not to exceed 41,000 feet for any duration, after decompression from any UERF condition not shown to be extremely improbable. This partial grant of exemption from § 25.841(a)(2)(i) will permit cabin-pressure altitude to exceed 25,000 feet for more than 2 minutes, but not more than 3 minutes, after decompression from any UERF condition not shown to be extremely improbable, allowing time for the airplane to descend from an altitude of 41,000 feet to 25,000 feet.

This partial grant of exemption is subject to the following conditions:

1. The Model SAneo series airplane AFM must specify the maximum certificated airplane indicated operating pressure altitude. The value must not exceed 41,000 feet.
2. The Model SAneo series airplane AFM must contain applicable flightcrew procedures for a rapid decompression event. The section of the AFM that pertains to actions in the event of a decompression must state that the flightcrew should initiate a descent at the

maximum rate of descent and safe descent speed, which is typically the maximum operating speed (V_{MO}/M_{MO}), assuming structural integrity of the airplane.

3. Airbus must submit certification flight test data for the Airbus Model A319-171n, A319-151n, A320-271n, A320-251n, A321-271n, and A321-251n series airplanes to corroborate the descent profiles used in the analysis to show that, after decompression at the maximum certificated airplane indicated operating pressure altitude, the cabin pressure altitude will not exceed 25,000 feet for more than 3 minutes or 40,000 feet for more than 1 minute.

Issued in Renton, Washington, on September 25, 2015.

/s/

Michael Kaszycki
Acting Manager, Transport Airplane Directorate
Aircraft Certification Service