AMSAFE AVIATION

Inflatable Restraints Division

5456 E. McDowell Road, Mesa, AZ 85215 ? Phone: 480-344-4700 ? Fax: 480-344-4777 ?
www.amsafe.com

The World Leader in Aviation Restraints

February 27, 2003

Docket Management System
U.S. Department of Transportation
Room Plaza 401
400 Seventh Street, NW
Washington, DC 20590-0001

REF: Docket No. FAA 2002-13464; Notice No. 02-17: RIN 2120-AC84

RE: SNPRM/FAA/DOT - Improved Seats in Air Carrier Transport Category Airplanes

Gentlemen:

AMSAFE, Inc. is a privately owned Arizona-based company that has been manufacturing aircraft restraint systems for the past 36 years. Our company is the recognized leader in the marketplace and its products may be found on virtually every model aircraft produced in the world.

AMSAFE maintains a vigorous and longstanding commitment to innovation in air crash survivability and conducts a well-funded, aggressive research and development effort. As part of that program, our company operates and maintains its own FAA-approved test sled facility in Phoenix.

Our company's most recent patent was issued for the airbag seatbelt; a robust, fully-developed and tested product, which is FAA/JAA certified and commercially available. It is currently installed and operational on several types of aircraft. AMSAFE's airbag has been successfully employed on over (11) installations to date allowing our customers' aircraft seats compliance with FAR 25.562 on problematic configurations that would not have been certified without the use of the energy-absorbing characteristics of our airbag. In addition to providing a means of compliance for problematic configurations, the airbag can dramatically reduce Head Injury Criteria (HIC) in row-to-row, exempted front row, and infinite setback seating arrangements (such as in first class and business class seating) achieving HIC values well below 1,000 and often below 500.

It is laudable that after many years of delay the 16g retrofit SNPRM has finally been issued. It is also commendable that the proposed rulemaking is driven by the apparent desire of the FAA to achieve "one level of safety." However, safety delayed is safety denied and the proposed implementation period of 14 years means that 28 years will have elapsed since the original rule was issued in 1988. That represents almost an entire generation of Americans who have been denied the protections promised by the original rule. Contrast this to the automotive experience where the industry and NHTSA have passed and/or revised 18 occupant safety regulations since 1988 (for example; FMVSS 214 Dynamic Side Impact Protection, FMVSS 213 Child Restraint Systems, FMVSS 216 Roof Crush Resistance, FMVSS 217 Roof Emergency Exits / Window Retention, FMVSS 219 Windshield Zone Intrusion, etc). It is also interesting to note that all automobile manufacturers have voluntarily adopted a maximum permissible HIC level of 700 and that NHTSA has proposed to make this a mandatory limit. Also, by proposing compliance with 25.562 and excluding the requirements of 25.785, the proposed rule is weakened at its inception. The FAA should issue a statement as to why the requirements of this regulation should not apply to compliance with the final rule contemplated.

The new rule will be further weakened if the current exemption granted by means of AC 25.562-1A and the draft language of AC 25.562-1B is not revisited and revoked. The guidance material allows an applicant to move or extend their seat pitch away from a vertical hazard thus allowing the occupant to strike their own legs or floor of the aircraft without ever considering the resulting HIC. We strongly disagree with the FAA's guidance, acceptance, and defense of an unrestrained upper torso in a 16g dynamic event as an acceptable means of compliance without ever considering or measuring the resulting injury. This loophole method of compliance has become the standard acceptable method for approximately 20% of all 25.562 seats in service. If the FAA is sincere about providing "one level of safety," then this loophole needs to be closed (see attachments Hagan letter 8-12-02 and Lipski letter 10-17-02).

Another compelling reason for closing this loophole is the fact that its continuation exposes the industry to a huge potential for liability losses. If modern litigation history is to be believed, it may not be long before the plaintiffs' bar discovers what the aviation industry and the FAA already know - inflatable lap belts in all cases reduce HIC to non-lethal, non-debilitating levels. AMSAFE's dynamic testing has shown that infinite setback seats will produce HIC results that, on average, substantially exceed the mandated limit of 1,000 and, therefore, would result in death or incapacitating injury. We are certain the plaintiffs' bar will continue to press the envelope.

