

FLIGHT SUMMARY REPORT

Flight #: 90-051
Date: 22 February 1990
Sensor Package: Airborne Visible and Infrared Imaging Spectrometer (AVIRIS)
Thematic Mapper Simulator (TMS)
Thermal Infrared Multispectral Scanner (TIMS)
Wild-Heerbrug RC-10
Area(s) Covered: Oregon

Investigator(s): Spanner, TGS Technology, Inc.
Flight Request: 90L223D

Aircraft #: 709
Julian Date: 053

SENSOR DATA

| | | | | |
|-----------------------|--------|------|------|--|
| Accession #: | ---- | ---- | ---- | 03998 |
| Sensor ID #: | 099 | 074 | 086 | 076 |
| Sensor Type: | AVIRIS | TMS | TIMS | RC-10 |
| Focal Length: | ---- | ---- | ---- | 12" 304.89 mm |
| Film Type: | ---- | ---- | ---- | High Definition Aerochrome IR SO-131 |
| Filtration: | ---- | ---- | ---- | cc .20B |
| Spectral Band: | ---- | ---- | ---- | 510-900 nm |
| f Stop: | ---- | ---- | ---- | 4 |
| Shutter Speed: | ---- | ---- | ---- | 1/125 |
| # of Frames: | ---- | ---- | ---- | 144 |
| % Overlap: | ---- | ---- | ---- | 60 |
| Quality: | ---- | ---- | ---- | Excellent |
| Remarks: | | | | |

Airborne Science and Applications Program

The Airborne Science and Applications Program (ASAP) is supported by three ER-2 high altitude Earth Resources Survey aircraft. These aircraft are operated by the High Altitude Missions Branch at NASA-Ames Research Center, Moffett Field, California. The ER-2s are used as readily deployable high altitude sensor platforms to collect remote sensing and *in situ* data on earth resources, celestial phenomena, atmospheric dynamics, and oceanic processes. Additionally, these aircraft are used for electronic sensor research and development and satellite investigative support.

The ER-2s are flown from various deployment sites in support of scientific research sponsored by NASA and other federal, state, university, and industry investigators. Data are collected from deployment sites in Kansas, Texas, Virginia, Florida, and Alaska. Cooperative international scientific projects have deployed the aircraft to sites in Great Britain, Australia, Chile, and Norway.

Photographic and digital imaging sensors are flown aboard the ER-2s in support of research objectives defined by the sponsoring investigators. High resolution mapping cameras and digital multispectral imaging sensors are utilized in a variety of configurations in the ER-2s' four pressurized experiment compartments. The following provides a description of the digital multispectral sensor used for data collection during this flight.

Airborne Visible and Infrared Imaging Spectrometer

The Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) is the second in the series of imaging spectrometer instruments developed at the Jet Propulsion Laboratory (JPL) for earth remote sensing. This instrument uses scanning optics and a four-line arrays of detectors to image a 614 pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4 μm).

AVIRIS parameters are as follows:

| | |
|---------------------------|---------------------------|
| IFOV: | 1 mrad |
| GIFOV (at 20 km): | 20 m |
| FOV: | 30° |
| GFOV (at 20 km): | 11 km |
| Spectral Coverage: | 0.41 - 2.45 μm |
| Number of Spectral Bands: | 224 |
| Digitization: | 10 Bits |
| Data Rate: | 17 MBPS |

| <u>Spectrometer</u> | <u>Wavelength Range</u> | <u>Number of Bands</u> | <u>Sampling Interval</u> |
|---------------------|---------------------------|------------------------|--------------------------|
| 1 | 0.41 - 0.70 μm | 31 | 9.4 nm |
| 2 | 0.68 - 1.27 μm | 63 | 9.4 nm |
| 3 | 1.25 - 1.86 μm | 63 | 9.7 nm |
| 4 | 1.84 - 2.45 μm | 63 | 9.7 nm |

All AVIRIS data is decommutated and archived at JPL and not currently available for public distribution. For further information contact Rob Greene at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 11-116, Pasadena, California 91109-8099.

Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a high altitude multispectral scanner flown aboard the ER-2 aircraft which simulates spatial and spectral characteristics of the seven Landsat-D Thematic Mapper bands. The specific bands are as follows:

| <u>Daedalus Channel</u> | <u>TM Band</u> | <u>Wavelength, μm</u> |
|-------------------------|----------------|---|
| 1 | A | 0.42 - 0.45 |
| 2 | 1 | 0.45 - 0.52 |
| 3 | 2 | 0.52 - 0.60 |
| 4 | B | 0.60 - 0.62 |
| 5 | 3 | 0.63 - 0.69 |
| 6 | C | 0.69 - 0.75 |
| 7 | 4 | 0.76 - 0.90 |
| 8 | D | 0.91 - 1.05 |
| 9 | 5 | 1.55 - 1.75 |
| 10 | 7 | 2.08 - 2.35 |
| 11 | 6 | 8.5 - 14.0 low gain |
| 12 | 6 | 8.5 - 14.0 high gain |

Sensor/aircraft parameters are as follows:

| | |
|--------------------|------------------------------------|
| IFOV: | 1.3 mr |
| Ground Resolution: | 91 feet (28 meters at 70,000 feet) |
| Total Scan Angle: | 43 ^o |
| Swath Width: | 9.0 nmi (16.6 km at 70,000 feet) |
| Pixels/Scan Line: | 716 (750 following rectification) |
| Scan Rate: | 12.5 scans/second |
| Ground Speed: | 400 kts (206 m/second) |

Thermal Infrared Multispectral Scanner

The Thermal Infrared Multispectral Scanner (TIMS) is a multispectral scanning system using a dispersive grating and a six element mercury cadmium telluride detector array to produce six discrete channels in the 8.2 μm to 12.2 μm region.

| <u>Channel</u> | <u>Wavelength, μm</u> | <u>NET</u> |
|----------------|---|----------------------|
| 1 | 8.2 - 8.6 | < 0.3 ^o C |
| 2 | 8.6 - 9.0 | < 0.3 ^o C |
| 3 | 9.0 - 9.4 | < 0.3 ^o C |
| 4 | 9.4 - 10.2 | < 0.3 ^o C |
| 5 | 10.2 - 11.2 | < 0.3 ^o C |
| 6 | 11.2 - 12.2 | < 0.3 ^o C |

Sensor/aircraft parameters are as follows:

| | |
|--------------------|-------------------------------------|
| IFOV: | 2.5 mrad |
| Ground Resolution: | 163 feet (50 meters) at 65,000 feet |
| Total Scan Angle: | 76.56 ^o |
| Swath Width: | 16.9 nmi (31.3 km) |
| Pixels/Scan Line: | 638 |
| Scan Rate: | 7.3 (scans/second) |
| Ground Speed: | 400 kts. (206 m/second) |

NOTE: Information on data tape format, logical record format, and scanner calibration data may be obtained from the NASA-Ames Aircraft Data Facility at (415) 604-6252 or FTS 464-6252.

**CAMERA FLIGHT LINE DATA
FLIGHT NO. 90-051**

Accession # 03998

Sensor # 076

| Check Points | Frame Numbers | Time (GMT-hr, min, sec) | | Altitude, MSL feet/meters | Cloud Cover/Remarks |
|--------------|---------------|-------------------------|----------|------------------------------|---|
| | | START | END | | |
| A - B | 0241-0244 | 20:04:31 | 20:05:42 | 65000/19800 | Clear |
| C - D | 0245-0253 | 20:07:32 | 20:10:23 | " | Clear |
| E - F | 0254-0262 | 20:17:27 | 20:20:30 | " | Clear |
| G - H | 0263-0271 | 20:27:07 | 20:30:10 | " | Clear |
| I - J | 0272-0279 | 20:38:53 | 20:41:23 | " | 20-40% stratus |
| K - L | 0280-0384 | 21:01:05 | 21:47:38 | " | 10% minor stratus (frames 0303-0307); oblique (frame 0362) |

