

# FLIGHT SUMMARY REPORT

**Flight #:** 91-079  
**Date:** 30 April 1991  
**Sensor Package:** Airborne Visible and Infrared Imaging Spectrometer (AVIRIS)  
Wild-Heerbrug RC-10  
**Area(s) Covered:** Southern California

**Investigator(s):** Crowley and Clark, USGS;  
Conel, JPL  
**Aircraft #:** 709  
**Flight Request:** 91G221, 91L241, 91L242  
**Julian Date:** 120

## SENSOR DATA

|                       |   |  |
|-----------------------|---|--|
| <b>Accession #:</b>   | ----  | 04215  |
| <b>Sensor ID #:</b>   | 099   | 033  |
| <b>Sensor Type:</b>   | AVIRIS                                      | RC-10  |
| <b>Focal Length:</b>  | ----  | 6"<br>153.17 mm                                  |
| <b>Film Type:</b>     | ----  | High Definition<br>Aerochrome Infrared<br>SO-131 |
| <b>Filtration:</b>    | ----  | cc.10B   |
| <b>Spectral Band:</b> | ----  | 510-900 nm                                       |
| <b>f Stop:</b>        | ----  | 4  |
| <b>Shutter Speed:</b> | ----  | 1/100  |
| <b># of Frames:</b>   | ----  | 31   |
| <b>% Overlap:</b>     | ----  | 60   |
| <b>Quality:</b>       | ----  | Excellent  |
| <b>Remarks:</b>       | No inertial navigation data for this flight |  |

## 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 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°                                |
| 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                   |

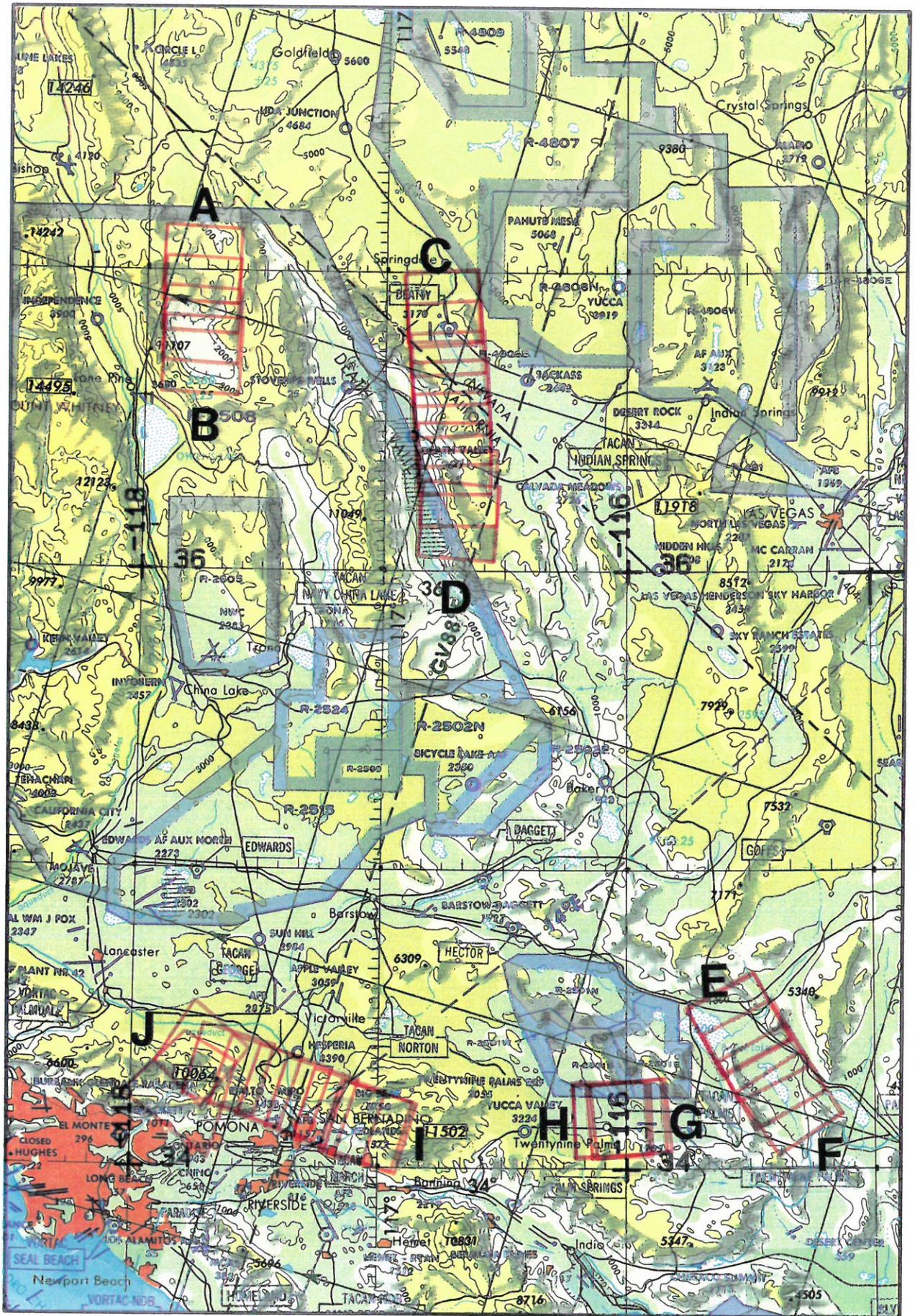
All AVIRIS data is decommutated and archived at JPL and not currently available for public distribution. For further information contact Rob Green at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 183-501, Pasadena, California 91109-8099.

