

## FLIGHT SUMMARY REPORT

**Flight Number:** 97-114  
**Calendar/Julian Date:** 23 June 1997 • 174  
**Sensor Package:** Wild Heerbrugg RC-10  
Airborne Visible and Infrared Imaging  
Spectrometer (AVIRIS)  
Modis Airborne Simulator (MAS)  
**Area(s) Covered:** Railroad Valley, NV

**Investigator(s):** Wan, UCSB; Slater, U of AZ; Kahle, JPL      **Aircraft #:** 706

### SENSOR DATA

|                       |                         |        |      |
|-----------------------|-------------------------|--------|------|
| <b>Accession #:</b>   | 05198                   | ----   | ---- |
| <b>Sensor ID #:</b>   | 034                     | 099    | 108  |
| <b>Sensor Type:</b>   | RC-10                   | AVIRIS | MAS  |
| <b>Focal Length:</b>  | 12"<br>304.66 mm        | ----   | ---- |
| <b>Film Type:</b>     | Aerochrome IR<br>SO-134 | ----   | ---- |
| <b>Filtration:</b>    | Wratten 12              | ----   | ---- |
| <b>Spectral Band:</b> | 510-900 nm              | ----   | ---- |
| <b>f Stop:</b>        | 11                      | ----   | ---- |
| <b>Shutter Speed:</b> | 1/300                   | ----   | ---- |
| <b># of Frames:</b>   | 73                      | ----   | ---- |
| <b>% Overlap:</b>     | 60                      | ----   | ---- |
| <b>Quality:</b>       | Excellent               | ----   | ---- |
| <b>Remarks:</b>       |                         |        |      |

## **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(s) and camera(s) 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 four spectrometers to image a 614 pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4  $\mu\text{m}$ ).

AVIRIS parameters are as follows:

|                           |                                    |
|---------------------------|------------------------------------|
| IFOV:                     | 1 mrad                             |
| Ground Resolution:        | 66 feet (20 meters) at 65,000 feet |
| Total Scan Angle:         | 30 <sup>o</sup>                    |
| Swath Width:              | 5.7 nmi (10.6 km) at 65,000 feet   |
| Spectral Coverage:        | 0.41-2.45 $\mu\text{m}$            |
| Pixels/Scan Line:         | 614                                |
| 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 $\mu\text{m}$ | 31                     | 9.4 nm                   |
| 2                   | 0.68 - 1.27 $\mu\text{m}$ | 63                     | 9.4 nm                   |
| 3                   | 1.25 - 1.86 $\mu\text{m}$ | 63                     | 9.7 nm                   |
| 4                   | 1.84 - 2.45 $\mu\text{m}$ | 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.

## MODIS Airborne Simulator

The MODIS Airborne Simulator (MAS) is a modified Daedalus multispectral scanner configured to replicate the capabilities of the Moderate-Resolution Imaging Spectrometer (MODIS), an instrument to be orbited on an EOS platform. MODIS is designed for the measurement of biological and physical processes and atmospheric temperature sounding. The MODIS Airborne Simulator records fifty 16-bit channels of multispectral data and is configured as follows:

| Spectral Channel | Band center (µm ) | Bandwidth (µm ) | Spectral Range |
|------------------|-------------------|-----------------|----------------|
| 1                | 0.4649            | 0.0397          | 0.4451-0.4848  |
| 2                | 0.5494            | 0.0417          | 0.5285-0.5703  |
| 3                | 0.6550            | 0.0511          | 0.6294-0.6805  |
| 4                | 0.7024            | 0.0415          | 0.6816-0.7231  |
| 5                | 0.7431            | 0.0420          | 0.7221-0.7641  |
| 6                | 0.8248            | 0.0427          | 0.8034-0.8461  |
| 7                | 0.8667            | 0.0414          | 0.8460-0.8874  |
| 8                | 0.9072            | 0.0409          | 0.8867-0.9276  |
| 9                | 0.9476            | 0.0397          | 0.9277-0.9674  |
| 10               | 1.6422            | 0.0519          | 1.6163-1.6682  |
| 11               | 1.6975            | 0.0505          | 1.6722-1.7228  |
| 12               | 1.7499            | 0.0506          | 1.7245-1.7752  |
| 13               | 1.8014            | 0.0491          | 1.7768-1.8259  |
| 14               | 1.8548            | 0.0489          | 1.8303-1.8792  |
| 15               | 1.9044            | 0.0487          | 1.8801-1.9288  |
| 16               | 1.9553            | 0.0483          | 1.9312-1.9794  |
| 17               | 2.0048            | 0.0487          | 1.9804-2.0291  |
| 18               | 2.0551            | 0.0484          | 2.0309-2.0793  |
| 19               | 2.1037            | 0.0486          | 2.0794-2.1280  |
| 20               | 2.1532            | 0.0483          | 2.1291-2.1774  |
| 21               | 2.2019            | 0.0481          | 2.1779-2.2259  |
| 22               | 2.2522            | 0.0486          | 2.2278-2.2675  |
| 23               | 2.3021            | 0.0487          | 2.2777-2.3265  |
| 24               | 2.3512            | 0.0476          | 2.3274-2.3750  |
| 25               | 2.4005            | 0.0483          | 2.3764-2.4246  |