Some may argue that manufacturers no longer offer 9g seats, thus all replacement seats will be 16g, thus routine periodic replacement of seats will automatically bring about the conversion of the fleet, and thus the retrofit rule is unnecessary. This syllogism ignores the fundamental purpose of 25.562 – to protect occupants from head injuries. The notion that passenger safety is enhanced by simply installing a 16g seat which will stay attached to the aircraft structure in a survivable 16g dynamic event is misguided. If the seat is designed to stay together and remain attached to the floor during such an event, the passenger is no longer at risk of being crushed. However, they are now at risk for serious, and most often fatal, head injuries that result from an unrestrained upper torso. This was anticipated in the original rule FAR 25.562 and it is for this reason that HIC testing is required when showing compliance. The acquisition of a 16g seat does not *ipso facto* demonstrate compliance. Compliance, and the attendant safety enhancement that results for passengers, can only be demonstrated by proper HIC testing and evaluation.

The timetable for compliance is a critical factor in the human element of this ruling. AMSAFE has attempted to reconstruct the timeline assuming an implementation period of only seven (7) years. Accelerating the compliance schedule and implementing safety measures sooner means an additional 20 lives can be saved and 23 serious injuries avoided. In terms of the FAA's cost/benefit analysis, $70 million could be saved by shortening the timeline (see attachment Cost/Benefit Table).

The FAA estimates the cost of compliance with seat certification requirements at $300,000 per seat. A substantial portion of this certification cost is attributable to dynamic testing related to HIC compliance. This could be substantially reduced by use of an airbag, especially if the FAA were to designate the device as an approved method of compliance. AMSAFE is actively participating in an SAE Seat Committee Subgroup whose mission is to write a standard, SAE AS5785; PERFORMANCE STANDARD FOR AVIATION INFLATABLE RESTRAINT SYSTEMS with an end goal of a TSO for airbags in aviation applications. Relative to cost, we highly recommend the FAA embrace and accelerate, in anyway possible, the issuance of a new TSO for airbags as a means of compliance for 25.562 and the SNPRM. This offers the possibility for the industry to save a substantial amount over the FAA's estimated cost of compliance of $300,000 per seat.

Our own certification efforts serve to demonstrate the point. One example is the A340-500/600 on which the airbag was recently certified for six operators. The first certification required six (6) dynamic tests. Second and subsequent installations required only one or two dynamic tests. Due to the robust energy-absorbing nature of the airbag, demonstrated in the course of thousands of developmental sled tests, the airbag is not affected by many of the changes that occur from installation to installation. It is entirely possible that at some point, while adhering to appropriate policy and guidance material, airbag installations could be certified by similarity with little or no dynamic testing.

AMSAFE would recommend the following actions:

- Require HIC compliance in all situations regardless of strike hazard fidelity
- Reduce compliance time to 7 years
- Eliminate the Advisory Circular 25.562-1A "loophole"
- Address liability issues
- Timely issuance of an airbag TSO as an acceptable means of compliance to 25.562

In summary, AMSAFE recommends that the FAA issue this ruling and enforce it in a manner consistent with the "one level of safety" philosophy. Don't marginalize the original intent of 25.562 - assuring that the flying public is afforded the rudimentary occupant protection is the least that the FAA should do.

For additional information, please contact me at 480-344-4712 or by email at jsmith@amsafe.com.

Respectfully submitted,

AMSAFE AVIATION, AAIR DIVISION

Joseph Smith 2/27/03

Joseph Smith
General Manager, AMSAFE Aviation Inflatable Restraints

cc: B. Hagan, President, AMSAFE Aviation
B. Harris

Attachments (3): Hagan Letter 8-12-02; Lipski letter 10-17-02; Cost/Benefit Table

AMSAFE AVIATION

1043 N. 47th Ave., Phoenix, AZ 85043 ?Phone: 602-850-2850 ?Fax: 602-850-2812 ?www.amsafe.com

The World Leader in Aviation Restraints

August 12, 2002

Vi Lipski
Manager
Large Airplane Directorate
Federal Aviation Administration
VIA ELECTRONIC TRANSMISSION
vi.lipski@faa.gov

Dear Ms. Lipski:

I am deeply concerned that the proposed Advisory Circular 25.562 1B completely contradicts the intent of the underlying FAR as well as the intent of FAR 25.785.

