

**DEPARTMENT OF TRANSPORTATION****Federal Aviation Administration****14 CFR Part 23**

[Docket No. CE210; Notice No. 23-04-01-SC]

**Special Conditions: AMSAFE, Incorporated, Sky International A1, A1A, A1B, Inflatable Five-Point Seatbelt Airbag Restraint****AGENCY:** Federal Aviation Administration (FAA), DOT.**ACTION:** Notice of proposed special conditions.

**SUMMARY:** This notice proposes special conditions for the installation of an AMSAFE, Inc. Inflatable Five-Point Seatbelt Airbag Restraint on Sky International models A1, A1A, and A1B. These airplanes, as modified by AMSAFE, Inc. will have novel and unusual design features associated with the upper-torso restraint portions of the 5-point safety belt, which contains an integrated airbag device. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. The proposed special conditions contain the additional safety standards the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** Comments must be received on or before October 14, 2004.

**ADDRESSES:** Comments on this proposal may be mailed in duplicate to: Federal Aviation Administration (FAA), Regional Counsel, ACE-7, Attention: Rules Docket, Docket No. CE210, 901 Locust, Room 506, Kansas City, Missouri 64106, or delivered in duplicate to the Regional Counsel at the above address. Comments must be marked: CE210. Comments may be inspected in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4 p.m.

**FOR FURTHER INFORMATION CONTACT:** Mr. Pat Mullen, Federal Aviation Administration, Aircraft Certification Service, Small Airplane Directorate, ACE-114, 901 Locust, Kansas City, Missouri, 816-329-4128, fax 816-329-4090, e-mail: [pat.mullen@faa.gov](mailto:pat.mullen@faa.gov).

**SUPPLEMENTARY INFORMATION:****Comments Invited**

Interested persons are invited to participate in the making of these proposed special conditions by submitting such written data, views, or arguments, as they may desire.

Communications should identify the regulatory docket or notice number and be submitted in duplicate to the address specified above. All communications received on or before the closing date for comments will be considered by the Administrator. The proposals described in this notice may be changed in light of the comments received. All comments received will be available in the Rules Docket for examination by interested persons, both before and after the closing date for comments. A report summarizing each substantive public contact with FAA personnel concerning this rulemaking will be filed in the docket. Persons wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include with those comments a self-addressed, stamped postcard on which the following statement is made: "Comments to CE210". The postcard will be date stamped and returned to the commenter.

**Background**

On January 15, 2004, AMSAFE, Inc. Aviation Inflatable Restraints Division, 1043 North 47th Avenue, Phoenix, AZ 85043, applied for a supplemental type certificate for the installation of a five-point safety belt restraint system incorporating an inflatable airbag for the pilot and co-pilot seats of the Sky International model A1, A1A, and A1B airplanes. Models A1, A1A, and A1B are single engine, two-place airplanes, arranged in a tandem configuration.

The inflatable restraint system is a five-point safety belt restraint system consisting of a lapbelt and dual shoulder harnesses. An inflatable airbag is attached to one of the shoulder harnesses, and the other shoulder harness is of conventional construction. The inflatable portion of the restraint system will rely on sensors to electronically activate the inflator for deployment. The inflatable restraint system will be installed on both the pilot and co-pilot seats.

In the event of an emergency landing, the airbag will inflate and provide a protective cushion between the occupant's head and structure within the airplane cockpit. This will reduce the potential for head and torso injury. The inflatable restraint behaves in a manner that is similar to an automotive airbag, but in this case, the airbag is integrated into one of the shoulder harnesses. While airbags and inflatable restraints are standard in the automotive industry, the use of an inflatable five-point restraint system is novel for general aviation operations.

The FAA has determined that this project will be accomplished on the

basis of providing the same current level of safety of the Sky International A1, A1A, and A1B occupant restraint systems. The FAA has two primary safety concerns with the installation of airbags or inflatable restraints:

- That they perform properly under foreseeable operating conditions; and
- That they do not perform in a manner or at such times to impede the pilot's ability to maintain control of the airplane or constitute a hazard to the airplane or occupants.

