FLIGHT SUMMARY REPORT

Flight Number: 93-009

Calendar/Julian Date: 14 October 1992 • 288

Sensor Package: Wild-Heerbrug RC-10
Modis-N Airborne Simulator (MAS)
Thermal Infrared Multispectral Scanner (TIMS)
Airborne Visible and Infrared Imaging Spectrometer (AVIRIS)

Area(s) Covered: Castaic Lake and Lake Tahoe

Investigator(s): Kahle and Realmuto, JPL ; Westerman, Lockheed

Aircraft #: 708

SENSOR DATA

Accession #:	04494	—	—	—
Sensor ID #:	026	108	086	099
Sensor Type:	RC-10	MAS	TIMS	AVIRIS
Focal Length:	12" 304.97 mm	—	—	—
Film Type:	Aerochrome IR SO-193	—	—	—
Filtration:	cc.30C + Wratten 12	—	—	—
Spectral Band:	510-900 nm	—	—	—
f Stop:	8	—	—	—
Shutter Speed:	1/250	—	—	—
# of Frames:	48	—	—	—
% Overlap:	60	—	—	—
Quality:	Good	Good	Fair	—
Remarks:	8.1 sec. offset between camera and navigation data			

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 and camera(s) used for data collection during this flight.

Modis-N Airborne Simulator

The Modis-N Airborne Simulator (MAS) is a modified Daedalus multispectral scanner. It records up to 12 8-bit channels, which can be selected from an array of 50 available spectral bands. The band selection is made prior to flight and the instrument is hard-wired to that configuration. Channel one can be used to store additional bits which provide 10-bit resolution for channels 9 through 12. The band configuration for the Stormfest deployment is as follows:

Channel	Band edges µm
1	-----
2	0.675 - 0.685
3	1.605 - 1.655
4	1.955 - 2.005
5	3.675 - 3.825
6	4.325 - 4.575
7	4.575 - 4.725
8	9.000 - 9.400
9*	9.400 - 9.800
10*	9.800 - 10.200
11*	10.700 - 11.200
12*	12.200 - 12.700

* 10-bit resolution

Sensor/Aircraft Parameters:

Spectral Channels:	50
Output Channels:	7 8-bit and 4 10-bit
IFOV:	0.5 mrad
Ground Resolution:	163 feet (50 meters at 65,000 feet)
Total Scan Angle:	85.92°

Pixels/Scan Line:	716
Scan Rate:	6.25 scans/second
Ground Speed:	400 kts (206 m/second)
Roll Correction:	Plus or minus 3.5 degrees (approx.)

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.

Channel	Wavelength, μm	NET
1	8.2 - 8.6	< 0.3° C
2	8.6 - 9.0	< 0.3° C
3	9.0 - 9.4	< 0.3° C
4	9.4 - 10.2	< 0.3° C
5	10.2 - 11.2	< 0.3° C
6	11.2 - 12.2	< 0.3° 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°
Swath Width:	16.9 nmi (31.3 km) at 65,000 feet
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.

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 four spectrometers 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
Ground Resolution:	66 feet (20 meters) at 65,000 feet
Total Scan Angle:	30°
Swath Width:	5.7 nmi (10.6 km) at 65,000 feet
Spectral Coverage:	0.41-2.45 μm
Pixels/Scan Line:	614
Number of Spectral Bands:	224
Digitization:	10-bits
Data Rate:	17 MBPS

Spectrometer	Wavelength Range	Number of Bands	Sampling Interval
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 Green at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 183-501, Pasadena, California 91109-8099.

