

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98055-4056

In the matter of the petition of

Addison Aviation Services, Inc.

for an exemption from § 25.857(e)(4) of
Title 14, Code of Federal Regulations

**Regulatory Docket
No. FAA-2000-8514**

GRANT OF EXEMPTION

By letter of November 22, 2000, Mr. Doug Boddie, Director of Maintenance, Addison Aviation Services Inc., (AAS), 4584 Claire Chennault Road, Addison, Texas, 75001, petitioned for an exemption from the requirements of § 25.857(e)(4), of Title 14, Code of Federal Regulations (14 CFR). The proposed exemption, if granted, would exempt Learjet Model 25 series airplanes, modified for the carriage of cargo, from the requirement to exclude hazardous quantities of smoke, flames, or noxious gases from the flight crew compartment, when certain other conditions are met.

The petitioner requests relief from the following regulation:

Section 25.857(e)(4), states: A Class E cargo compartment is one on airplanes used only for the carriage of cargo and in which there are means to exclude hazardous quantities of smoke, flames, or noxious gases, from the flight crew compartment.

Related Sections of the Federal Aviation Regulations (FAR):

Section 25.831(e) reads: Except as provided in paragraph (f) of this section, means must be provided to enable the occupants of the following compartments and areas to control the temperature and quantity of ventilating air supplied to their compartment or area

ANM-01-091-E

independently of the temperature and quantity of air supplied to other compartments and areas:

(1) The flight crew compartment.

(2) Crewmember compartments and areas other than the flight crew compartment unless the crewmember compartment or area is ventilated by air interchange with other compartments or areas under all operating conditions.

The petitioner's supportive information is as follows:

“In accordance with FAR 11.25, Addison Aviation Services, Inc., hereby petitions the Federal Aviation Administration for exemption from the requirements outlined in FAR 25.857(e)(4), relating to the requirement for excluding hazardous quantities of smoke, flames or noxious gases from the flight crew compartment. This request for exemption is for Lear 25 series aircraft to be modified by Addison Aviation Services for the carriage of cargo in a Class E cargo compartment. The application for Supplemental Type Certificate (STC) was submitted to Southwest Region FAA, ASW-190, on August 10, 1999, and has been assigned FAA Project Number ST5996SC-T.

“BACKGROUND

“Addison Aviation Services, Inc., is in the process of obtaining a Supplemental Type Certificate for a Learjet Model 25 Class E cargo compartment.

“FAR 25.831(e) outlines the requirement for separate ventilating and heating air systems for the cockpit and other compartments, except when the total volume for the cockpit and passenger compartments is 800 cubic feet or less (as outlined in paragraph § 25.831(f)). Addison Aviation Services, Inc., has interpreted this exception to include the Learjet, as the Lear 25 series cabins fall within the 800 cubic feet or less exception outlined in paragraph (f). Consequently, since the Learjet 25 series do not require separate ventilating and heating air systems for the cockpit, other means have been used to attempt to meet the FAR requirements.

“FAR 25.857(e)(4) does not specifically define what constitutes hazardous quantities of smoke, fire and/or noxious gases.

“Advisory Circular AC 25-9A paragraph 11e(4)(i) states that ‘wisps of smoke that enter and immediately exit at the occupied compartment boundaries are acceptable as long as a light haze or stratified haze does not form,’ and the testing requirements outlined in paragraph 11e(7)(iii) states that ‘The transmissibility level in any occupied compartment should not be less at any time during the test than it was before the start of the tests.’

“In an attempt to meet FAR 25 and applicable AC requirements to the fullest extent possible, Addison Aviation Services, Inc., is now petitioning the FAA to exempt the Learjet from the requirements pertaining to the exclusion of hazardous quantities of smoke, flames, or noxious gases from the flight crew compartment, outlined in FAR 25.857(e)(4).

“NATURE AND EXTENT OF RELIEF SOUGHT

“The interest of Addison Aviation Services, Inc., in this petition is to be able to offer a Class ‘E’ cargo compartment to Air Cargo Operators, which fulfills the expectations of our customers and is in compliance with Federal Aviation Regulations to the maximum extent possible. In requesting this exemption, Addison Aviation Services, Inc., proposes to address the intent of § 25.857(e)(4) in the following manner:

- “1. Addition of a Smoke Curtain ahead of the cargo net.
- “2. Modification of the air distribution system to duct incoming flow forward of the smoke curtain.
- “3. Manual operation of the aft outflow valve (safety valve) for smoke evacuation.
- “4. Provision for smoke goggles and supplemental oxygen masks for the crew.
- “5. Relocation of the emergency exit to a forward location for easier crew egress.
- “6. AFMS Procedures for emergency conditions.