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 91-079**

Accession # 04215

Sensor # 033

| Check Points | Frame Numbers | Time (GMT-hr, min, sec) |          | Altitude, MSL feet/meters | Cloud Cover/Remarks                        |
|--------------|---------------|-------------------------|----------|---------------------------|--|
|              |               | START                   | END      |                           |  |
| A - B        | 4938-4941     | 18:38:00                | 18:40:54 | 65000/19800               | 20-30% strato-cumululus (frames 4940-4941) |
| C - D        | 4942-4950     | 18:52:00                | 18:58:44 | "                         | Clear                                      |
| E - F        | 4951-4955     | 19:16:00                | 19:18:52 | "                         | Clear                                      |
| G - H        | 4956-4959     | 19:22:00                | 19:22:24 | "                         | Clear                                      |
| I - J        | 4960-4968     | 19:34:00                | 19:40:54 | "                         | Clear                                      |



FLIGHT 91-079 80 Apr 11 1991 A/G 709 AVIRIS / RC-10 Accession # 04215 JNC 49

# FLIGHT SUMMARY REPORT

**Flight #:** 91-082  
**Date:** 6 May 1991  
**Sensor Package:** Wild-Heerbrug RC-10  
Airborne Ocean Color Imager (AOCI)  
Thematic Mapper Simulator (TMS)  
**Area(s) Covered:** Pacific Ocean off Southern California

**Investigator(s):** Carlson, Naval Ocean Systems Center      **Aircraft #:** 706  
**Flight Request:** 91R100      **Julian Date:** 126

## SENSOR DATA

|                       |                       |       |       |
|-----------------------|-----------------------|-------|-------|
| <b>Accession #:</b>   | 04216                 | ----- | ----- |
| <b>Sensor ID #:</b>   | 033                   | 090   | 101   |
| <b>Sensor Type:</b>   | RC-10                 | AOCI  | TMS   |
| <b>Focal Length:</b>  | 6"<br>153.17 mm       | ----- | ----- |
| <b>Film Type:</b>     | Aerial Color<br>SO242 | ----- | ----- |
| <b>Filtration:</b>    | 2.2 AV                | ----- | ----- |
| <b>Spectral Band:</b> | 400-700 nm            | ----- | ----- |
| <b>f Stop:</b>        | 4                     | ----- | ----- |
| <b>Shutter Speed:</b> | 1/100                 | ----- | ----- |
| <b># of Frames:</b>   | 40                    | ----- | ----- |
| <b>% Overlap:</b>     | 60                    | ----- | ----- |
| <b>Quality:</b>       | Excellent             | Good  | Good  |
| <b>Remarks:</b>       |                       |       |       |

## Airborne Science and Applications Program

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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 sensors used for data collection during this flight.