Camera Systems

Various camera systems and films are used for photographic data collection. Film types include high definition color infrared, natural color, and black and white emulsions. Available photographic systems are as follows:

- Wild-Heerbrug RC-10 metric mapping camera
  - 9 x 9 inch film format
  - 6 inch focal length lens provides area coverage of 16 x 16 nautical miles from 65,000 feet
  - 12 inch focal length lens provides area coverage of 8 x 8 nautical miles from 65,000 feet

- Hycon HR-732 large scale mapping camera
  - 9 x 18 inch film format
  - 24 inch focal length lens provides area coverage of 4 x 8 nautical miles from 65,000 feet

- IRIS II Panoramic camera
  - 4.5 x 34.7 inch film format
  - 24 inch focal length lens
  - 90 degree field of view provides area coverage of 2 x 21.4 nautical miles from 65,000 feet

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for NASA-Ames aircraft acquired photographic and digital imagery. For information regarding photography and digital data (including areas of coverage, products, and product costs) contact EROS Data Center, Customer Services, Sioux Falls, South Dakota 57198 (Telephone: (605) 594-6151).

Additional information regarding ER-2 acquired photographic and digital data is available through the Aircraft Data Facility at Ames Research Center. For specific information regarding flight documentation, sensor parameters, tape format, logical record format, scanner calibration, and areas of coverage contact the Aircraft Data Facility, NASA-Ames Research Center, Mail Stop 240-6, Moffett Field, California 94035-1000 (Telephone: (415) 604-6252).

CAMERA FLIGHT LINE DATA
FLIGHT NO. 93-009

Accession # 04494

Sensor # 026

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	2924-2931	19:59:19	20:02:14	65000/19800	10-20% cirrus
C -E	2932-2942	20:06:32	20:11:13	"	20% cirrus (frames 2932-2934); 10-20% cirrus (frames 2938-2940)
A - B	2943-2953	20:16:17	20:20:41	"	10-50% cirrus (frames 2945-2951)
F - G	2954-2962	21:05:32	21:09:14	"	10-90% cirrus (frames 2957-2962)
A - B	2963-2971	21:57:41	22:00:55	"	Minor-20% cirrus (frames 2965-2968)

