

Exemption No. 10934

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
KANSAS CITY, MO 64106

In the matter of the petition of

**SHERPA AIRCRAFT
INCORPORATED**

for an exemption from § 23.562 of
Title 14, Code of Federal
Regulations

Regulatory Docket No. FAA 2013-0647

DENIAL OF EXEMPTION

By letter dated July 12, Mr. Alan Pendergrass, Structures DER, Sherpa Aircraft Incorporated (Sherpa), 34100 Sky Way Drive, Scappoose, OR 97056 petitioned the Federal Aviation Administration (FAA) on behalf of Sherpa for an exemption from § 23.562 of Title 14, Code of Federal Regulations (14 CFR). The proposed exemption, if granted, would allow Sherpa to type certificate Sherpa airplane Models SH550 and SH650 without showing compliance with emergency landing dynamic conditions.

The petitioner [requires/requests] relief from the following regulation[s]:

Section 23.562 prescribes, in pertinent part, that all occupant seats and restraints require dynamic testing.

The petitioner supports its request with the following information:

The petitioner states:

“The SH550 aircraft is a 6 occupant aircraft with a maximum gross weight of 4750 lbs. and a power off flaps down stall speed of 40 knots. The SH650 aircraft is an 8 occupant aircraft with a maximum gross weight of 7,750 lbs. and a power off flaps down stall speed of 40 knots. Sherpa Aircraft, Inc. will perform static test on the seat and harnesses and equip both model aircraft

with a 4-point harness with a TSO. Justification for this exemption is based on low stall speed of the aircraft and the fact that head impact is unlikely.

The purpose of this petition for exemption is to permit type certification of the SH550 and SH650 with seats that have not shown compliance to §23.562, Emergency Landing Dynamic conditions, effective at Amendment level 23-62. Sherpa Aircraft, Inc. will demonstrate mitigating factors to ensure that safety will not be adversely affected.”

In addition, the petitioner provides the following rationale:

“1. Sherpa Aircraft, Inc. will perform a static test on the SH550 and SH650 seat and harness system to an ultimate load of 3,060 lbs. The ultimate load will represent 170 lbs. (simulated occupant weight) multiplied by 18 G, which represents the required longitudinal design load factor for items of mass. This load factor was introduced at the same time that the §23.562 was adopted, and viewed as a suitable static alternative to dynamically testing items of mass. The strength of the occupant seating system (consisting of the seat, seat attachment hardware, the harness, and the airframe attachment points of the harness) will thus be demonstrated to be equivalent in strength to an item of mass restraint. In addition, the proposed test requirements far exceeds the current requirement of Part 23 for static seat system testing, which is 9 G in the forward longitudinal direction.

2. The SH550 and SH650 will have a flaps-down, power-off stall speed that is much lower than aircraft with a stall speed of 61 knots for which this regulation was envisioned. The 34% slower stall speed of the SH550 and SH650 will result in a at least 57% reduction in impact of the seat and occupant, greatly reducing the structural load on the seat and giving the SH550 and SH650 aircraft a wider margin of safety. In addition, the FAA has previously granted similar exemptions to other aircraft types with stall speeds of 45 knots or less.

3. The level of compliance required for this type certificate category far exceeds that of an experimental/homebuilt category aircraft, a Light Sport Category (LSA) or Part 21 primary category aircraft. This higher level of certification will result in an increased level of safety for the SH550 and SH650 over the CAR 3, Experimental or LSA class aircraft against which the SH550 and SH650 will compete.

4. The Pilot and Copilot seats will be equipped with a 4-point inflatable TSO harness, the passenger seats will be equipped with a 3-piont TSO harness. The seating system will be tested as mentioned above in Item 1.

5. The head flail envelope will be determined analytically using data from the following publication: “Aircraft Crash Survival Design Guide, Volume 1 – Design Criteria and Checklists,” report number USAAVSCOM TR 89-D-22A. Other applicants for similar exemption have successfully argued that the head flail envelope can be derived analytically using the report. The seat will be equipped with a 4-point harness with a TSO.”