### Airborne Ocean Color Imager

The Airborne Ocean Color Imager (AOCI) is a high altitude multispectral scanner designed for oceanographic remote sensing. It provides 10-bit digitization of eight bands in the visible/near-infrared region of the spectrum, plus two 8-bit bands in the near and thermal infrared. The bandwidths are as follows:

| <u>Channel</u> | <u>Wavelength, <math>\mu\text{m}</math></u> |
|----------------|---|
| 1              | 0.436 - 0.455                               |
| 2              | 0.481 - 0.501                               |
| 3              | 0.511 - 0.531                               |
| 4              | 0.554 - 0.575                               |
| 5              | 0.610 - 0.631                               |
| 6              | 0.655 - 0.676                               |
| 7              | 0.741 - 0.800                               |
| 8              | 0.831 - 0.897                               |
| 9              | 0.989 - 1.054                               |
| 10             | 8.423 - 12.279                              |

Sensor/aircraft parameters are as follows:

|                    |  |
|--------------------|--|
| IFOV:              | 2.5 mrad                                   |
| Ground Resolution: | 163 feet (50 meters) at 65,000 feet        |
| Total Scan Angle:  | 85°  |
| Swath Width:       | 19.6 nmi (36.3 km) at 65,000 feet          |
| Pixels/Scan Line:  | 716  |
| Scan Rate:         | 6.25 scans/second                          |
| Ground Speed:      | 400 kts (206 m/second)                     |
| Digitization:      | 8-bit channels 9-10<br>10-bit channels 1-8 |

## Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a 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, <math>\mu\text{m}</math></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:              | 1.25 mrad                          |
| Ground Resolution: | 81 feet (25 meters) at 65,000 feet |
| Total Scan Angle:  | 43°                                |
| Swath Width:       | 8.4 nmi (15.6 km) at 65,000 feet   |
| Pixels/Scan Line:  | 716                                |
| Scan Rate:         | 12.5 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. 91-082**

Accession # 04216

Sensor # 033

| Check Points  | Frame Numbers | Time (GMT-hr, min, sec) |          | Altitude, MSL feet/meters | Cloud Cover/Remarks                  |
|---|---------------|-------------------------|----------|---------------------------|--------------------------------------|
|   |               | START                   | END      |                           |                                      |
| C - D   | 4987-5001     | 22:22:35                | 22:34:00 | 65000/19800               | 10% minor cumulus (frames 5002-5004) |
| E - F   | 5002-5015     | 22:38:10                | 22:49:10 | "                         | 10% minor cumulus (frames 4997-5001) |
| G - H   | 5016-5026     | 22:52:55                | 23:01:20 | "                         | Clear                                |
| <p>Annotation very faint. Times unreadable and estimated from Inertial Navigation data. Last flightline lost in processing.</p> |               |                         |          |                           |                                      |