TIMS SCANNER FLIGHT LINE DATA

FLIGHT NO. 93-009

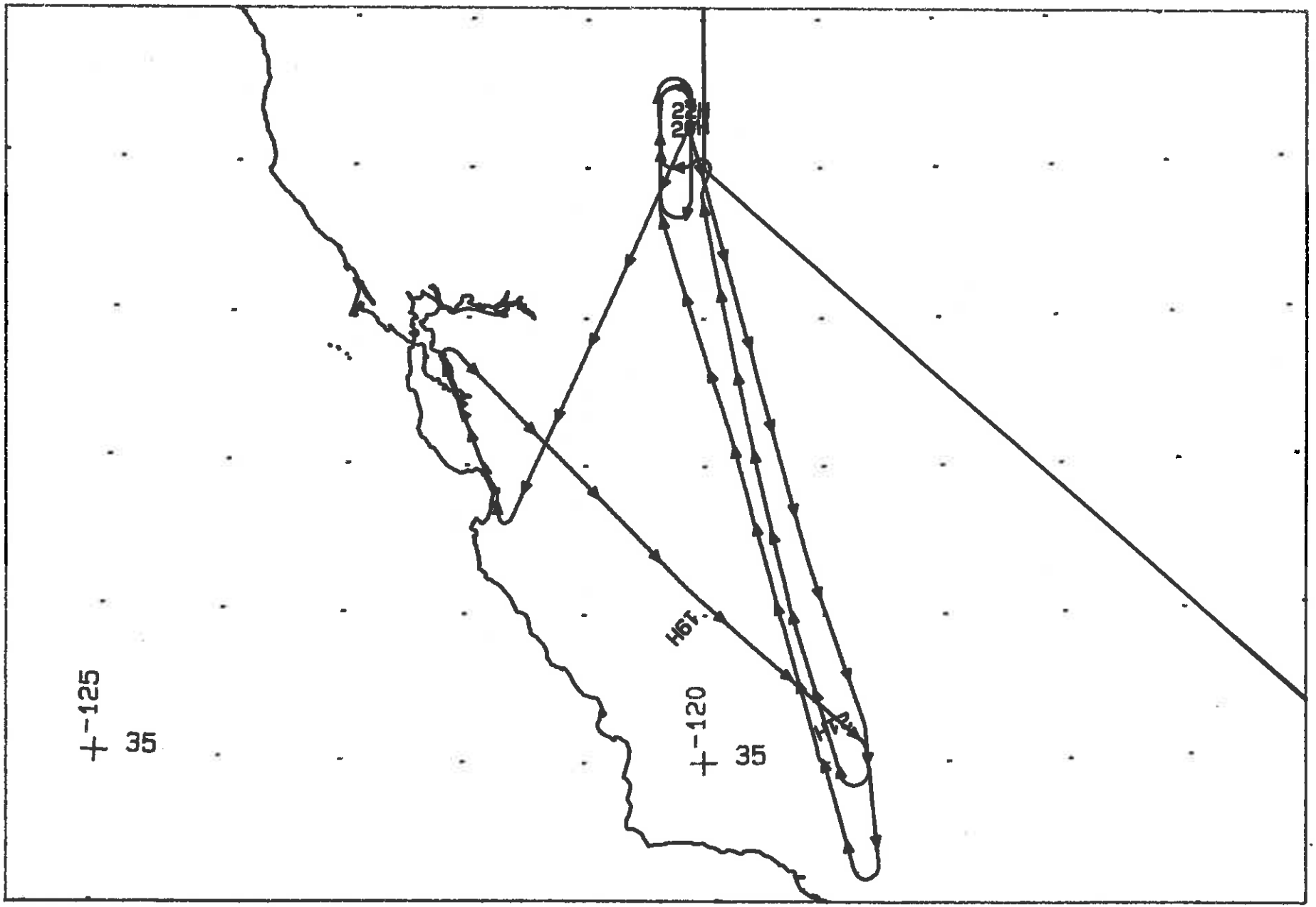
TIMS FLIGHT DATA
FLIGHT NUMBER: 93-009

Check Points	Actual time (GMT) begin	Actual time (GMT) end	Actual scanline begin	Actual scanline end	Altitude feet/meter	Scan Speed (rps)	total Good scanlines	total Interpolated scanlines	total Repeated scanlines
A-B	19:59:10.0	20:02:23.0	43286	44697	65000/19812	7.30	1405	0	7
C-D	20:06: 8.0	20:07: 4.0	46342	46751	65000/19812	7.30	410	0	0
D-E	20:07:29.0	20:11:30.0	46934	48695	65000/19812	7.30	1756	0	6
A-B	20:16: 3.0	20:20:36.0	50691	52687	65000/19812	7.30	1993	0	4
F-G	21:05:20.0	21:09:21.0	72312	74068	65000/19812	7.30	1755	0	2
A-B	21:56:46.0	22:00:15.0	94879	96409	65000/19812	7.30	1529	0	2

MAS SCANNER FLIGHT LINE DATA
FLIGHT NO. 93-009

DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 93-009

Check Points	Actual Time (GMT) Begin	End	Actual Scanline Begin	End	Altitude feet/meter	Scan Speed (rps)	Total Good Scanlines	Total Interpolated Scanlines	Total Repeated Scanlines
A-B	19:59:10.0	20:02:23.0	36810	38010	65000/19812	6.25	1201	0	0
C-D	20:20:08.0	20:07:04.0	39410	39760	65000/19812	6.25	351	0	0
D-E	20:07:29.0	20:11:30.0	39910	41410	65000/19812	6.25	1501	0	0
A-B	20:16:03.0	20:20:36.0	43110	44810	65000/19812	6.25	1701	0	0
F-G	21:04:48.0	21:09:21.0	61310	63009	65000/19812	6.25	1700	0	0
A-B	21:56:46.0	22:00:15.0	80710	82010	65000/19812	6.25	1301	0	0



