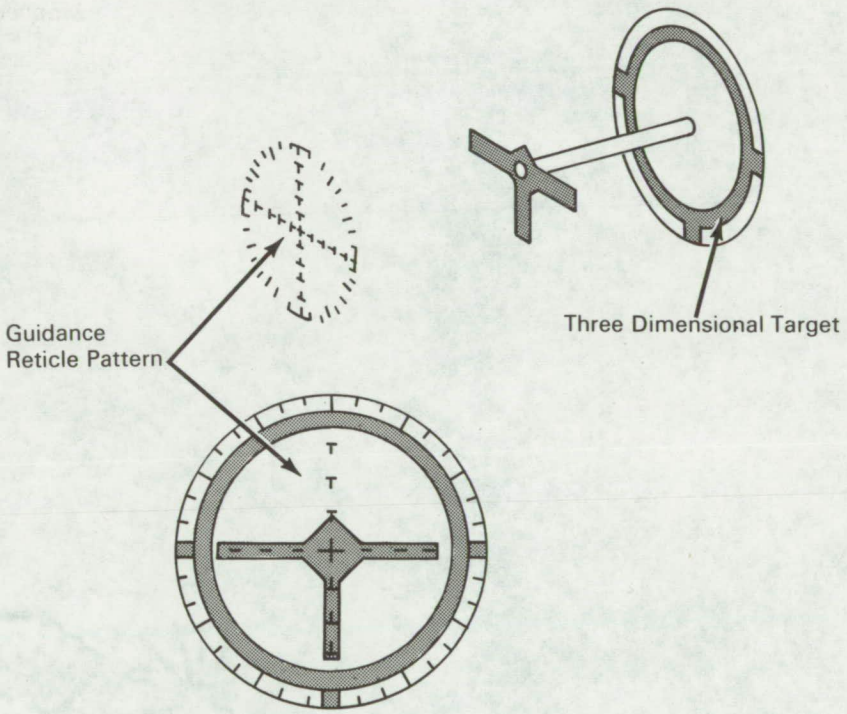
NASA TECH BRIEF

Visual Attitude Orientation and Alignment System



An active vehicle optical alignment aid and a passive vehicle three-dimensional alignment target are used for proper orientation and alignment plus control of the closure range and rate between two bodies, one in controlled motion and one at rest. The alignment aid and target may be located other than at the surfaces required to be aligned. The visual aid is a small, lightweight, highly accurate and reliable optical system designed to project a collimated optical alignment image for superimposition on a three-dimensional visual target on the body at rest.

In principle, the alignment aid device is similar to the World War II fighter aircraft optical gun sight. A light source projects the image to the pilot's right eye by means of a beam splitter or combining glass. The optical system is such that the image presented appears to be the same distance away as the target. Unlike etched lines on a window, or a ring and post type sight, it is not necessary for the head and eyes of the pilot to remain fixed in one position to maintain accurate alignment. While the image is projected to the right eye only, the pilot sights with both eyes open.

(continued overleaf)

The single eye projection keeps the system small and eliminates apparent parallax of the projected image caused by eye accommodation (focusing) and convergence when target sighting during the final docking phase.

The target on the body at rest must, in conjunction with the body-in-motion sighting aid, provide the pilot with a visual cue to align within 12 degrees of freedom (6 for each body: yaw, pitch, roll, and 3 in translation). When the two bodies are aligned in all axes, the standoff cross of the three-dimensional target appears in the center of the target base and the projected image reticle pattern appears centered around the outer diameter of the target base. This aligns the two bodies in yaw, pitch, and translation. Roll is aligned when the horizontal and vertical markings on the target and the projected reticle pattern are parallel and oriented top to top.

Notes:

1. This man-in-the-loop, ±6 degree of freedom visual targeting system should be useful in many applications where two bodies are to be docked or maintained in predetermined attitude relationships.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   Houston, Texas 77058
   Reference: B67-10120

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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of North American Aviation, Inc.
under contract to
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