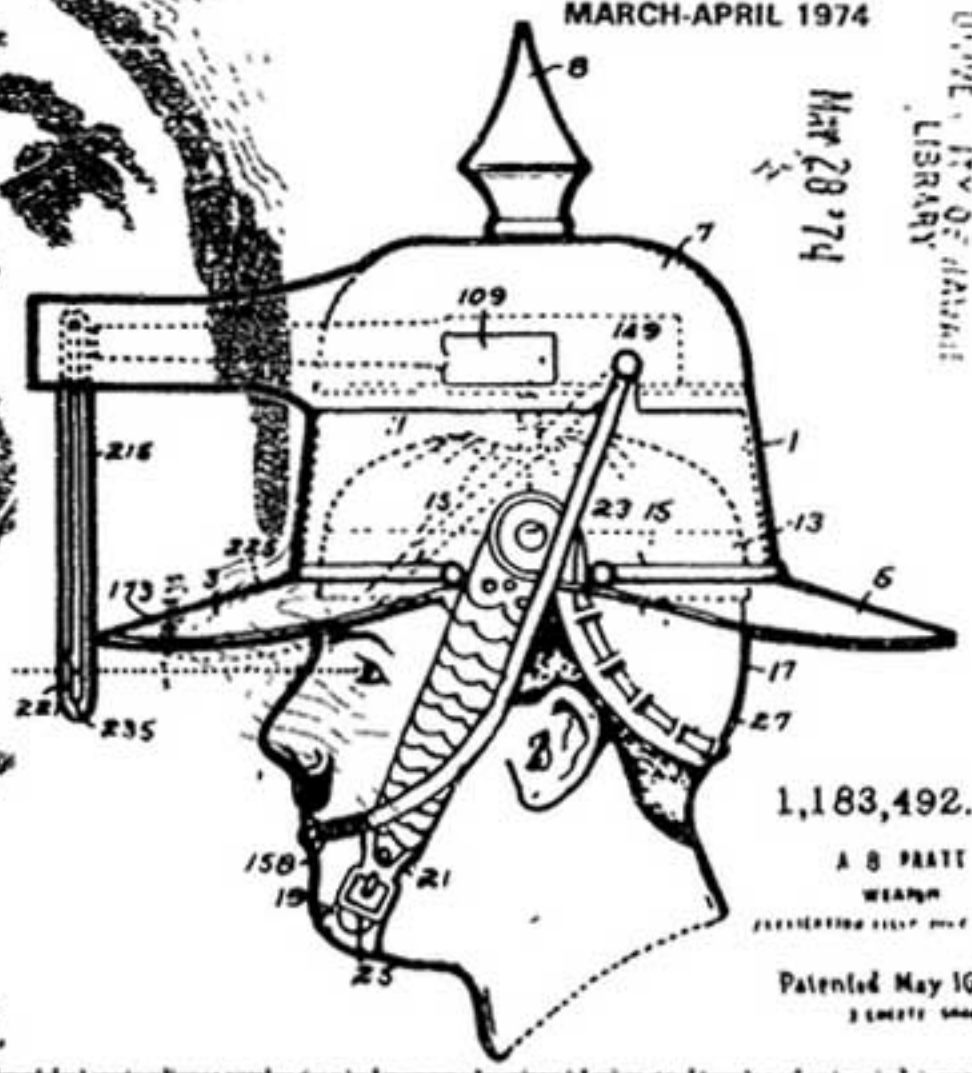
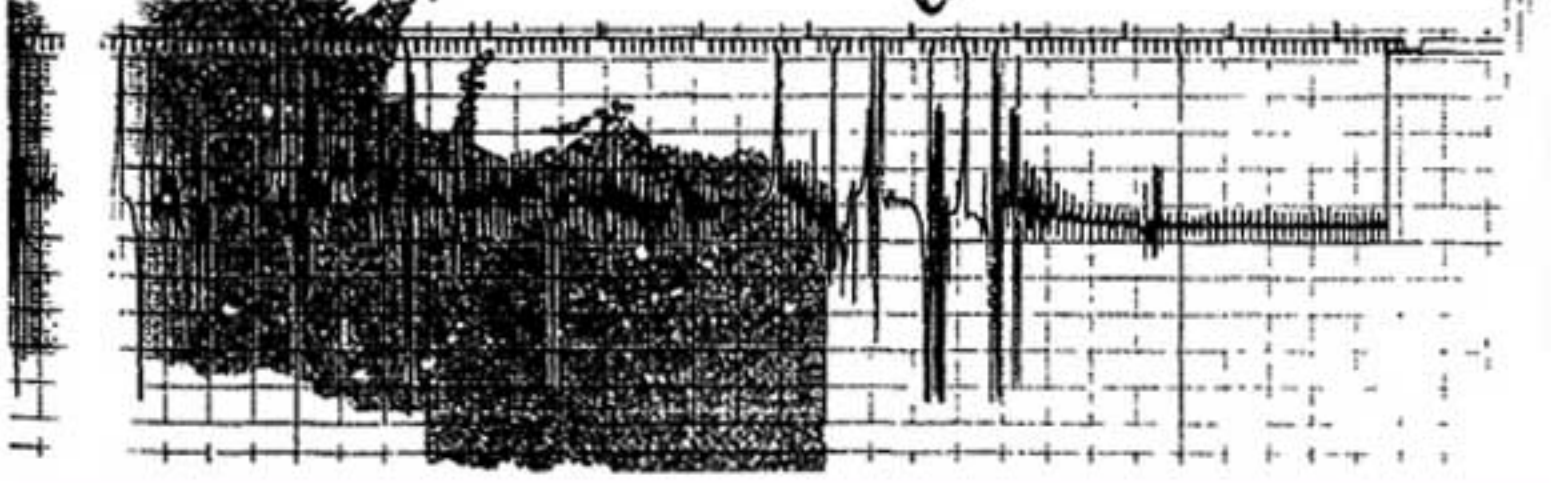
D