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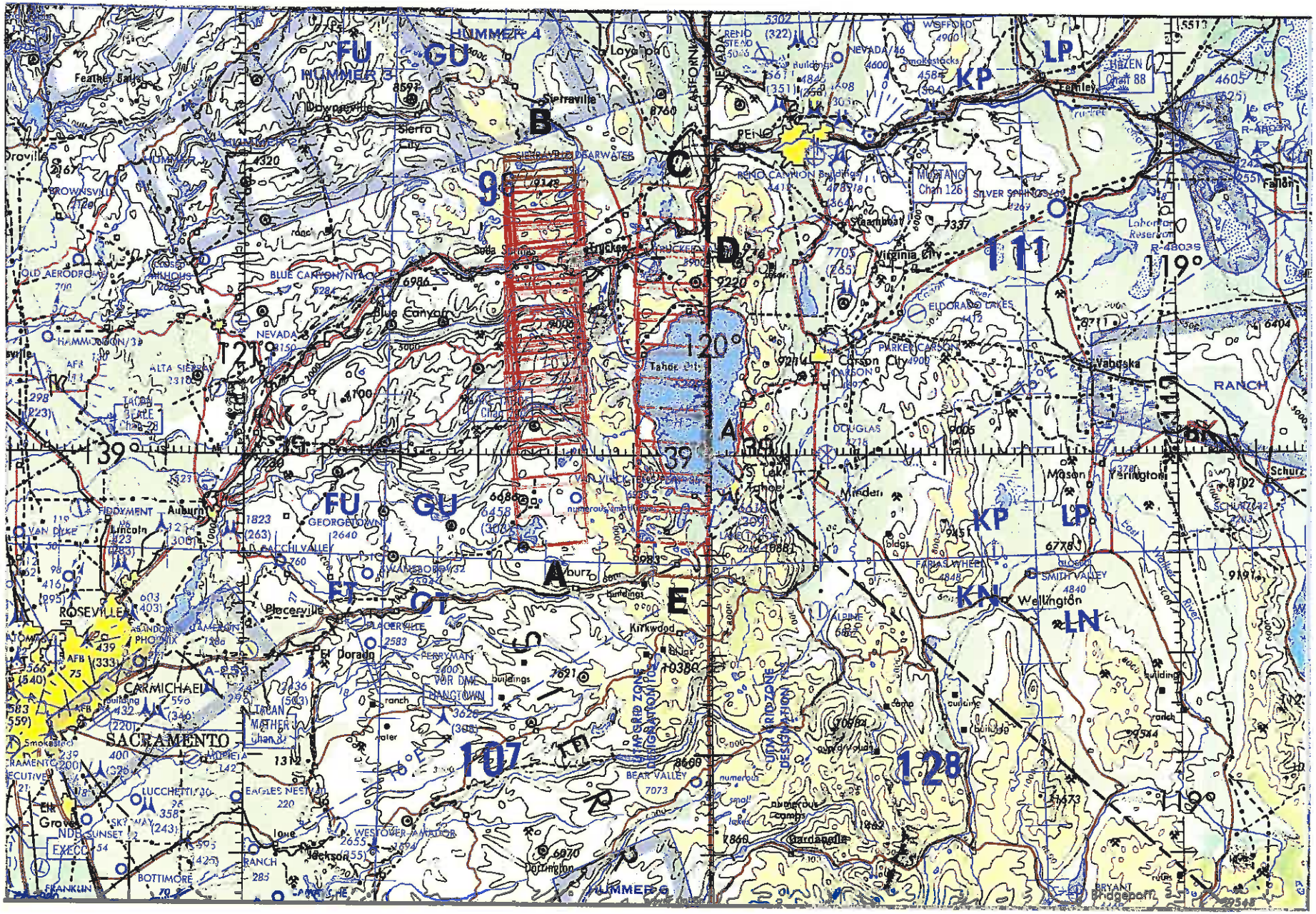