| Spectral Channel | Band center (µm ) | Bandwidth (µm ) | Spectral Range |
|------------------|-------------------|-----------------|----------------|
| 26               | 3.1192            | 0.1616          | 3.0384-3.2000  |
| 27               | 3.2809            | 0.1486          | 3.2066-3.3552  |
| 28               | 3.4330            | 0.1617          | 3.3521-3.5138  |
| 29               | 3.5940            | 0.1539          | 3.5170-3.6709  |
| 30               | 3.7449            | 0.1449          | 3.6724-3.8174  |
| 31               | 3.9069            | 0.1602          | 3.8267-3.9870  |
| 32               | 4.0707            | 0.1554          | 3.9929-4.1484  |
| 33               | 4.1699            | 0.0669          | 4.1365-4.2034  |
| 34               | 4.4029            | 0.1255          | 4.3401-4.4656  |
| 35               | 4.5404            | 0.1512          | 4.4648-4.6160  |
| 36               | 4.6979            | 0.1591          | 4.6184-4.7775  |
| 37               | 4.8536            | 0.1516          | 4.7778-4.9294  |
| 38               | 5.0033            | 0.1468          | 4.9298-5.0767  |
| 39               | 5.1588            | 0.1400          | 5.0888-5.2288  |
| 40               | 5.3075            | 0.1327          | 5.2412-5.3738  |
| 41               | 5.3977            | 0.0755          | 5.3590-5.4365  |
| 42               | 8.5366            | 0.3950          | 8.3391-8.7341  |
| 43               | 9.7224            | 0.5365          | 9.4541-9.9906  |
| 44               | 10.5071           | 0.4579          | 10.278-10.736  |
| 45               | 11.0119           | 0.4710          | 10.776-11.247  |
| 46               | 11.9863           | 0.4196          | 11.776-12.196  |
| 47               | 12.9013           | 0.3763          | 12.713-13.089  |
| 48               | 13.2702           | 0.4584          | 13.041-13.500  |
| 49               | 13.8075           | 0.5347          | 13.540-14.075  |
| 50               | 14.2395           | 0.3775          | 14.051-14.428  |

NOTE: Bandpass centers approximate

Sensor/Aircraft Parameters:

Spectral Bands: 50 (digitized to 16-bit resolution)  
 IFOV: 2.5 mrad  
 Ground Resolution: 163 feet (50 meter at 65,000 feet)  
 Swath Width: 22.9 mi/19.9 nmi (36 km)  
 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.)

## 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-Heerbrugg 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).

