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NASA TECH BRIEF

Ames Research Center

Integral Aircraft Passenger Seat

The problem:

Since the advent of commercial passenger aircraft, there have been major changes in aircraft mass, performance, range, etc. Unfortunately, as aircraft design has improved, passenger seat specifications and design criteria have not changed accordingly, so that the passenger has relatively archaic protection from impact or potential safety hazards and is afforded only a modicum of comfort and convenience.

The solution:

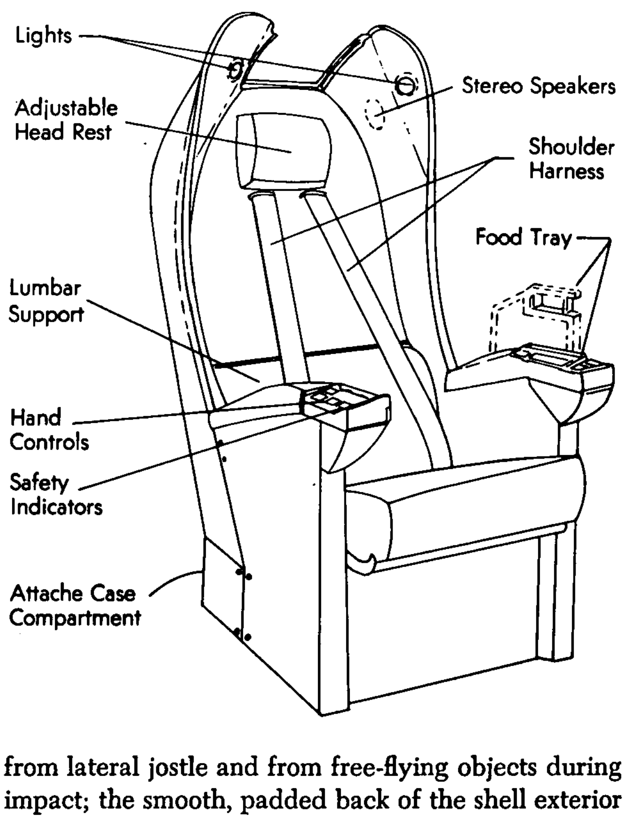
Utilize a human-engineering approach to design a single, integral seat which provides all the safety, comfort, and protective features that can possibly be afforded the airline passenger.

How it's done:

The integral seat consists primarily of two parts, the inner seat and the outer shell. The inner seat is an aluminum structure with a fixed seat angle of 105° between the seat pan and seat back; the pan is at a 6° incline from the horizontal when in the normal upright position. The entire inner seat (pan and back) can be put into a comfortable reclining position from one pivot point by depressing the seat-positioning switch and leaning back; in this operation, the seat reclines an additional 12° from the normal upright position completely within the outer shell.

The back area between the inner seat and outer shell houses all the impact attenuation, seat restraint, and seat-positioning mechanisms. Other items adding to the comfort and protection of the passenger are indicated in the diagram.

The outer shell, an aluminum structure formed over with fiberglass, is bolted to the aircraft floor and will not move unless design loads are exceeded or the bolts are purposely removed. It is padded on the inner left and right sides and provides protection



from lateral jostle and from free-flying objects during impact; the smooth, padded back of the shell exterior provides added protection for passengers from impact with the back of the seat. The arm rests are built in as part of the outer shell, thus eliminating hazardous hard-contact points.

(continued overleaf)

The reel-and-harness seat restraint system has been described previously (see Note 1). Impact energy is absorbed by movement of the inner seat on energy-absorption cables; the energy-absorbing mechanisms of the seat consist of upper-vertical and lower-horizontal assemblies of stainless steel cable, a pivoting hydraulic cylinder used to allow the fixed-length cable to move with the inner seat, a nylon restraint webbing with specially-stitched patterns, the outer shell structure, and the inner seat cushion which is fabricated from a specially developed foam polymer that also efficiently attenuates acceleration forces. Energy attenuation is performed by the combination of all the mechanisms, but primarily by the elongation of the stainless steel cables as the inner seat separates from the outer shell.

The results of dynamic impact testing indicated that the seat can withstand and attenuate gravity loads of 21-g horizontal and 45-g vertical; by design, the seat will withstand lateral g's as well.

Notes:

1. The seat restraint system is described in NASA Tech Brief B72-10692.
2. Requests for further information may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Moffett Field, California 94035
   Reference: TSP 73-10495

Patent status:

NASA has decided not to apply for a patent.

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