“NOTE: These features are discussed in more detail in ‘INFORMATION IN SUPPORT OF THE PETITION.’

“By receiving a partial exemption to the requirements of 25.857(e)(4), Addison Aviation Services, Inc., will be able to provide Air Cargo Operators with a Class ‘E’ cargo compartment that is in compliance, and offers a high degree of safety to the flight crew during emergency situations.

“DESCRIPTION OF EACH AIRCRAFT TO BE COVERED

“Addison Aviation Services, Inc., requests that this exemption be applicable to the aircraft listed here: Lear 25, 25A, 25B, 25C, 25D, 25F.

“INFORMATION IN SUPPORT OF THE PETITION

“Over the past few years, it has become increasingly obvious to the FAA and industry that a standardized cargo compartment is needed for Learjet operators flying freight, cargo or cancelled checks for hire. There are a wide variety of cargo configurations currently being utilized by operators, the majority of which were installed and/or field approved at the local level, without benefit of an STC. While we are not aware of any accidents attributable to the lack of standardization, it has created an ongoing problem for the FAA and industry because of different interpretations of the regulations in various regions and/or districts of the FAA.

“Addison Aviation Services, Inc. recognizes that the proposed design does not meet literal compliance with the FARs, due to the requirement to exclude hazardous quantities of smoke, flames, or noxious gases from the flight crew compartment. Addison Aviation Services, Inc. is now requesting a partial exemption from the requirements of FAR 25.857(e)(4), in accordance with FAR 11.25. If granted, this partial exemption would allow Addison Aviation Services, Inc. to move forward with the modification, conformity and testing of its proposed Class ‘E’ cargo compartment design.

“Description of Basic Learjet Environmental Control and Air Distribution System.

“It is important to note that Learjet 25 series aircraft were designed and FAA approved under the same Type Certificate (A-10CE). The environmental control system (ECS) for these various models of aircraft is essentially the same, in that there is only one air ventilating system, which serves to condition and pressurize the air for the entire cabin during flight. An outflow valve for the ECS is located on the forward pressure bulkhead, and a safety valve is located on the aft bulkhead. The outflow valve controls and maintains the desired pressure within the cabin. In the basic system, air flows from the aft passenger compartment forward through the cabin to the cockpit, and exits the aircraft through the outflow valve. The unique design of the Learjet 25 series environmental control system, coupled with the relatively small size of the aircraft, precludes the installation of separate ventilating and heating air systems for the cockpit and other compartments, as addressed by FAR 25.831(e). The design also precludes the total elimination of hazardous quantities of smoke, flames or noxious gasses from the cockpit under all possible operating conditions without a total re-design of the ECS.

“Mitigating Design Features

“The basis for the exemption request is the mitigating design features of the proposed STC modification. These mitigating design features restrict the intrusion of hazardous quantities of smoke, flames, and/or noxious gases to the cockpit area in several ways:

“1. A Smoke Curtain has been added, attached to the cabin floor and surrounding cargo liner, which will effectively restrict the forward movement of hazardous quantities of smoke, flames and/or noxious gases to the cockpit area. The smoke curtain is located aft of the flight crew compartment and aft of the relocated emergency exit window, (see item 5) to allow a clear path for emergency egress, if required.

“2. The air distribution system has been modified to direct ventilated air ahead of the smoke curtain and into the cockpit area. This will meet the requirements outlined in FAR 25.857(e)(3), and also limit the movement of air forward from the aft cabin to the cockpit. With all ventilated air bypassing the aft cabin and redirected to the cockpit through overhead outlets, a constant supply of conditioned air is introduced into the flight crew area behind the pilots. This re-directed airflow will force any smoke that may enter the cockpit downward toward the outflow valve; helping to ensure that adequate flight visibility is maintained for the flight crew.

“3. Manual control of the safety valve (rear outflow valve) located at the rear of the cabin, inside the Class E cargo compartment has been provided in the cockpit for the flight crew. In the event of smoke or fumes in the cargo compartment, this safety valve can be opened by the crew, from the cockpit, to exhaust the smoke or fumes through the rear of the cabin, minimizing the potential for the smoke or fumes to enter the cockpit. Similarly, opening the rear safety valve quickly removes the oxygen supply from the smoke source.

“4. Smoke goggles and oxygen masks are provided for the crew, to ensure both eye and breathing protection in the event of smoke intrusion into the cockpit.

“5. The emergency exit window will be relocated to a forward location, in accordance with STC ST098345SC, to allow the secondary means of crew egress.

“6. The Approved Flight Manual Supplement (AFMS) includes Emergency Procedures to be followed in the event the smoke detection system is activated and/or smoke enters the cockpit area.