AIR UNIVERSITY
review
MARCH-APRIL 1974





and center of gravity were problem areas.

The Air Force sponsored further development to reduce the size and bulk and to improve components. The resulting second-generation sight was then loaned to the Navy for a significant F-4B flight test at Point Mugu, California, in June 1969.[8] Navy test pilots concluded that it provided additional target acquisition capability under dynamic high G air-to-air combat conditions. As a result of that and later tests,[9] the Navy contracted through McDonnell Douglas, St. Louis, for a helmet sight capability, called Visual Target Acquisition System, to direct radar and missile target acquisition in certain F-4B and F-4J aircraft.

An improved second-generation sight was flight-tested at Tyndall AFB later in 1969 in F-101 and F-106 aircraft. (Photo on page 32) This important test quantitatively determined the accuracy of this sight under high maneuvering acceleration and wide off-boresight aiming conditions.[10]

In the early sights discussed so far, a reticle was projected onto a "granny glass" (combining glass) suspended directly in front of the eye. In a subsequent (1970) Air Force exploratory development, a substantial improvement was made by projecting the reticle directly upon a parabolic helmet visor, thus eliminating any visual obstructions by the suspended granny glass. An experimental version of the helmet-mounted sight with a visor reticle projection was included in flight tests in 1972 by the Air Force at Tyndall AFB and by the Navy in conjunction with its Visual Target Acquisition System testing. The Navy is currently retrofitting the visor reticle into its operational F-4J fleet.

Each helmet-sight version represents a development improvement to meet program and flight-test schedules. A current flight-testable sight has the photo diode sensors and visor-projected reticle in one lightweight unit attached to the helmet.

Air Force visual coupling research and development activities center around the Aerospace Medical Research Laboratory's Project 5973, "Development of Visual Coupling Aids." These development activities catalyze and complement the programs of the sister services and industrial agencies. The project's objectives are to provide the Air Force with design criteria and test information for current sight applications and for future advanced helmet sight, helmet display, and visual coupling equipment. Existing sights are ready for specific application evaluations. The project's technical objectives call for an interim helmet sight in 1974 and an advanced sight in 1976 (Table I).[11]

In the latest sight under development, the sighting mechanism is integrated into a lightweight helmet. This interim helmet unit will weigh less than the standard 55-ounce Air Force helmet (HGU-2A/P).

The advanced sight will include one of three new advanced approaches[12] to sensing head position and likewise will be integrated into a lightweight helmet. Flight-testing of advanced helmet-position sensing concepts in cooperation with the Navy is anticipated. An approach by Polhemus Navigation Sciences, Inc., employs controlled projection and sensing of a magnetic field. A Raytheon device uses light-emitting diodes on the helmet and cockpit-mounted photo diode detection surfaces. A Honeywell technique employs ultrasonic sound ranging and sensing.

Projected advanced sight improvements include enlarging from 1 cubic foot to 2 cubic feet the head-motion envelope (motion box) within which helmet position can be determined. Also sighting accuracy is to be improved, as is the effective coverage of line-of-sight azimuth and elevation angles. Improvements will further reduce helmet weight to 51 ounces and will reduce costs per unit while increasing its reliability. Helmet-mounted sight technology is being integrated with helmet display developments