The latter point has the potential to be the more rigorous of the requirements. An unexpected deployment while conducting the takeoff or landing phases of flight may result in an unsafe condition. The unexpected deployment may either startle the pilot, or generate a force sufficient to cause a sudden movement of the control stick. Either action could result in a loss of control of the airplane, the consequences of which are magnified due to the low operating altitudes during these phases of flight. The FAA has considered this when establishing the special conditions.

The inflatable restraint system relies on sensors to electronically activate the inflator for deployment. These sensors could be susceptible to inadvertent activation, causing deployment in a potentially unsafe manner. The consequences of an inadvertent deployment must be considered in establishing the reliability of the system. AMSAFE, Inc. must show that the effects of an inadvertent deployment in flight are not a hazard to the airplane or that an inadvertent deployment is extremely improbable. In addition, any general aviation aircraft can generate a large amount of cumulative wear and tear on a restraint system. It is likely that the potential for inadvertent deployment increases as a result of this cumulative damage. Therefore, the impact of wear and tear on inadvertent deployment must be considered. Due to the effects of this cumulative damage, a life limit must be established for the appropriate system components in the restraint system design.

There are additional factors to be considered to minimize the chances of inadvertent deployment. General aviation airplanes are exposed to a unique operating environment, since the same airplane may be used by both experienced and student pilots. The effect of this environment on inadvertent deployment must be understood. Therefore, qualification testing of the firing hardware/software must consider the following:

- The airplane vibration levels appropriate for a general aviation airplane; and

- The inertial loads that result from typical flight or ground maneuvers, including gusts and hard landings.

Any tendency for the firing mechanism to activate as a result of these loads or acceleration levels is unacceptable.

Other influences on inadvertent deployment include high intensity electromagnetic fields (HIRF) and lightning. Since the sensors that trigger deployment are electronic, they must be protected from the effects of these threats. To comply with HIRF and lightning requirements, the AMSAFE, Inc. inflatable restraint system is considered a critical system, since its inadvertent deployment could have a hazardous effect on the airplane.

Given the level of safety of the current Sky International A1, A1A, and A1B occupant restraints, the inflatable restraint system must show that it will offer an equivalent level of protection in the event of an emergency landing. In the event of an inadvertent deployment, the restraint must still be at least as strong as a Technical Standard Order certificated belt and dual shoulder harnesses. There is no requirement for the inflatable portion of the restraint to offer protection during multiple impacts, where more than one impact would require protection.

The inflatable restraint system must deploy and provide protection for each occupant under a crash condition where it is necessary to prevent serious head injury. The seats of the models A1, A1A, and A1B are not certificated to the requirements of § 23.562, and it is not known if they would remain intact following exposure to the crash pulse identified in § 23.562. Therefore, the test crash pulse used to satisfy this requirement may have a peak longitudinal deceleration lower than that required by § 23.562. However, the test pulse onset rate (deceleration divided by time) must be equal to or greater than the onset rate of the pulse described in § 23.562. This will demonstrate that the crash sensor will trigger when exposed to a rapidly applied deceleration, like an actual crash event.

It is possible a wide range of occupants will use the inflatable restraint. Thus, the protection offered by this restraint should be effective for occupants that range from the fifth percentile female to the ninety-fifth percentile male. Energy absorption must be performed in a consistent manner for this occupant range.

In support of this operational capability, there must be a means to

verify the integrity of this system before each flight. As an option, AMSAFE, Inc. can establish inspection intervals where they have demonstrated the system to be reliable between these intervals.

It is possible that an inflatable restraint will be "armed" even though no occupant is using the seat. While there will be means to verify the integrity of the system before flight, it is also prudent to require that unoccupied seats with active restraints not constitute a hazard to any occupant. This will protect any individual performing maintenance inside the cockpit while the aircraft is on the ground.

In addition, the design must prevent the inflatable seatbelt from being incorrectly buckled and/or installed such that the airbag would not properly deploy. As an alternative, AMSAFE, Inc. may show that such deployment is not hazardous to the occupant, and will still provide the required protection.