“COMMENTS IN THE PUBLIC INTEREST

“Business aircraft are far different in design and complexity than the carriers of the general public (i.e., commercial airliners). Airliners are equipped with several different compartments for cargo, baggage and passengers. They are also equipped with two or more ventilating systems for the various compartments. It is therefore relatively easy to isolate certain compartments as Class ‘E’ cargo compartments, without adversely affecting the safety of other compartments.

“Conversely, business aircraft typically have only one ventilating system that is used for pressurizing and heating the entire aircraft. The external skin, forward bulkhead and aft bulkhead serve as the pressure boundary for the entire cabin, including the cockpit. The outflow valve is located either in the front or back of the aircraft, and again serves to regulate pressurization of the entire cabin, including the cockpit.

“Despite the fact that most business aircraft are not able to meet the literal compliance requirements of FAR 25.857(e)(4), it is in the public’s best interest to have an STC that meets the requirements to the greatest extent possible.

“Certain FAR 25 certified aircraft, and Learjet 25 Series Aircraft in particular, are used extensively to facilitate the rapid movement of cancelled checks for the Federal Reserve and other banking institutions. The entire banking industry relies on the overnight movement of cancelled checks, which annually saves millions of dollars in interest expense. Cargo configured aircraft like the Learjet are also utilized to transport parts and materials for the automotive and other industries to maximize just-in-time inventory control, to fly expensive replacement parts to remote locations to repair machinery, and numerous other specialized missions. By dedicating aircraft to these specific missions, flexible schedules and routings can be maintained to ensure timely deliveries, rather than relying on scheduled carriers. The Learjet is ideal for these missions, due to its high speed, high altitude capability, dependability, and relatively low acquisition and operating costs.

“The proposed Addison Aviation Services, Inc., Class ‘E’ Cargo Compartment offers full compliance in all other areas, including the requirement for a smoke detection system, flight crew control of the airflow system, and a secondary means of emergency escape for the flight crew.

“Granting a partial exemption will clear the way for an approved STC that will help standardize many previously modified cargo aircraft, and ensure that new aircraft entering the air cargo fleet are modified to approved STC standards.

“SAFETY ENHANCEMENT

“The proposed Addison Aviation Services, Inc., Class ‘E’ Cargo Compartment will provide a level of safety for the aircrew that is not currently available to operators of Learjet aircraft modified for the carriage of cargo. The combination of barrier nets, a smoke curtain, a smoke detection system, smoke goggles, supplemental oxygen breathing equipment, and a forward emergency escape window serve to provide maximum protection, consistent with the inherent design of the aircraft.

“By providing a high degree of protection for the flight crew, AAS will ensure that public safety is also enhanced. There is greater probability that flight crews encountering an

emergency situation involving smoke or fire in the cargo compartment will be able to safely descend and land at a suitable airport without further incident. This will help protect the aircraft, aircrew and any potential obstacles in its flight path.

“SUMMARY STATEMENT

“Addison Aviation Services, Inc. (AAS) is pursuing a Supplemental Type Certificate, STC, for the installation of a Class E cargo interior in the Learjet Model 25 Series aircraft. In development of this STC, it has become apparent that it may not be possible to meet the strict interpretation of § 25.857(e)(4), of Title 14, Code of Federal Regulations (14 CFR). Therefore, AAS requests an Exemption from these requirements, when certain other conditions are met.”

Notice and public procedure has been provided as follows:

A summary of the petition was published in the Federal Register on February 2, 2001 (66 FR 8841), and comments from the public were requested. No comments were received.

The Federal Aviation Administration's analysis/summary is as follows:

BACKGROUND

1. The FAA concurs with the applicant’s interpretation of § 25.831(e) and (f) as far as they apply to Lear 25 series aircraft already certified as passenger airplanes. It is the conversion of that passenger cabin into a Class E cargo compartment (a new configuration compared to the certified type design) that requires compliance with § 25.857(e)(4). The applicant is requesting an exemption from this requirement.

2. The FAA concurs that § 25.857(e)(4) does not specifically define what constitutes hazardous quantities of smoke, fire and/or noxious gases. However, the reasons are documented in AC 25-9A, paragraph 11a(2) and Appendix I, page 2, and read as follows:

Par. 11a(2): “Except as noted in paragraph 11e(4) below, any penetration of smoke into occupied compartments from cargo, storage, or baggage compartments, equipment bays, equipment cooling systems, or other non-continuously occupied areas (e.g., galleys, lavatories, or crew rest areas) during the tests is unacceptable because the toxicity of the smoke is unpredictable and the smoke exposure might continue or increase to a hazardous level before a landing can be made.”

