TITLE OF THE PAPER : THE MATRA THEMATIC SCANNER
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MATRA is currently producing (CNRS/Anvar licence) and marketing a new airborne multispectral scanner known as the MATRA Thematic Scanner. One of the device's key features is a capability to cover any wavelength ranges between ultraviolet and thermal infrared.

Designed and developed by the "division des systèmes de contrôle et d'optique", this MATRA Scanner is intended primarily for use as part of MATRA turnkey remote sensing information processing systems. This new instrument has benefitted immensely from MATRA's unique combination of experience in the fields of space instrumentation, optics, electronics and image processing, not to mention MATRA's close ties with various institutions involved in remote sensing research and applications.

Some of the key advantages of the MATRA thematic scanner over more conventional scanning radiometers include :

- increased modularity : modular architecture allows up-grading from one to 6 channels as well as the choice of filters.

- higher sensitivity due to improved optical design, high quality of MATRA optical components, and up-stream data digitization.

- improved measurement accuracy for IR channels,

- improved flexibility of operation (complete pre-flight checkout, simple in-flight calibration and operation, acquisition of flight and mission parameters, in-flight selection of visible filters).

- improved repeatability for separate passes over a given area due to calibration by continuous recording of irradiance,

- improved interfaces between radiometer and peripherals and between radiometer proper and other parts of the system.

Applications

The main applications for MATRA remote sensing information processing systems, and hence also for the airborne scanner include :

- satellite imagery simulation studies (LANDSAT, SPOT, etc...),
- agricultural inventory,
- crop classification and desease assessment,

- oil and mineral exploration,
- land use and management,
- detection of offshore oil spills,
- monitoring of forest fires,
- energy and heat loss detection,
- maritime surveillance.

Scanner technical data

- 4 visible channels with selectable filters and in-flight change-over mechanism for a total of 8 spectral bands per airborne mission.
- visible (0.4 - 0.9 microns) detectors : si PIN photodiodes
- 2 IR channels, also with selectable filters,
- IR (8 - 14 microns) detectors : mercury-cadmium-telluride (MCT)
- thematic filters available on request
- radiometric resolution : < 10 nm
- line scan field : 90°
- scan speed : 4.55 - 9.1 - 18.2 - 36.4 RPS (72 RPS optional)
- number of pixels per line : 900
- IFOV (instantaneous field of view) : 2.8 mrad
- calibration of visible channels by continuous monitoring of irradiance through each of the four channels
- calibration of IR channels by hot and cold blackbodies controlled to within 0.1° C over the range - 20 to + 60° C
- direct digitization into 8-bit words
- cryostat endurance : 12 hours
- weight : 80 kg
- power requirements : 25 A at 115 V/400 Hz or 60 A at 27 Vdc (including power for airborne quick-look).

Spectral bands and performance parameters

Spectral bands and performance parameters for a typical airborne mission might be :

visible band : 0.610 - 0.625 micron $\Delta\lambda = 15$ nm NER < 0.3 at 18.2 scans/s $NE\Delta\rho < 0.11$

IR band : 8.5 - 13 microns $NE\Delta T < 0.05$° C at 9.1 scans/s
NER : noise equivalent radiance

(in W x $10^{-7}.cm^{-2}.nm^{-1}.sr^{-1}$)

$NE\Delta\rho$: noise equivalent reflectance change
$NE\Delta T$: noise equivalent temperature change