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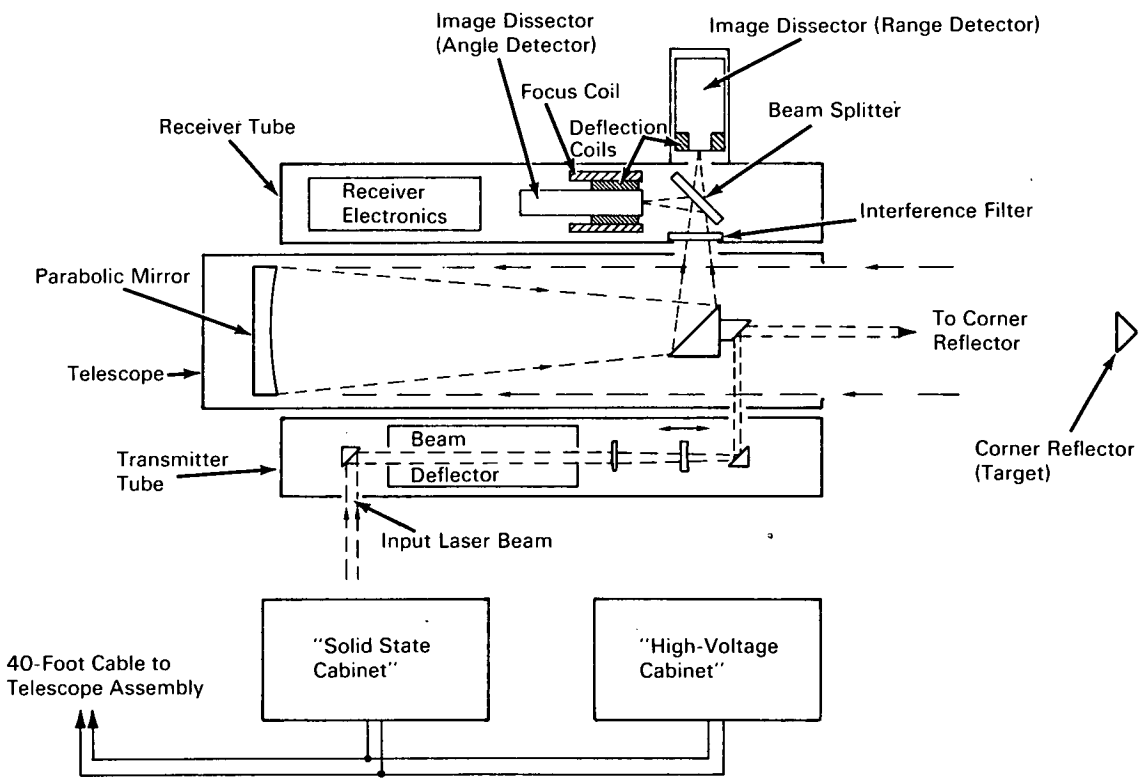
NASA TECH BRIEF

Improved Electro-Optical Tracking System



The schematic diagram represents a prototype of an electro-optical system designed to track a space vehicle from the instant of liftoff to a maximum slant range of 10 kilometers. The system employs a laser beam illuminating source, an electronic laser beam deflector, and an image dissector photomultiplier which search for the target (an optical corner reflector), acquire it, and track it electronically anywhere within a 1° × 1° field of view. Several major improvements are realized by the introduction of an electronically scannable transmitter and receiver to an ordinary optical tracking system. In addition to providing a scanning capability for search and acquisition, this system permits the transmitter and receiver to follow rapid movements or accelerations of the target electronically.

The system consists of an optical telescope assembly and two electronics cabinets. The components of the telescope assembly are contained in three aluminum tubes and a small electronics chassis, all of which are

(continued overleaf)

supported by a bezel casting. The latter is designed to mount directly onto the elevation gimbal of an existing NASA precision tracking pedestal. The two components which give the system its unique electronic scanning capability are the beam deflector and the image dissector. The transmitter tube contains the beam deflector, which can electronically steer the laser beam in two dimensions with maximum deflections of approximately ±0.33 degree. The collimating lenses magnify this to ±0.50 degree and also adjust the output laser beamwidth to a nominal 1/44 degree. The receiver tube contains a standard image dissector, which is a photomultiplier with an imaging section that allows its small instantaneous field of view to be scanned in two dimensions. The ultimate accuracy of the system is provided by the image dissector, which performs like a star tracker with an electronically controllable bias. The only function of the laser and beam deflector is to illuminate the corner reflector so that the beam dissector can track it. The telescope is a simple Newtonian astronomical unit. It images a 1° × 1° field of view onto the photocathode of the image dissector. The latter, however, scans only a portion of this field at one time, specifically a square field measuring 100 arc seconds on a side. Solid state control electronics and logic circuitry for the system are contained in one cabinet. A second cabinet contains three high-voltage power supplies and two high-voltage amplifiers for driving the beam deflector.

Notes:

1. This system may be of interest in the fields of air defense and commercial air traffic control.
2. Complete details may be obtained from:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B68-10311

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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