The cockpits of the models A1, A1A, and A1B are confined areas, and the FAA is concerned that noxious gasses may accumulate in the event of restraint deployment. When deployment does occur, either by design or inadvertently, there must not be a release of hazardous quantities of gas or particulate matter into the cockpit.

An inflatable restraint should not increase the risk already associated with fire. Therefore, the inflatable restraint should be protected from the effects of fire, so that an additional hazard is not created by, for example, a rupture of the inflator.

Finally, the airbag is likely to have a large volume displacement, and possibly impede the egress of an occupant. Since the bag deflates to absorb energy, it is likely that the inflatable restraint would be deflated at the time an occupant would attempt egress. However, it is appropriate to specify a time interval after which the inflatable restraint may not impede rapid egress. Ten seconds has been chosen as reasonable time. This time limit will offer a level of protection throughout the impact event.

#### **Type Certification Basis**

Under the provisions of § 21.101, AMSAFE, Inc. must show that the Sky International models A1, A1A, and A1B, as changed, continue to meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. A22NM or the applicable regulations in effect on the date of application for the change. The regulations incorporated by reference in the type certificate are commonly referred to as the "original type

certification basis." The regulations incorporated by reference in Type Certificate No. A22NM are as follows:

Part 23 of the Federal Aviation Regulations dated February 1, 1965, as amended by 23-1 through 23-31 (normal category) and FAR 36 amended through 36-12. FAR 21 amended through 21-57.

For the models listed above, the certification basis also includes all exemptions, if any; equivalent level of safety findings, if any; and the special conditions adopted by this rulemaking action.

The Administrator has determined that the applicable airworthiness regulations (*i.e.*, part 23 as amended) do not contain adequate or appropriate safety standards for the AMSAFE, Inc. inflatable restraint as installed on these Sky International models because of a novel or unusual design feature. Therefore, special conditions are prescribed under the provisions of § 21.16.

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 § 21.101.

Special conditions are initially applicable to the model for which they are issued. Should the applicant apply for a supplemental type certificate to modify any other model included on the same type certificate to incorporate the same novel or unusual design feature, the special conditions would also apply to that model under the provisions of § 21.101.

#### **Novel or Unusual Design Features**

The Sky International models A1, A1A, and A1B will incorporate the following novel or unusual design feature:

The AMSAFE, Inc. Five-Point Safety Belt Restraint System incorporating an inflatable airbag for the pilot and co-pilot seats. The purpose of the airbag is to reduce the potential for injury in the event of an accident. In a severe impact, an airbag will deploy from one shoulder harness, in a manner similar to an automotive airbag. The airbag will deploy between the head of the occupant and cockpit structure. This will, therefore, provide some protection to the head of the occupant. The restraint will rely on sensors to electronically activate the inflator for deployment.

The Code of Federal Regulations state performance criteria for seats and restraints in an objective manner. However, none of these criteria are adequate to address the specific issues raised concerning inflatable restraints.

Therefore, the FAA has determined that, in addition to the requirements of part 21 and part 23, special conditions are needed to address the installation of this inflatable restraint.

Accordingly, these special conditions are adopted for the models A1, A1A, and A1B equipped with the AMSAFE, Inc. five-point inflatable restraint. Other conditions may be developed, as needed, based on further FAA review and discussions with the manufacturer and civil aviation authorities.

#### Applicability

As discussed above, these special conditions are applicable to the Sky International models A1, A1A, and A1B equipped with the AMSAFE, Inc. five-point inflatable restraint system. Should AMSAFE, Inc. apply at a later date for a supplemental type certificate to modify any other model on Type Certificate number A22NM to incorporate the same novel or unusual design feature, the special conditions would apply to that model as well under the provisions of § 21.101.

#### Conclusion

This action affects only certain novel or unusual design features on the Sky International models A1, A1A, and A1B. 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 21.101 for STC or 21.17 for TC; and 14 CFR 11.38 and 11.19.

