

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

SP-20
log 185/

ISSUED: December 17, 1985

Forwarded to:

Honorable Donald D. Engen
Administrator
Federal Aviation Administration
Washington, D. C. 20591

SAFETY RECOMMENDATION(S)

A-85-122 through -125

The National Transportation Safety Board has concluded its General Aviation Airplane Crashworthiness Project. In this project, the Safety Board examined 500 relatively severe general aviation airplane accidents to determine what proportion of the occupants would have benefited from the use of shoulder harnesses and energy-absorbing seats. The Safety Board found that 20 percent of the fatally-injured occupants in these accidents could have benefited from the use of shoulder harnesses and that 88 percent of the seriously injured could have had significantly less severe injuries with the use shoulder harnesses. Energy-absorbing seats could have benefited 34 percent of the seriously injured. The Safety Board concluded that shoulder harness use is the most effective way of reducing fatalities and serious injuries in general aviation accidents. Pilots should be made aware that they may forget or may not have time to don a shoulder harness during an emergency.

During the in-depth investigations of general aviation accidents, many examples of good seat/restraint designs were found as well as many examples of very poor designs. In some accidents, the Safety Board found seat pan constructions which were adequate when new but which had deteriorated with age to the point that they could no longer fulfill their intended functions. Inspections had not been sufficient to cause repair or replacement of these seat pans. Airworthiness Directives are needed to ensure that these problems are promptly discovered, and appropriate repairs or replacements are made.

The lapbelt cables on certain Piper airplanes have broken in accidents, permitting injury to the occupants. Those cables were the subject of Safety Recommendation A-73-56 issued to the Federal Aviation Administration (FAA) in 1973. The FAA did not issue an Airworthiness Directive for these airplanes because it believed that the crash loads were more severe than those provided for in the design standards. Since that time, at least two more accidents have involved broken lapbelt cables. In these three accidents, five people were injured and one received fatal injuries.

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A number of other designs, maintenance, or inspection problems were documented. Most of these relate to the need for dynamic testing requirements for restraints, seat legs and seat feet design, and equipment add-ons to seats. These problems need to be addressed by changes in certification rules, or by the issuance of Airworthiness Directives or Advisory Circulars. The actions desired would not bring occupant protection to the highest level now available, but they would bring occupant protection to the level that many seat/restraint systems now provide.

Detailed findings of the General Aviation Crashworthiness Project are presented in a series of three reports. 1/ These findings support a number of previous Safety Board recommendations to the FAA. Dynamic testing, higher strength seats and restraints, and the availability and use of shoulder harnesses for all occupants have been the subject of previous recommendations. 2/ In the interval since the adoption of the Phase Three report and associated recommendations, the FAA has amended Federal Aviation Regulations to require occupants of seats equipped with shoulder harnesses to wear them for takeoff and landing. 3/ As a result, the Safety Board has classified Safety Recommendation A 85-123 on shoulder harness use as "Closed-Acceptable Alternate Action."

As a result of this General Aviation Crashworthiness Project, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Amend 14 CFR Part 23 to specify performance standards for the seat/restraint systems in small airplanes consistent with the standards proposed by the General Aviation Safety Panel; and require the multi-axis dynamic testing of seat/restraint systems as necessary to demonstrate energy management in the vertical direction and structural adequacy in the longitudinal and lateral directions. (Class II, Priority Action) (A-85-122)

Amend 14 CFR Part 91 and Part 135 to require that all occupants of small airplanes use shoulder harnesses for takeoff and landing when they are available in the airplane. (Class II, Priority Action) (A-85-123) (Closed--Acceptable Alternate Action)

Issue an Advisory Circular to provide pilots, passengers and maintenance personnel with information regarding the crash survivability aspects of small airplanes. The Advisory Circular should contain, as a minimum, discussion of the benefits of using lapbelts and shoulder harnesses during

1/ Safety Studies--"General Aviation Crashworthiness Project, Phase One," June 27, 1983 (NTSB/SR-83/01); "General Aviation Crashworthiness Project, Phase Two, Impact Severity and Potential Injury Prevention in General Aviation Accidents," March 15, 1985 (NTSB/SR-85/01); "General Aviation Crashworthiness Project: Phase Three--Acceleration Loads and Velocity Changes of Survivable General Aviation Accident," September 4, 1985 (NTSB/SR-85/02).

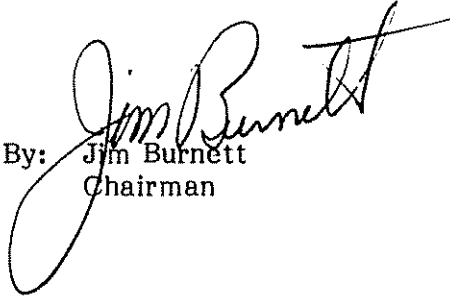
2/ Recommendations CY -70-42, Part 4; A-77-70; A-80-125; A-80-126; A-80-127; A-80-128; A-80-129; A-80-130 and A-80-131.

3/ Amendment 91-191 to Part 91 of the Federal Aviation Regulations; Shoulder Harnesses in Normal, Utility, and Acrobatic Category Airplanes; Issued in Washington, D.C. November 6, 1985. (50FR46872).

all phases of flight, discussion of the hazards of modifying seats, appendages to seats and stowage of articles in space designed or available for energy management, and discussion of the need for regular inspection and maintenance of seats. (Class II, Priority Action) (A-85-124)

Issue a series of Airworthiness Directives to require modification of seats installed in general aviation airplanes which have identified deficiencies. For example, require the replacement of the 1/8-inch diameter lapbelt attachment cable on applicable airplanes with a cable of a strength more compatible with the seat design, require replacement of plastic-type seatpans on applicable airplanes with a structural seatpan, and require additional stabilizing support on seats using "S"-shaped springs for the seatpans. (Class II, Priority Action) (A-85-125)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in these recommendations.

By: 
Jim Burnett
Chairman