# AOCI SCANNER FLIGHT LINE DATA

FLIGHT NO. 91-082

DAEDALUS FLIGHT DATA  
FLIGHT NUMBER: 91-082

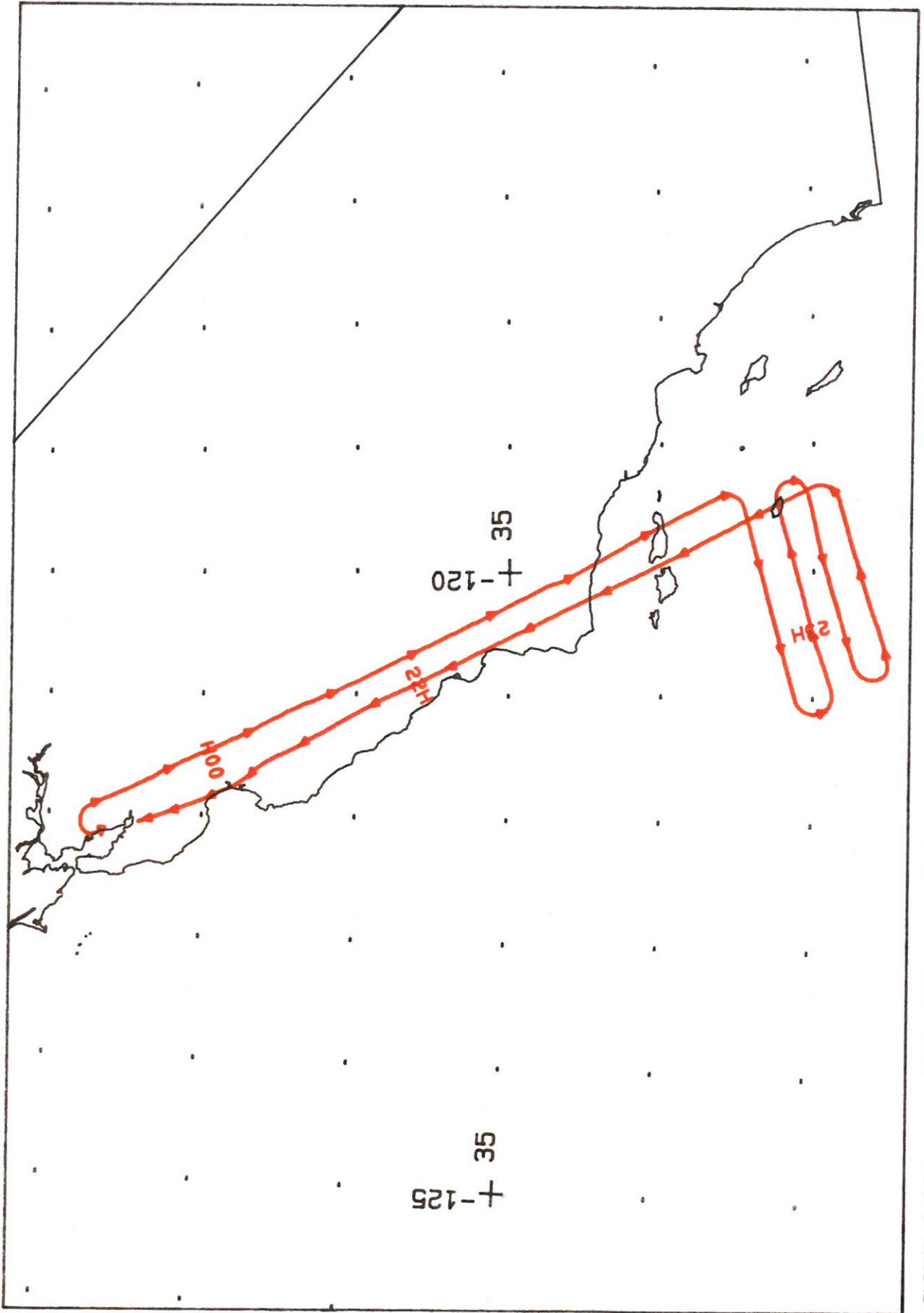
| Check<br>Points | Actual<br>time (GMT) |            | Actual<br>scanline<br>begin end | Altitude<br>feet/meter | Scan<br>Speed<br>(rps) | total             |                           | total                 |    |
|-----------------|----------------------|------------|---------------------------------|------------------------|------------------------|-------------------|---------------------------|-----------------------|----|
|                 | begin                | end        |                                 |                        |                        | Good<br>scanlines | Interpolated<br>scanlines | Repeated<br>scanlines |    |
| C-D             | 22:23:18.0           | 22:34:0.0  | 23340                           | 27350                  | 6.25                   | 4001              | 0                         | 0                     | 10 |
| E-F             | 22:38:32.0           | 22:47:14.0 | 29933                           | 33061                  | 6.25                   | 4001              | 0                         | 0                     | 0  |
| G-H             | 22:52:42.0           | 23:02:50.0 | 34361                           | 38165                  | 6.25                   | 3801              | 0                         | 0                     | 4  |
| I-J             | 23:06:51.0           | 23:15:56.0 | 37667                           | 43070                  | 6.25                   | 3401              | 0                         | 0                     | 11 |

