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Ejection Seat Test Results

DSI Cushion Wins in USAF Impact Tests

Recent tests by the U.S. Air Force showed that a two-inch SunMate composite cushion performed substantially better than other proposed ejection seat cushions in reducing the force of impact in the catapult stage.

Comfort is an important factor in the design of ejection seats for pilots who must remain seated for missions that sometimes last as long as fifteen hours. However, it has been discovered that some cushions designed for comfort actually amplify the force of impact upon ejection.

In some instances, recoil forces of seat cushions have been responsible for lumbar fractures. It is therefore important to equip high-performance USAF craft with ejection seats that provide comfort and minimize spinal column injury.

In the quest for such a cushion, researchers at Wright-Patterson Air Force Base tested four proposed seat designs, including one from Dynamic Systems, Inc., for impact response. The results were compared to cushions currently used.

In the experiments, a 160-pound manikin in standard flight attire was strapped in an ejection seat which, guided by rails, was allowed to free fall from a set height. The manikin was rigged with sensors for monitoring the accelerations, loads, and torques that could contribute to spinal injury on impact.

The cushion proposed by Dynamic Systems was comprised of a one inch layer of SunMate Medium on top of a one inch layer of SunMate Firm, and covered with a poly-cotton stretch fabric. The other cushions tested included contoured designs and integrated a variety of energy-absorbent materials.

Recoil was gauged in terms of five parameters, and in all instances, the Dynamic Systems cushion outperformed the other seat designs. The other cushions tested amplified recoil in either four or five of the five test categories.

In processing the data, a shock transmissibility factor was calculated. This factor indicated that all cushions actually amplify the onset rate of the energy of impact; however, the DSI cushion did so by only 1.3%, whereas the other cushions demonstrated increases between 8.1 and 16%.

The report states that "...the [Dynamic Systems cushion] would transmit the least shock to the occupant compared to the other cushion configurations..."