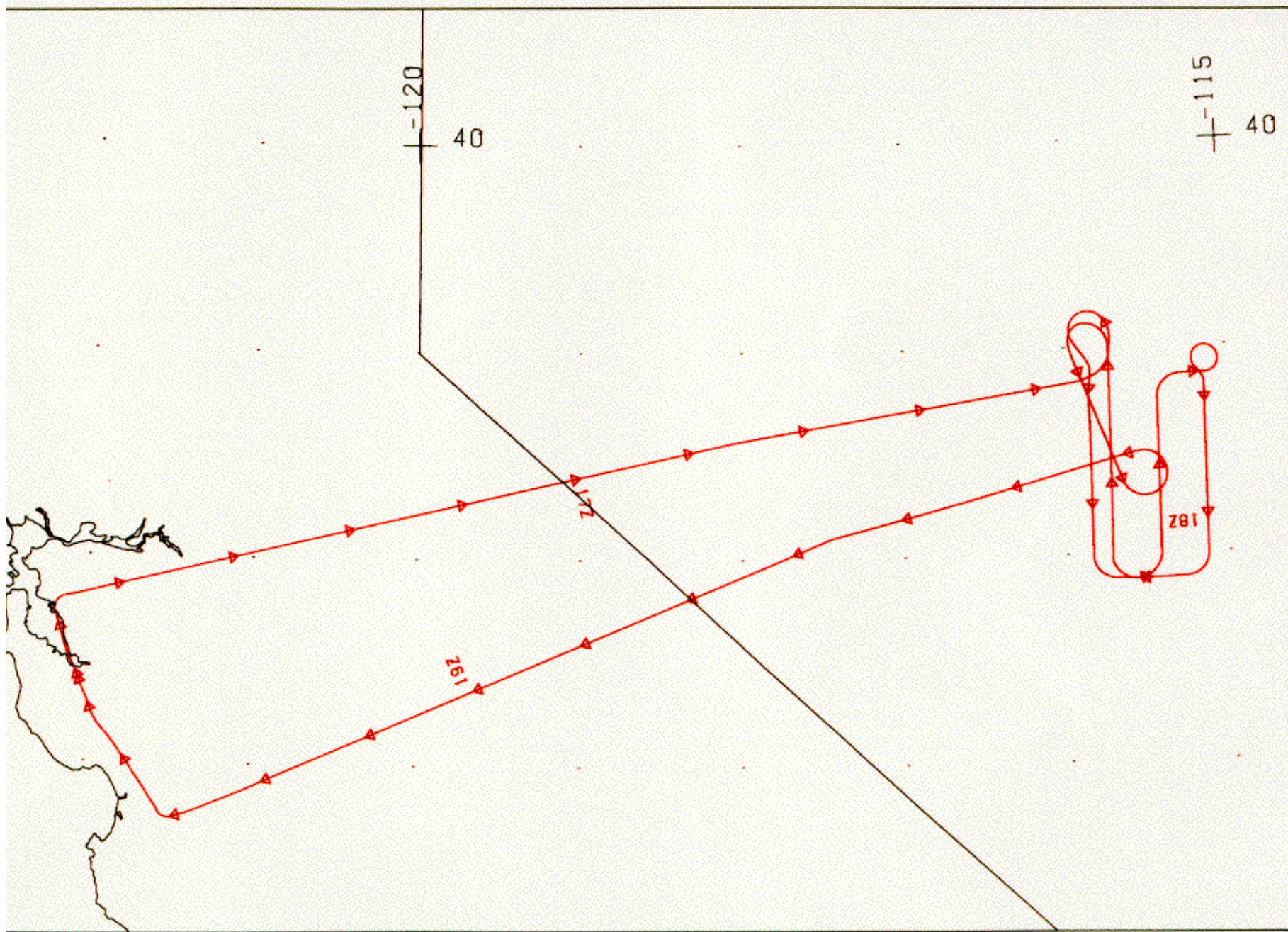
Additional information regarding ER-2 acquired photographic and digital data is available through the Aircraft Data Facility at Ames Research Center. For specific information regarding flight documentation, sensor parameters, and areas of coverage contact the Aircraft Data Facility, NASA-Ames Research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

**CAMERA FLIGHT LINE DATA**  
**FLIGHT NO. 97-114**

Accession # 05198

Sensor # 034

| Check Points | Frame Numbers | Time (GMT-hr, min, sec) |          | Altitude, MSL<br>feet/meters | Cloud Cover/Remarks                    |
|--------------|---------------|-------------------------|----------|------------------------------|--|
|              |               | START                   | END      |                              |  |
| A            | 4309          | 16:47:44                | 16:47:44 | 56700/17282                  | Clear                                  |
| B - C        | 4310-4326     | 17:29:28                | 17:37:05 | 65141/19855                  | Clear; oblique (frame 4312)            |
| D - E        | 4327-4340     | 17:41:26                | 17:47:37 | 65071/19834                  | Clear                                  |
| F - G        | 4341-4355     | 17:54:38                | 18:01:16 | 65373/19926                  | Clear                                  |
| H - I        | 4356-4369     | 18:06:56                | 18:13:05 | 64657/19707                  | Clear                                  |
| J - K        | 4370-4378     | 18:20:54                | 18:24:40 | 65267/19893                  | Clear                                  |
| L - M        | 4379-4381     | 18:30:09                | 18:31:06 | 65100/19842                  | Clear; processing residue (frame 4380) |

