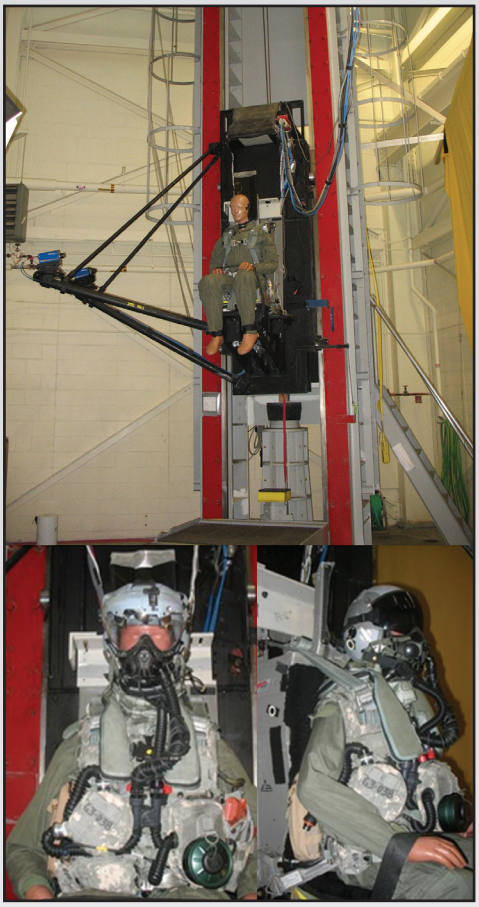
AFRL Unmasks Biodynamic Potential of New Pilot Protective Device



A manikin fitted with a Joint Service Aircrew Mask and Joint Helmet-Mounted Cueing System facilitates AFRL's recent biodynamic evaluation of the protective equipment in terms of pilot neck loads. (Air Force image)

AFRL performed key biodynamic assessment of the Type II (most recent) Joint Service Aircrew Mask (JSAM), an incrementally developed head/eye/respiratory sustainment system intended primarily to safeguard individual Airmen against chemical and biological (CB) warfare agents. The lightweight mask, which is easily donned and doffed during flight, is the first and only CB protective mask in the Department of Defense (DoD) inventory that can provide anti-g (acceleration force) and g-induced loss of consciousness protection for operators of high-performance aircraft. Fully compatible with existing aircraft- and aircrew-mounted breathing equipment, the JSAM technology—once integrated with these current life-support ensembles—also defends against radiological particles, flame and thermal exposure, and hypoxia (to 60,000 ft). Suitable for incorporation into more than 60 different aircraft, both fixed-wing and rotary, JSAM use will span all US military services and summarily replace six DoD aircrew masks.

The comprehensive JSAM assessment entailed three Safety of Flight tests: vertical impact, horizontal impact, and windblast. The purpose of the vertical impact test was to structurally evaluate the JSAM, alone and in conjunction with various helmet-mounted technologies, as well as to verify the consistency of these assemblies in maintaining an acceptably low risk of neck injury risk during emergency escape. The scientists used the lab's vertical deceleration tower to simulate catapult acceleration for both the Advanced Concept Ejection Seat II (ACES II) and the seat used in B-52 aircraft. Using specially instrumented manikins fitted with standard HGU-55P flight helmets, they measured the dynamic loads imparted to a pilot's neck during ejection events. All equipment performed well, with no major failures and no violations of injury criteria.

The point of the horizontal impact test was to verify that the JSAM O2 hose and the Joint Helmet-Mounted Cueing System's (JHMCS) quick-disconnect connector (QDC) detached at their respective torso connector mounts on the AIRSAVE [Aircrew Integrated Recovery Survival Armor Vest and Equipment] vest during the catapult phase of ejection. The team used the lab's horizontal impulse accelerator (HIA) to simulate catapult acceleration for an ACES II, along with a specially designed test fixture mounted on the HIA track to measure the dynamic load needed for O2 hose and QDC separation. Test results show that even with larger occupants, the combined JSAM/AIRSAVE setup will have limited impact on the disconnect loads of the JHMCS QDC. Interestingly, results also reflect the QDC disconnect load's sensitivity to pull angle; the load for an F-15 with the JHMCS in-line release connector (IRC) 7 in. from the seat was much lower than the load for an F-16 with the IRC 2 in. from the seat.

The object of the windblast test was to confirm the structural integrity and aerodynamic compatibility of the JSAM with the ACES II during high-speed ejection. For this leg of the test series, the team used the Windblast Test Facility at Dayton T. Brown, Inc., to subject the JSAM to airspeeds of 350-600 knots equivalent airspeed. Test results prove the JSAM sufficiently robust, with the equipment sustaining little to no structural damage