# SCANNER FLIGHT LINE DATA

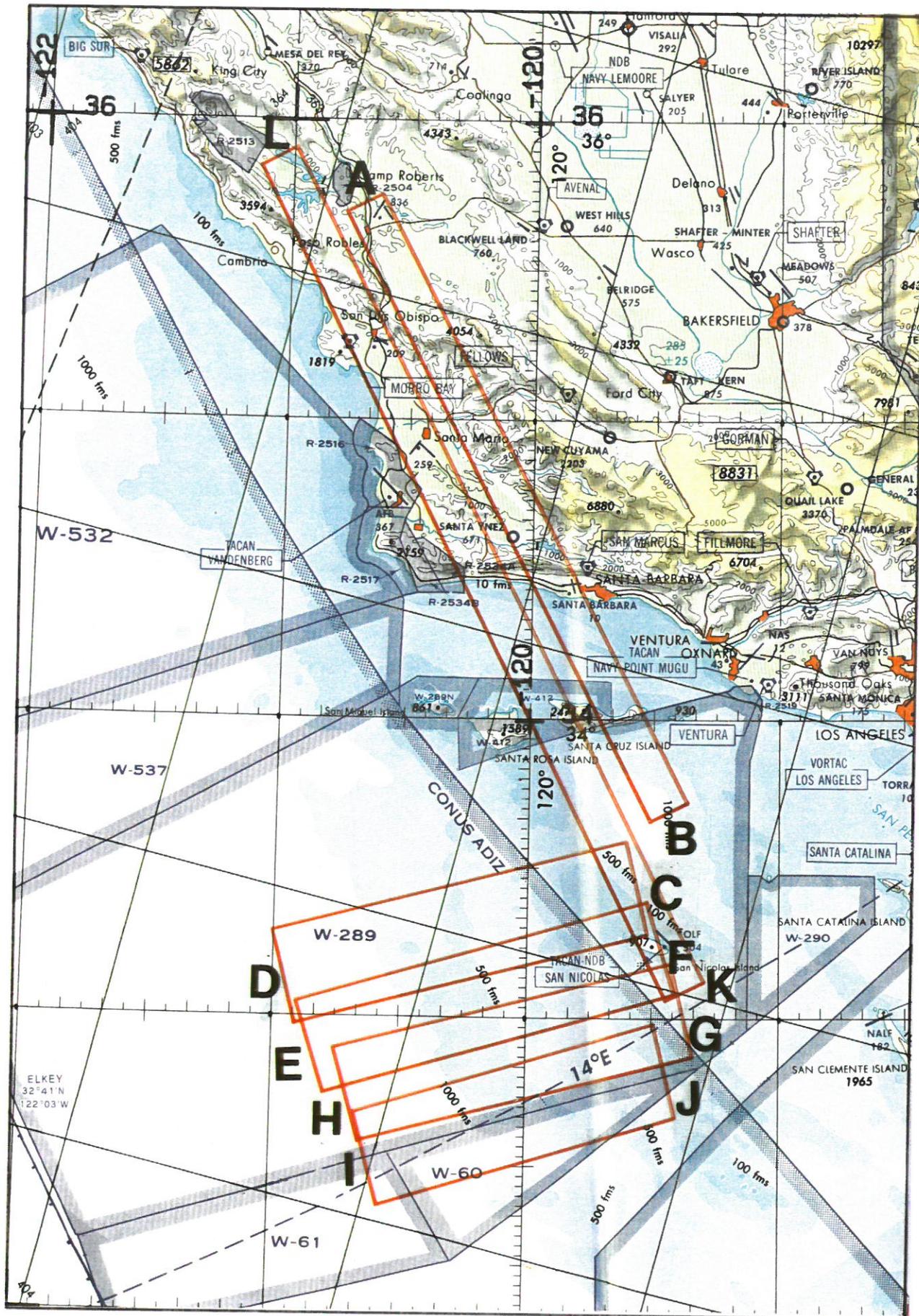
FLIGHT NO. 91-082

## DAEDALUS FLIGHT DATA FLIGHT NUMBER: 91-082

| Check Points | A c t u a l<br>t i m e (GMT)<br>b e g i n e n d | A c t u a l<br>s c a n l i n e<br>b e g i n e n d | A l t i t u d e<br>f e e t / m e t e r | Scan<br>S p e e d<br>(rps) | t o t a l<br>G o o d<br>s c a n l i n e s | t o t a l<br>I n t e r p o l a t e d<br>s c a n l i n e s | t o t a l<br>R e p e a t e d<br>s c a n l i n e s |
|--------------|---|---|--|----------------------------|---|---|---|
| A-B          | 22:00: 4.0 22:20: 7.0                           | 29222 44268                                       | 65000/19812                            | 12.50                      | 15001                                     | 0   | 46  |
| K-L          | 23:19: 1.0 23:47: 3.0                           | 88469 109512                                      | 65000/19812                            | 12.50                      | 21001                                     | 0   | 43  |