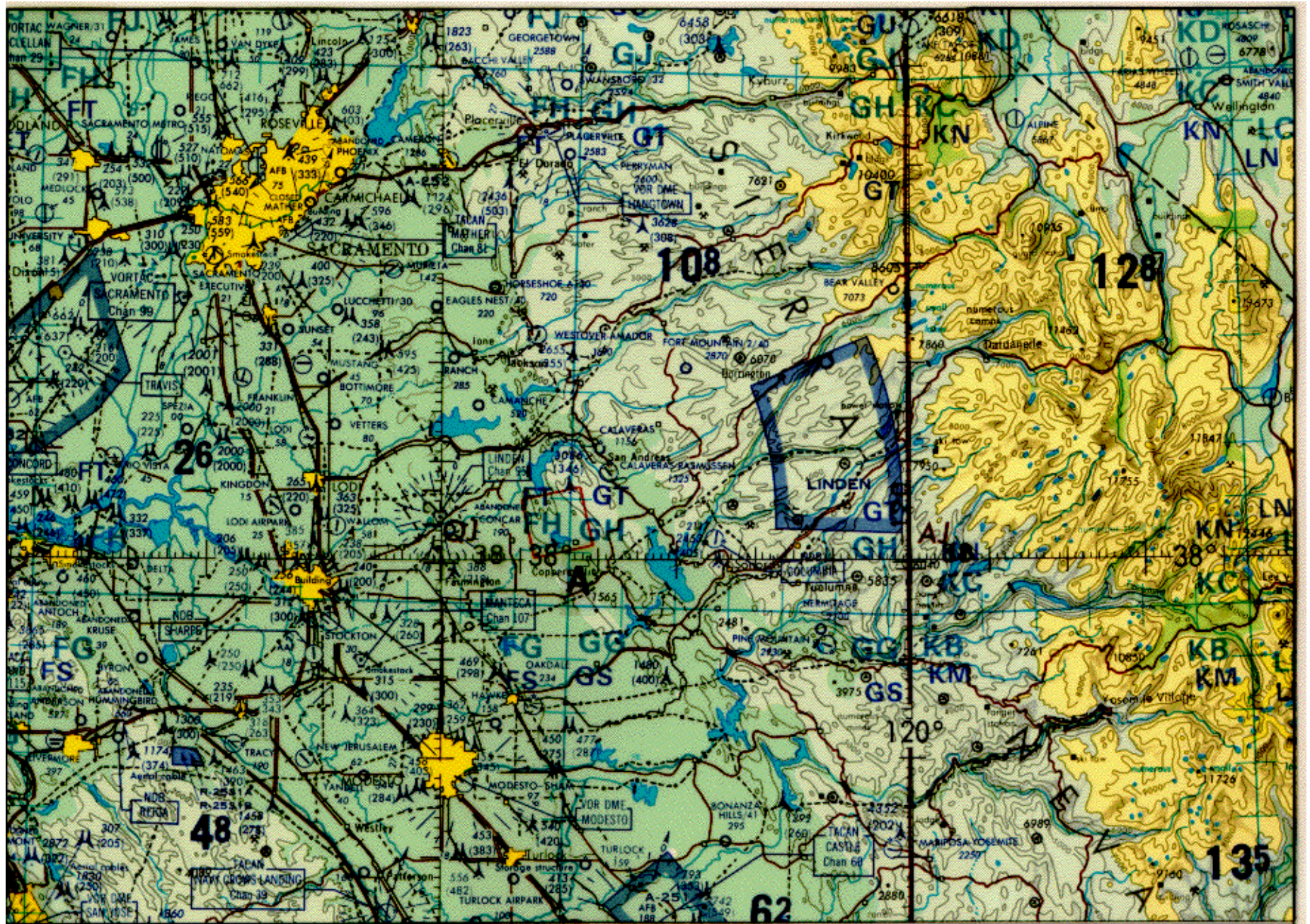


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