TIMS SCANNER FLIGHT LINE DATA

FLIGHT NO. 90-051

TIMS FLIGHT DATA
FLIGHT NUMBER: 90-051

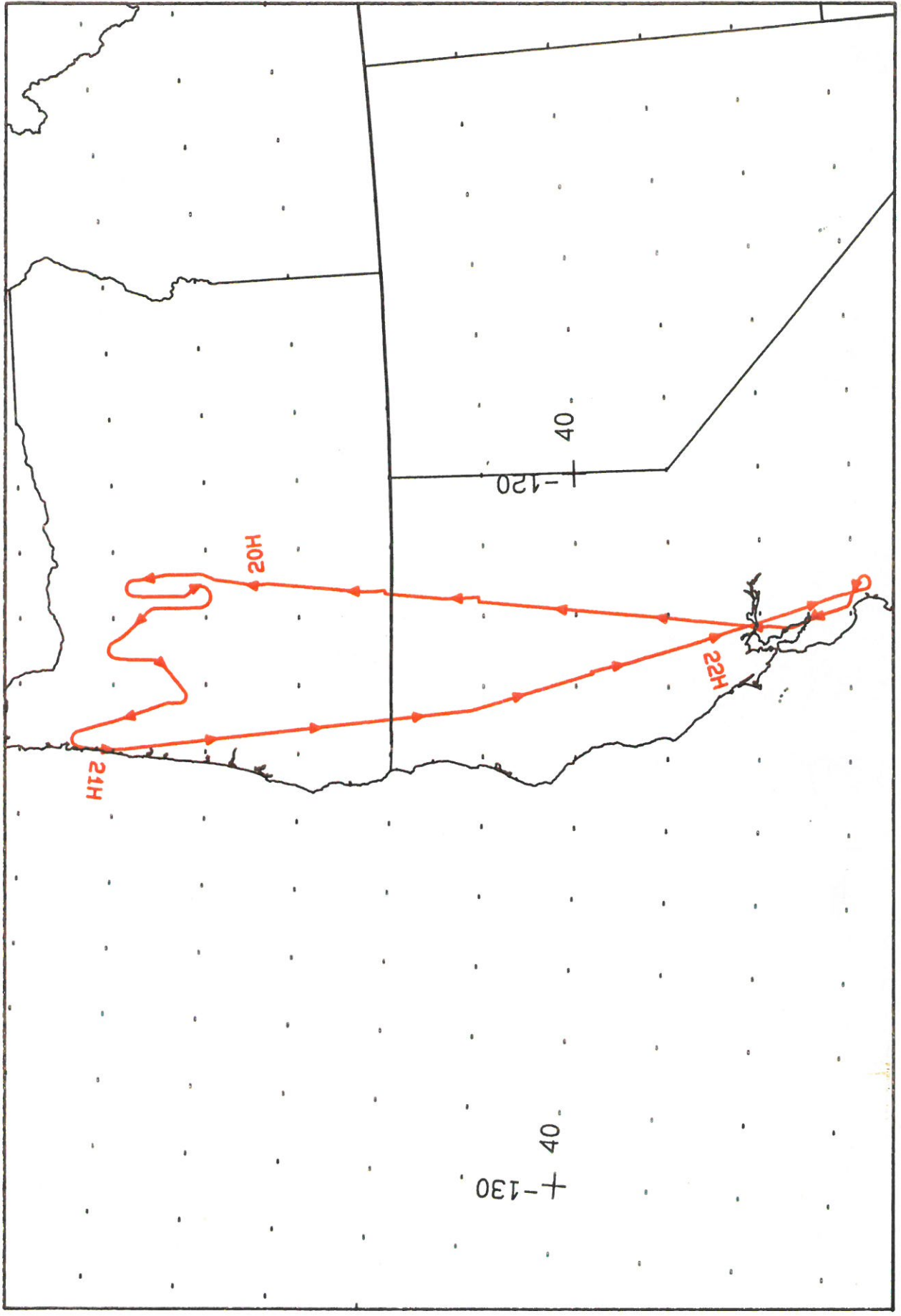
| Check Points | A c t u a l t i m e b e g i n e n d | A c t u a l s c a n l i n e b e g i n e n d | A l t i t u d e f e e t / m e t e r | S c a n S p e e d (r p s) | t o t a l G o o d s c a n l i n e s | t o t a l I n t e r p o l a t e d s c a n l i n e s | t o t a l R e p e a t e d s c a n l i n e s |
|--------------|---|---|--|-----------------------------------|---|---|---|
| C-D | 20:06:32.0 20:09: 8.0 | 32727 33868 | 65000/19812 | 7.30 | 1136 | 0 | 6 |
| E-F | 20:16:25.0 20:19:33.0 | 37063 38440 | 65000/19812 | 7.30 | 1376 | 0 | 2 |
| G-H | 20:26: 5.0 20:29: 8.0 | 41304 42639 | 65000/19812 | 7.30 | 1336 | 0 | 0 |
| I-J | 20:37:46.0 20:40:20.0 | 46432 47556 | 65000/19812 | 7.30 | 1125 | 0 | 0 |
| K-L | 21:07:15.0 21:27: 9.0 | 59358 68090 | 65000/19812 | 7.30 | 8727 | 0 | 6 |