FLIGHT 91-082    6 May 1991    A/C 706    AOCI / TMS / TMS / RC-10



JNC 43

TMS / ACCI Coverage  
A/C 706

6 May 1991

FLIGHT 91-082

ELKEY  
32°41'N  
122°03'W

D

E

H

I

W-289

W-60

D

E

H

I

B

C

F

K

G

J

100 fms

500 fms

1000 fms

14°E

CONUS ADIZ

120°

120°

120°

120°

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120°

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120°

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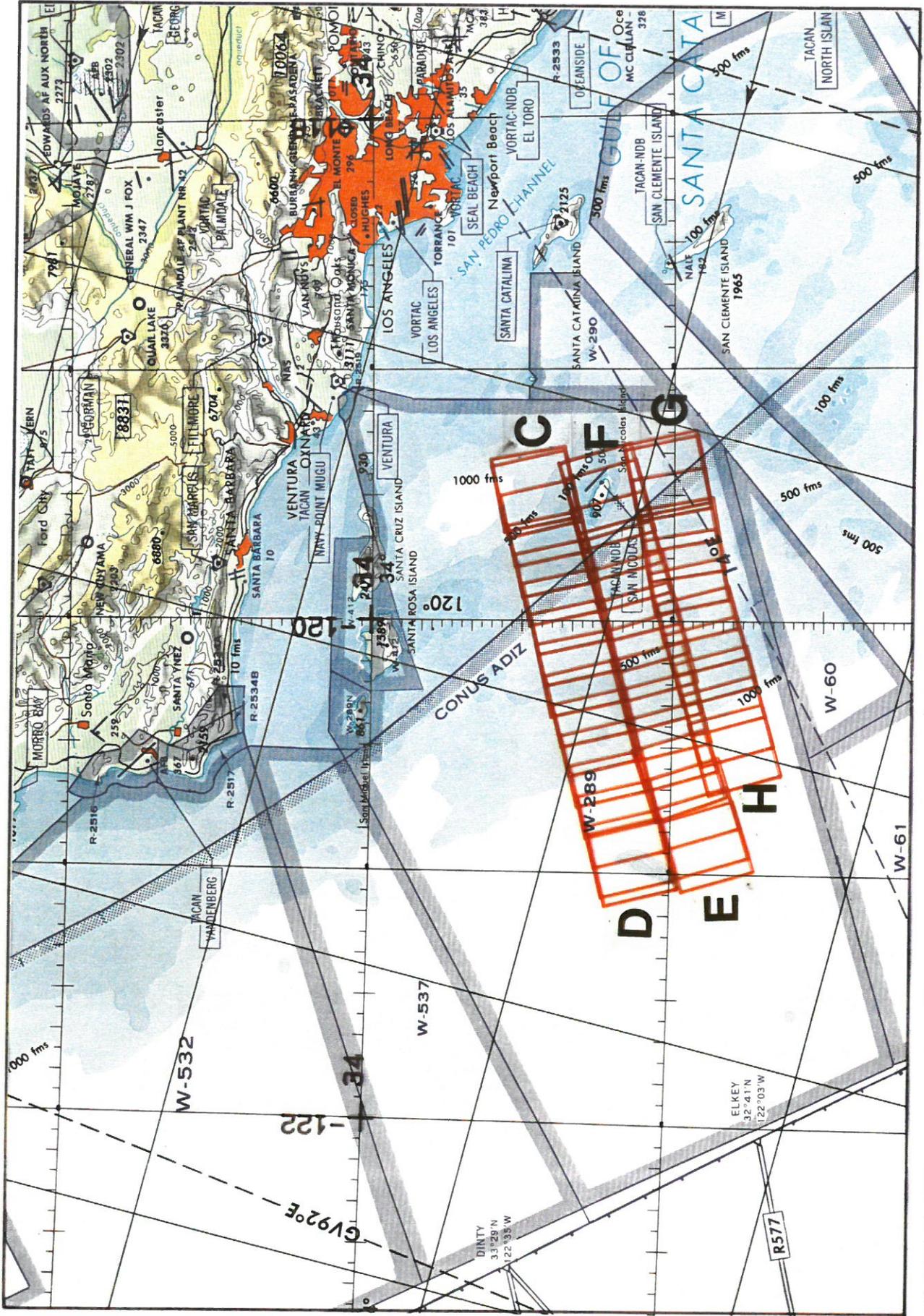
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FLIGHT 91-082

6 May 1991

A/C 706

AOCI / TMS / RC-10

Accession # 04216

JNC 43