The Advisory Circular reads in part, **"Data for determining the Head Injury Criterion (HIC) need to be collected during tests discussed in this AC only if the ATD's head is exposed to an impact on airplane interior features (not including the floor or the ATD's own leg) during the test."** Whereas the language of FAR 25.562 reads in part **"Each occupant must be protected from serious head injury under the conditions described in paragraph (b) of this section. Where head contact with seats or other structure can occur, protection must be provided so that the head impact does not exceed a Head Injury Criterion (HIC) of 1,000 units."**

As you are well aware, this company in concert with the FAA has over the past several years expended enormous resources in time, money and manpower to test and certify an airbag seatbelt (AAIR) that is designed to allow operators to meet the regulatory requirement as set forth above. Clearly the floor is part of the "structure" of an aircraft; and, clearly, all of our dynamic testing shows that in the absence of any other intervening structure, ATDs invariably strike the floor (or their own legs) with invariably fatal HIC readings.

Indeed, a later regulation FAR 25.785 reads in part **"(b) Each seat, berth, safety belt, harness, and adjacent part of the airplane at each station designated as occupiable during takeoff and landing must be designed so that a person making proper use of these facilities will not suffer serious injury in an emergency landing as a result of the inertia forces specified in 25.561 and 25.562."**

The exemption of HIC resulting from impact with floors and the ATD's own legs virtually rescinds the substantive intent of the regulations referenced for approximately 20% of the passenger seats delivered on 25.562 aircraft, primarily premium seats.

In fairness, I would point out that at the time the AC 25.562 1A guidance was issued, no solution to the problem existed. However, in response to the regulation and the safety enhancement it envisioned, our company and others have responded with a major R&D investment resulting in a now certified, installed and operating AAIR. This device has been commercially available for the past two years.

It has historically been an FAA/Industry partnership that has lead to enormous advances in aviation safety which have greatly benefited the traveling public. When the FAA sets forth a performance requirement in a regulation, industry has the right to expect that the agency is serious and therefore industry is justified in committing resources to meet the performance standard. If that is not the case, I suspect it will have a chilling effect on future safety developments and a commensurate decline in the advancement of public safety.

Moreover, two important studies on aviation accident survivability reveal compelling statistics, The European Transport Safety Council study of accidents worldwide estimates that of those who die in survivable events, over 50% (330) die as a result of impact. The National Transportation Safety Board, investigating 26 accidents between 1983 and 2000 (NTSB/SR-01/01) concluded that (716) occupants died from impact in otherwise survivable accidents.

The factual irony is astonishing: the FAA has in place regulatory performance requirements that might be expected to substantially reduce these fatalities, and there are commercially available means to implement these performance requirements. Yet, the FAA essentially fails to enforce its own regulations, officially advises non-compliance, and preventable deaths continue to occur.

I would hope that what we currently see in AC guidance with regard to this issue is a function of precedent and that new guidance will be forthcoming which acknowledges the technical advances that have been made over the past decade. Please let me know what the FAA's position on this issue is since it is critical to this company's planning and product development efforts.

Very truly,

Bill Hagan
President
AmSafe Aviation

CC: Barry Lambert Harris

U.S. Department
of Transportation

**Federal Aviation
Administration**

Transport Airplane Directorate
Aircraft Certification Service

1601 Lind Avenue, S.W.
Renton, Washington 98055-4056

OCT 16 2002

In reply refer to: 00-115-23

Mr. Bill Hagan
President
AmSafe Aviation
1043 N. 47th Ave.,
Phoenix, AZ 85043

Dear Mr. Hagan:

This is in reply to your letter of August 12, 2002, and the FAA/AmSafe meeting of September 17, 2002, concerning the requirements for Head Injury Protection (HIC) under 14 Code of Federal Regulations § 25.562. In particular, you questioned the guidance contained in Advisory Circular (AC) 25.562-1, which does not consider head impacts that occur on the airplane floor, or when the anthropomorphic test dummy (ATD) contacts its own legs.