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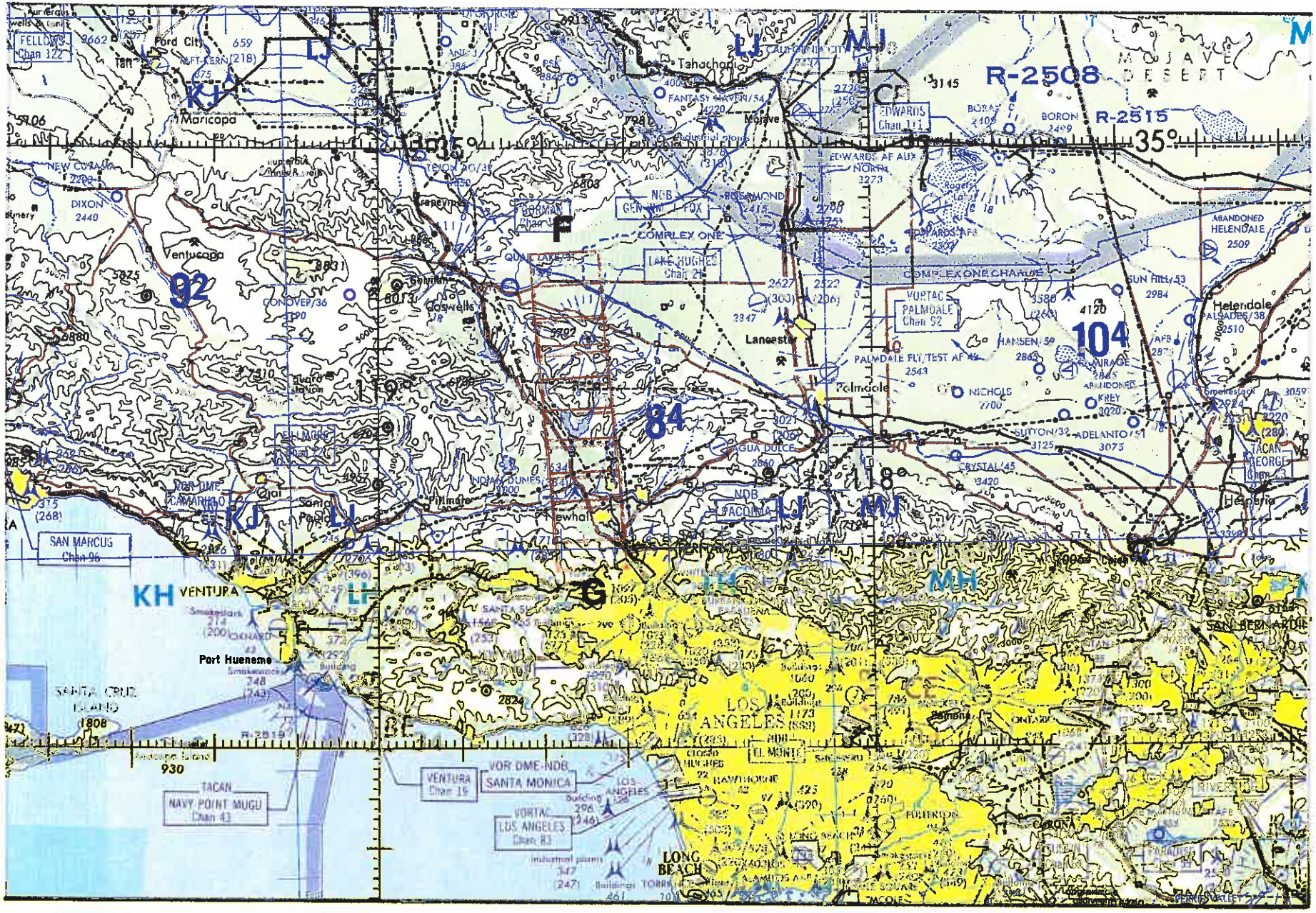

PLOT 19-002 14 OCTOBER 1992 A/C 703 AVRAD / HS-11 CVC 6-15