Compliance with § 25.857(b)(2), (c)(3), (d)(2) and (e)(4): “One method of showing there are means of excluding hazardous quantities of smoke and extinguishing agent would be to define all the probable combustion sources within the cargo compartment and combinations of combustible byproducts combined with and without the extinguishing

agent, and show that the possible exposure concentrations of these byproducts and extinguishing agents will not exceed human tolerances. In addition to the complication of trying to define the concentrations of all the probable combinations of combustion byproducts and extinguishing agent, the complication exists that the acceptable human tolerance to various combinations of combustion byproducts and extinguishing agent have not been defined. For these reasons, this approach to compliance with § 25.857(b)(2), (c)(3), (d)(2) and (e)(4) has not been attempted.”

The AC identifies one means of compliance, but not the only means of compliance, that the FAA has found to be acceptable. The applicant may propose an alternate means of compliance for the FAA’s consideration and acceptance.

3. In the Advisory Circular AC 25-9A, the title of 11e(7) reads “An Alternate Technique to Determine Smoke Penetration” under Step (4) above: (Exceptions (i), (ii), and (iii) still apply). Obviously, the exception 11e(4)(i), allowing “wisps of smoke...form”, also applies to 11e(7)(iii); the applicant failed to notice that. Therefore, the two statements are consistent.

The FAA is cognizant that the petitioner intends to meet all applicable requirements to the fullest extent possible by obtaining a partial exemption from § 25.857(e)(4).

NATURE AND EXTENT OF RELIEF SOUGHT

The petitioner’s proposal offers a Class E cargo compartment to Air Cargo Operators that:

1. Meets the applicable regulations vis-à-vis § 25.857(e)(4) to the maximum extent possible.

2. Has a partial exemption from the requirements of § 25.857(e)(4) so that, in case of smoke or fire, entry of hazardous quantities of smoke, flames, and/or noxious gases into the flight crew compartment is minimized, but not completely excluded by:

- a. Modifying the ventilation system to redirect all air to the cockpit only;
- b. Installing a smoke curtain to the forward barrier net and the cargo liner to restrict the forward movement of smoke/fire;
- c. Using the aft outflow valve located in the cargo compartment for smoke evacuation;
- d. Providing smoke goggles and supplemental oxygen masks for the crew;
- e. Relocating the emergency exit to a forward location for easier crew egress; and

- f. Prescribing AFM procedures for emergency conditions.
3. Meets all other applicable regulations for a Class E cargo compartment.

The FAA concurs that by implementing the proposed design changes Addison Aviation Services, Inc. should be able to meet the intent of the applicable regulations but not show a literal compliance.

DESCRIPTION OF EACH AIRCRAFT TO BE COVERED

The FAA is cognizant of the coverage requested for various Learjet Models listed earlier under this title.

INFORMATION IN SUPPORT OF THE PETITION

The FAA concurs that the mitigating design features, numbers 1 through 6, described by the petitioner and the implementation of the proposed design changes should substantially meet the intent of the applicable regulations without a literal compliance.

COMMENTS IN THE PUBLIC INTEREST

The FAA agrees that the business aircraft are different in design and complexity than the commercial airliners. However, the FAA does not concur that it is not feasible to design a second ventilating system for the cockpit of business aircraft. The argument presented is strictly an economic one and of interest to the applicant and/or operators only. The FAA concedes that from the public interest point of view the use of certain part 25 aircraft, such as Learjet Model 25 series, is necessary for on time delivery of parts and equipment. Also, the FAA considers establishing a standard STC procedure including applicable exemption(s) an enhancement of safety over one using previous field approvals. The FAA agrees that the proposed AAS Class E Cargo Compartment STC criteria meet the intent of the requirements of § 25.857(e)(4) and offer full compliance in all other areas.

SAFETY ENHANCEMENT

The FAA concurs that the combination of barrier nets, a smoke curtain, a smoke detection system, supplemental oxygen breathing equipment, a forward emergency escape window, an approved AFMS for emergency procedures to follow in case of smoke detection or entry into the cockpit would:

- restrict the intrusion of hazardous quantities of smoke, flames, and/or noxious gases to the cockpit,
- provide an acceptable level of safety, and
- be an enhancement of safety over the field approval method.

The Grant of Exemption is as follows:

In consideration of the foregoing, I find that a grant of exemption would be in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 40113 and 44701, delegated to me by the Administrator, Addison Aviation Services, Inc. is hereby granted an exemption from 14 CFR § 25.857(e)(4) pertaining to exclusion hazardous quantities of smoke, flames, or noxious gases from the flight crew compartment, to the extent necessary to permit supplemental type certification of the Learjet Model 25 series airplanes modified for the carriage of cargo.

All test results pertinent to this exemption must be documented in a report and a copy provided to this office.

Issued in Renton, Washington, on April 11, 2001.

/s/ Ali Bahrami
Ali Bahrami
Acting Manager
Transport Airplane Directorate
Aircraft Certification Service