TMS SCANNER FLIGHT LINE DATA

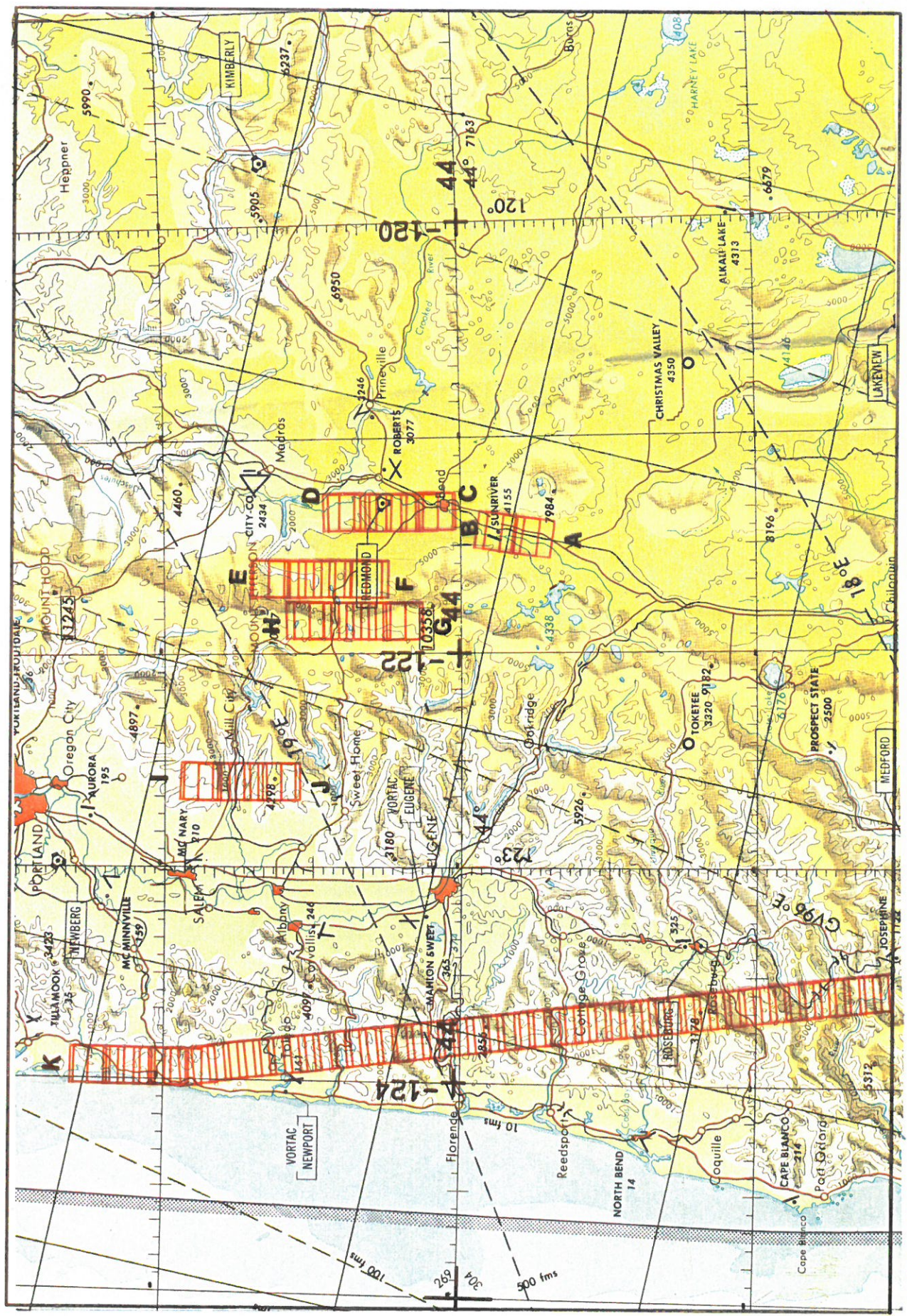
FLIGHT NO. 90-051

DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 90-051

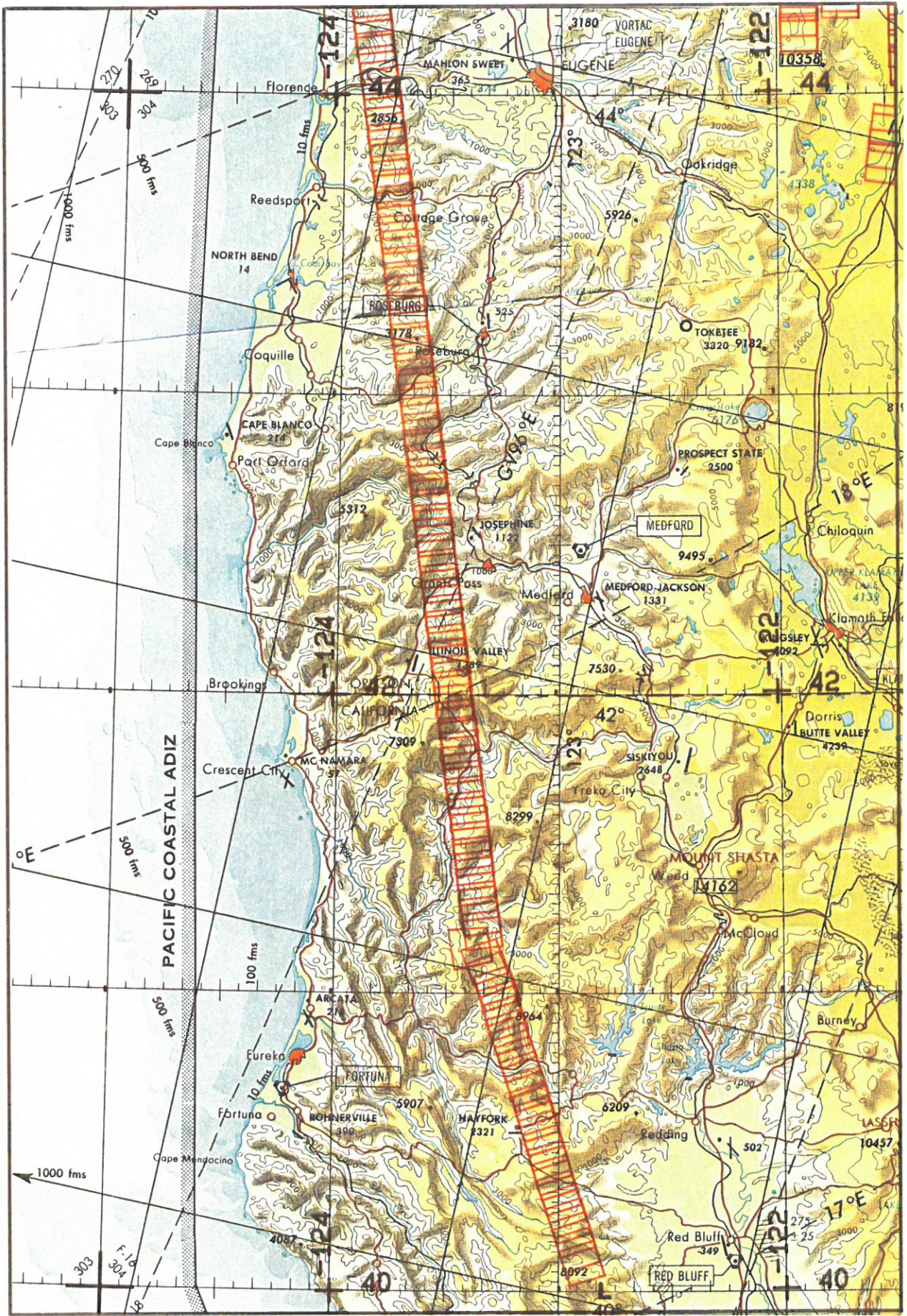
| Check Points | Actual Time (GMT) | | Actual Scanline | | Altitude feet/meter | Scan Speed (rps) | Total Good Scanlines | Total Interpolated Scanlines | Total Repeated Scanlines |
|--------------|-------------------|------------|-----------------|-------|---------------------|------------------|----------------------|------------------------------|--------------------------|
| | Begin | End | Begin | End | | | | | |
| C-D | 20:06:30.0 | 20:09:07.0 | 55543 | 57483 | 65000/19812 | 12.50 | 1728 | 0 | 213 |
| E-F | 20:16:24.0 | 20:19:34.0 | 62861 | 65204 | 65000/19812 | 12.50 | 2122 | 0 | 222 |
| G-H | 20:26:05.0 | 20:29:07.0 | 70013 | 72252 | 65000/19812 | 12.50 | 2001 | 0 | 239 |
| I-J | 20:37:46.0 | 20:40:20.0 | 78646 | 80529 | 65000/19812 | 12.50 | 1685 | 0 | 199 |
| K-L | 21:00:03.0 | 21:14:05.0 | 95101 | 96963 | 65000/19812 | 12.50 | 1676 | 0 | 187 |



FLIGHT 90-051 22 February 1990 A/C 709 AVIRIS / TMS / TMS / RC-10



FLIGHT 90-051 22 February 1990 A/C 709 AVIRIS / TMS / TMS / RC-10 Accession # 03998 JNC 43



FLIGHT 90-051
 22 February 1990
 A/C 709
 AVIRIS / TMS / TMS / RC-10
 Accession # 03996
 JNC 43