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ADVANCED SOLIDSTATE ARRAY SPECTRORADIOMETER

by

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During the Summer of 1987, the Advanced Solidstate Array Spectroradiometer (ASAS) was installed and flown on the NASA Ames C130 in support of the First International Field Experiment (FIFE) missions. The study site was over the grassland areas of the Konza Prairie in Kansas. The data collected with ASAS during these flights has been used to produce the first nearly simultaneous multiangular/multispectral images of selected terrestrial study sites. This data will be valuable in the study of surface bidirectional reflectance and albedo. The data will also be useful for the development of data analysis algorithms for future spaceborne instruments such as the Goddard MODIS-T and JPL's HIRIS.

The ASAS is an airborne imaging spectrometer with 30 spectral channels extending from 450 to 880 nm. The sensor is capable of pointing up to 45 degrees fore and aft of nadir during flight. A conceptual drawing of the ASAS optical system is shown in Figure 1. The reflected solar radiance from a line of 512 pixels at right angles to the aircraft direction of flight is imaged by the collecting optic onto the entrance slit of a spectrometer. Located at the focal plane of the spectrometer is a 512 X 32 element silicon CID detector array. Thus, each of the 512 surface pixels is dispersed into 32 spectral channels. The ASAS image is

formed in the pushbroom fashion. This has the advantage of essentially no moving parts and the dwell time for each pixel is (in this case) at least 512 times greater than can be achieved with a scanning system having a single detector element. The field of view is 25 degrees and the IFOV is 0.85 mr.

Originally, the ASAS sensor was mounted on a baseplate in a fixed nadir viewing position. In 1985, a pointable mount for the sensor was developed at GSFC that allows the ASAS to view an area on the surface at several angles fore and aft of nadir during a single airborne overpass of the site. The ASAS sensor and a color video camera are boresighted on a gimballed platform that is driven by a DC motor via a worm gear and worm wheel as shown in Figure 2. Typically, the target site is imaged at seven angles starting at +45 of nadir and ending at -45 with images acquired at 15 degree increments. The image size is typically 512 elements by 300 scan lines.

In preparation for the FIFE flights, in 1987, a major effort was initiated to redesign and rebuild most of the ASAS sensor electronics. This was done to improve the stability of the array radiometric response and increase the reliability of the instrument. As a result of this effort the instrument operation was trouble free for the entire five months and 23 flights that it was in operation on the C130 and the instrument radiometric stability was on the order of 0.3%. Additional flights of the ASAS are planned for the summer of 1988 over forest areas in Minnesota.

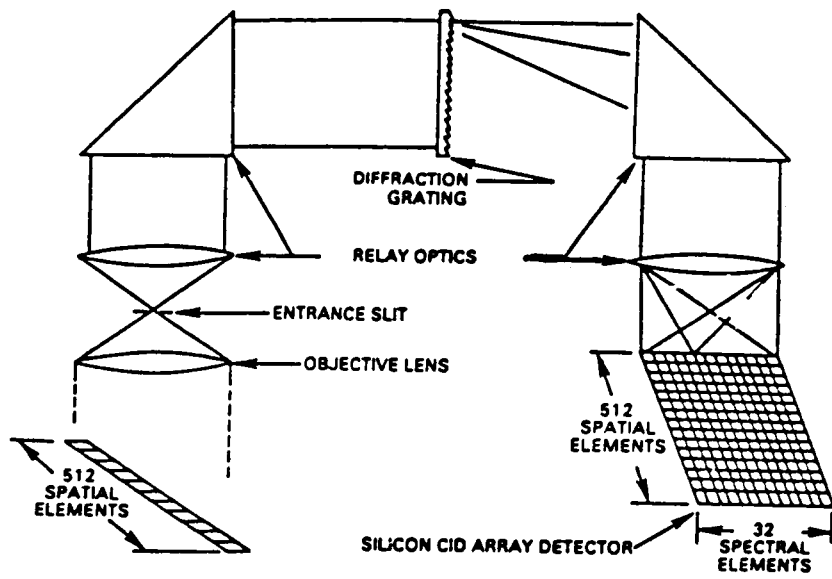


Figure 1. ASA Optical Concept

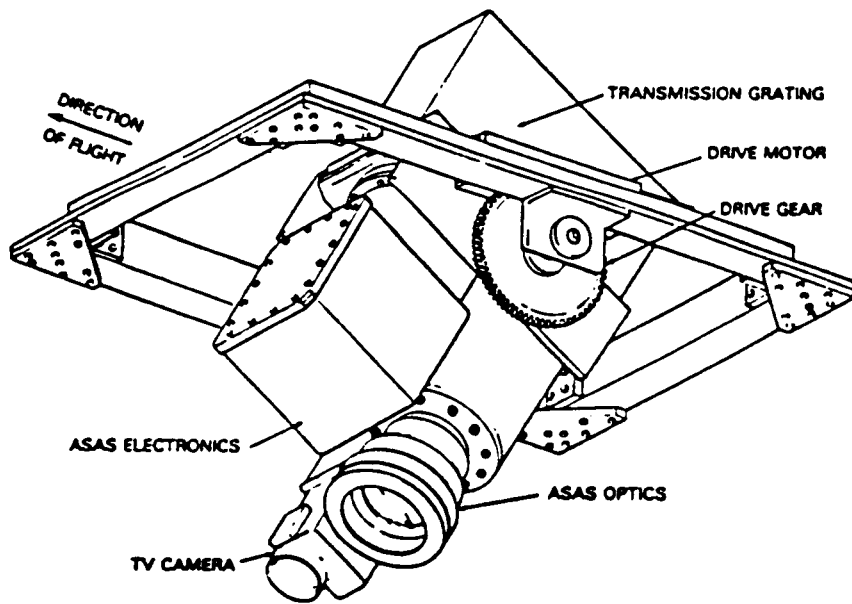


Figure 1. ASA Sensor