The petitioner offers the following support for the exemption serving the Public Interest:

“The public interest will be served if this exemption is granted because it will enable the SH550 and SH650 to:

1. Ensure that the SH550 and SH650 are competitive with aircraft of similar configuration, weight and speed that have recently been granted exemptions for reasons that are very similar to the ones given in this petition.
2. It will offer to the market an aircraft with Part 23 normal category type certification that will have an enhanced level of safety over equivalent CAR 3, LSA and homebuilt type aircraft that compete directly with it.
3. The local, state, and national economies will experience tangible income benefits due to the resulting number of employment positions required for the production of these aircraft. Further, it is reasonable to assume that job security for Airframe and Powerplant mechanics will benefit as a result of the routine maintenance and continued airworthiness requirements of these aircraft.”

A summary of the petition was published in the Federal Register on December 9, 2013 (78 FR 73918). No comments were received.

The FAA’s analysis is as follows:

To obtain an exemption, the petitioner must demonstrate per 14 CFR 11.81(d) and (e) that granting the exemption is in the public interest and will not adversely affect safety or that a level of safety will be equal to that provided by the rules from which the exemption is sought.

The FAA has carefully reviewed the information contained in the petitioner’s request for exemption. The FAA does not agree with the petitioner’s argument that the exemption will not affect safety.

The applicant proposes 18G seat/restraint static testing similar to that required of items of mass in the cabin per § 23.561(b)(3)(ii). This static test will not address the seat’s vertical requirements of § 23.562(b)(1) and most importantly ignores the biometric criteria that has

been established and is considered the threshold for serious injury in dynamic testing. Additionally, the proposed exemption would not address floor pitch and roll requirements that ensure seats remain attached under accident floor deformation.

From the preamble to § 23.562, Amendment 23-36:

“The test conditions of proposed Section 23.562(b)(1) required a 60-degree pitched orientation of the seat relative to the velocity vector and were intended to create a predominantly vertical deceleration input to assess the occupant spinal protection provided by the seat/restraint system. This test condition has a longitudinal component of deceleration to simulate a more realistic impact environment where the restraint system is loaded by the initial impact...”

The specific dynamic test conditions in § 23.562 are supported by several research studies including:

- (1) A series of full-scale crash impact "drop tests" conducted by the National Aeronautics and Space Administration (NASA),
- (2) Actual accident evaluation information from the National Transportation Safety Board (NTSB),
- (3) Dynamic tests conducted by the FAA Civil Aeromedical Institute (CAMI), and
- (4) Generally accepted human impact injury criteria developed by the military and other sources.

Data from these studies provided vertical and horizontal conditions deemed survivable at aircraft impact. The conditions took into account accidents from a wide range of aircraft with varying sizes, impact orientations, and velocities. The impulses introduced during the dynamic seat testing typically far exceed human tolerance if the seat does not incorporate energy absorbing details. While the petitioner's aircraft may allow for slower horizontal impact energy due to reduced stall speeds, survivability in the vertical direction has not been mitigated or otherwise demonstrated.

The petitioner suggests that the higher static load test would exceed the requirements of Civil Air Regulations Part 3 (CAR 3), homebuilt type (experimental) aircraft, primary category 14 CFR part 21, and light sport (LSA) aircraft. The level of safety for a part 23 aircraft is, in fact, higher than that of experimental, LSA, and most CAR 3 aircraft. Requirements for occupant safety are included in the current certification basis. This level of certification also allows additional types of commercial operations not available to LSA, part 21 primary category, and experimental aircraft. The safety requirements added by § 23.562 were a result of extensive accident studies involving primarily CAR 3 aircraft. By incorporating safety benefits realized in automotive safety, the newer dynamic seat tests were included to enhance survivability.

The applicant has included three and four point harnesses, some with the inclusion of airbags. All of these features will work to reduce head impact criteria Head Impact Criteria HIC values. However, dynamic testing will more accurately define and validate the head path as a seat may deform during a dynamic test. If inflatable restraints are used, additional special conditions will be required that include dynamic seat tests.

As noted above, the petitioners exemption request for an aircraft that carries up to eight occupants and operates at significantly higher weights, does not demonstrate similarity to previously approved exemptions for dynamic seat testing. Previous exemptions were for much lighter aircraft that integrated the seats into the airframe and operated at much lighter weights with only two occupants; therefore, vastly reducing risk exposure to revenue passengers.

The FAA's Decision:

In consideration of the foregoing, I find that a grant of exemption would not 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, the Sherpa Aircraft Incorporated petition for an exemption from 14 CFR 23.562 is hereby denied.

Issued in Kansas City, Missouri on February 11, 2014.

//SIGNED//

Earl Lawrence
Manager, Small Airplane Directorate
Aircraft Certification Service