We share your interest in applying the HIC requirement as comprehensively as is reasonable to provide the maximum protection for the most occupants. As pointed out in your letter, the FAA has never considered the airplane floor in assessing the HIC requirements. As discussed during the September 17 meeting, there are several reasons for this. First, we are not aware of impact on the floor being an issue in dynamic testing, or in actual accidents. We have discussed this possibility with our Civil Aerospace Medical Institute and they do not have data that indicate a potential for floor strikes. Additionally, efforts by seat designers to reduce the head and torso flail envelopes of lap belt restrained occupants have resulted in more effective belt anchor geometry, which should reduce the likelihood of gross forward excursion of the ATD and subsequent head strikes on the floor. In addition, the occupant dynamics as represented by the ATD are not likely representative of the dynamics of an actual person for this extreme part of the occupant trajectory. Finally, the data provided at the September 17 meeting did not illustrate any floor strikes.

With respect to the impact of an ATD on its own legs, you did provide us data showing head to leg contact, with associated HIC measurements, in three tests. However, as we discussed at the meeting, the ATD is not biofidelic as an *impact surface*, and therefore the measured HIC values are not representative. There would appear to be a potential injury mechanism associated with such contact, but whether the injury would be to the head or the leg or both, is not clear. In any case, the tests shown do not provide sufficient data to warrant a change to the advisory circular prior to its publication for comment. However, we welcome your comments to the AC when it is published for comment and these will be considered in developing the final document.

We are also in the process of conducting research to gather additional information on injury mechanisms. We will initiate efforts to address the issue of head/leg contact and the potential for lower leg injury or head injury in this program or in a future research program. We will review the status of the research program and see what can be done to incorporate consideration of the issues you have raised.

Please be assured that we endorse the efforts of AmSafe and others to develop advanced methods of occupant protection. We regard such efforts as furthering safety and will continue to work with you to define the appropriate criteria and facilitate certification. The accident studies you cite support the need for occupant protection standards such as those contained in § 25.562, but do not suggest that those requirements are inadequate, or inadequately applied. In summary, we appreciate your concern that the standards be applied in a manner that satisfies the intent of the rule, and consider that this is currently taking place. AmSafe's efforts in developing an active occupant protection system contribute to this objective and we foresee further application of this technology in the near future.

I hope the above has addressed your questions. Do not hesitate to contact me, or Jeff Gardlin of my staff at 425-227-2136, if you have additional questions.

Sincerely,

Vi L. Lipski
Manager, Transport Airplane Directorate
Aircraft Certification Service

cc: Mr. Barry L. Harris

RETROFIT RULE
MOVE UP TOTAL TIME LINE HORIZON 7 YEARS-ANALYSIS
SAVINGS AND COSTS ON PASSENGER SEATS

CURRENTLY PROPOSED 14 YEAR TIME LINE *

	ESTIMATED 2000-2020	AVERAGE PER YEAR	COST PER VICTIM (IN $ MILLIONS)	COST SAVINGS PER YEAR (IN $ MILLIONS)	SAVINGS UNDISCOUNTED (IN $ MILLIONS)	LIVES SAVED OR SERIOUS INJURIES AVOIDED
DEATHS AVOIDED	112.1	5.6	$ 3.0	$ 16.8	$ 126.0	42
SERIOUS INJURIES	130.2	6.5	$ 0.5	$ 3.3	$ 24.8	8
			TOTAL	$ 20.1	$ 150.8	

7 YEAR TIME LINE

	ESTIMATED 2000-2020	AVERAGE PER YEAR	COST PER VICTIM (IN $ MILLIONS)	COST SAVINGS PER YEAR (IN $ MILLIONS)	7 YR SAVINGS UNDISCOUNTED (IN $ MILLIONS)	LIVES SAVED OR SERIOUS INJURIES AVOIDED
DEATHS AVOIDED	112.1	5.6	$ 3.0	$ 16.8	$ 184.8	62
SERIOUS INJURIES	130.2	6.5	$ 0.5	$ 3.3	$ 36.3	12
			TOTAL	$ 20.1	$ 221.1	

ADDED COST SAVINGS RESULTING FROM MOVING UP TIMELINE **70.3**