#### The Proposed Special Conditions

The FAA has determined that this project will be accomplished on the basis of not lowering the current level of safety for the Sky International models A1, A1A, and A1B occupant restraint system. Accordingly, the FAA proposes the following special conditions as part of the type certification basis for these models, as modified by AMSAFE, Inc.

Five-Point Safety Belt Restraint System Incorporating an Inflatable Airbag for the Pilot and Co-pilot Seats of the Sky International models A1, A1A, and A1B.

1. It must be shown that the inflatable lapbelt will deploy and provide protection under crash conditions where it is necessary to prevent serious

head injuries. Compliance will be demonstrated using the deceleration pulse specified in § 23.562, which may be modified as follows:

a. The peak longitudinal deceleration may be reduced, however the onset rate of the deceleration must be equal to or greater than the crash pulse identified in § 23.562.

b. The peak longitudinal deceleration must be above the deployment threshold of the crash sensor, and equal to or greater than the forward static design longitudinal load factor required by the original certification basis of the airplane.

The means of protection must take into consideration a range of stature from a 5th percentile female to a 95th percentile male. The inflatable restraint must provide a consistent approach to energy absorption throughout that range.

2. The inflatable restraint must provide adequate protection for each occupant. In addition, unoccupied seats that have an active restraint must not constitute a hazard to any occupant.

3. The design must prevent the inflatable restraint from being incorrectly buckled and/or incorrectly installed such that the airbag would not properly deploy. Alternatively, it must be shown that such deployment is not hazardous to the occupant and will provide the required protection.

4. It must be shown that the inflatable restraint system is not susceptible to inadvertent deployment as a result of wear and tear or the inertial loads resulting from in-flight or ground maneuvers (including gusts and hard landings) that are likely to be experienced in service.

5. It must be shown (or be extremely improbable) that an inadvertent deployment of the restraint system during the most critical part of the flight does not impede the pilot's ability to maintain control of the airplane or cause an unsafe condition (or hazard to the airplane). In addition, a deployed inflatable restraint must be at least as strong as a Technical Standard Order (C114) 5-point harness.

6. It must be shown that deployment of the inflatable restraint system is not hazardous to the occupant or result in injuries that could impede rapid egress. This assessment should include occupants whose restraint is loosely fastened.

7. It must be shown that an inadvertent deployment that could cause injury to a standing or sitting person is improbable.

8. It must be shown that the inflatable restraint will not impede rapid egress of

the occupants 10 seconds after its deployment.

9. For the purposes of complying with HIRF and lightning requirements, the inflatable restraint system is considered a critical system since its deployment could have a hazardous effect on the airplane.

10. It must be shown that the inflatable restraints will not release hazardous quantities of gas or particulate matter into the cabin.

11. The inflatable restraint system installation must be protected from the effects of fire such that no hazard to occupants will result.

12. There must be a means to verify the integrity of the inflatable restraint activation system prior to each flight or it must be demonstrated to reliably operate between inspection intervals.

13. A life limit must be established for appropriate system components.

14. Qualification testing of the internal firing mechanism must be performed at vibration levels appropriate for a general aviation airplane.

Issued in Kansas City, Missouri on August 26, 2004.

**David R. Showers,**

*Acting Manager, Small Airplane Directorate, Aircraft Certification Service.*

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**BILLING CODE 4910-13-P**

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## DEPARTMENT OF TRANSPORTATION

### Federal Aviation Administration

#### 14 CFR Part 39

[Docket No. 2004-CE-01-AD]

RIN 2120-AA64

#### Airworthiness Directives; Raytheon Aircraft Company Beech 100, 200, and 300 Series Airplanes

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Notice of proposed rulemaking (NPRM).

**SUMMARY:** The FAA proposes to supersede Airworthiness Directive (AD) 93-25-07, which applies to Raytheon Aircraft Company (Raytheon) Beech 100, 200, and 300 series airplanes. AD 93-25-07 currently requires you to repetitively inspect the fuselage stringers for cracks and modify at certain times depending on the number of cracked stringers. This proposed AD is the result of FAA's policy (since 1996) to not allow airplane operation when known cracks exist in primary structure. The fuselage structure is