

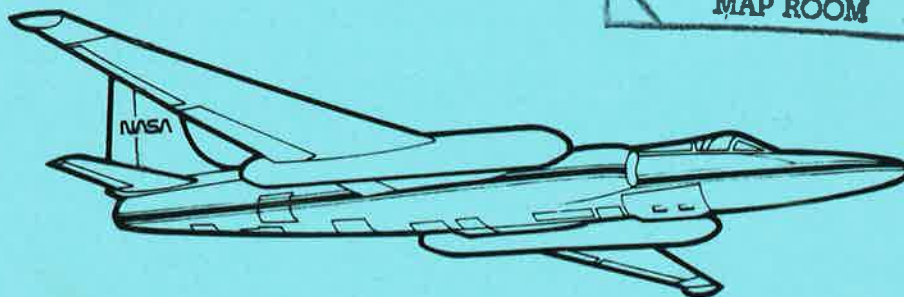
Airborne Instrumentation Research Project

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Flight Summary Report

Flight No. 88-046

Date 11 March 1988



Science and Applications Aircraft Division

NASA

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035

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FLIGHT SUMMARY REPORT

Flight Number: 88-046

Date: 11 March 1988

Julian Date: 071

Aircraft No: 706

Sensor Package: Wild-Heerbrug RC-10 Camera
 IRIS II Panoramic Camera
 Thematic Mapper Simulator (TMS)

Purpose of Flight: # 88X001

Requestor: Functional Check Flight

Area(s) Covered: Central and Southern California

SENSOR DATA

| | | | |
|----------------|---|---|-------------------------|
| Accession No: | 03712 | 03703 | ----- |
| Sensor ID No: | 076 | 070 | 074 |
| Sensor Type: | RC-10 | IRIS II | TMS |
| Focal Length: | 12" 304.89mm | 24" 609.6mm | ----- ----- |
| Film Type: | High Definition Aerochrome IR, SO-127 | High Definition Aerochrome IR, SO-127 | ----- ----- ----- |
| Filtration: | cc .10B | cc .30B | ----- |
| Spectral Band: | 510-900nm | 510-900nm | See write up. |
| f Stop: | 4 | 3.5 | ----- |
| Shutter Speed: | 1/200 | 1/125 | ----- |
| No. of Frames: | 108 | 580 | ----- |
| % Overlap: | 60% | 60% | ----- |
| Quality: | Excellent | Excellent | Excellent |
| Remarks: | See write up. | See write up. | See write up. |

FLIGHT SUMMARY

88-046

This flight was flown as a functional check flight under the FY 1988 Airborne Instrumentation Research Program (AIRP) Plan. RC-10 and IRIS II photographic data and TMS scanner data were acquired over areas in Central and Southern California (see Track Map).

No processing or camera malfunctions were noted and the quality of the data is rated excellent.

Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a high altitude multispectral scanner flying on the U-2 and 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 um</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:

IFOV: 1.3 mr
Ground Resolution: 91 feet (28 meters at 70,000 feet)
Total scan angle: 43°
Swath width: 9.0 nmi (16.6 km at 70,000 feet)
Pixels/scan line: 716 (750 following rectification)
Scan rate: 12.5 scans/sec
Aircraft velocity: 390 kts (200 m/sec)

U-2 Thematic Mapper Simulator Calibration Data

Flight No: 88-046

| Daedalus Channel Number | TM Channel Number | Radiance/Count (mW/cm ² *um*sr/count) |
|----------------------------|----------------------|---|
| 1 | A | 0.0072 |
| 2 | 1 | 0.0221 |
| 3 | 2 | 0.0366 |
| 4 | B | 0.0527 |
| 5 | 3 | 0.0411 |
| 6 | C | 0.0415 |
| 7 | 4 | 0.0354 |
| 8 | D | 0.0383 |
| 9 | 5 | 0.0131 |
| 10 | 7 | 0.0041 |

(Radiance/Count should be multiplied by gray-level value to obtain radiance. No "tare" correction is necessary.)

Thermal Data

The thermal data (Channels 11 and 12) may be calibrated using information from the digital housekeeping words contained in each scanline (see enclosed record format). Words 7 and 8 contain the temperatures of the two onboard thermal black body references, and words 19 and 20 contain their corresponding digital counts.

TMS SCANNER DATA TAPE FORMAT

The Applications Aircraft Data Management Facility converts scanner data recorded on 14-track high-density tape to standard 9-track computer-compatible tapes (CCT) for the user. Density of CCTs can be 6250, 1600, or 800 bpi, depending on the user's preference. The logical record length is fixed at 766 8-bit bytes for raw data and 800 for geometrically corrected data. The first 50 bytes of all records are house-keeping information; the next 716 (or 750 for geometrically corrected data) are digitized video pixel data.

All channels for a particular flight segment are written in a single tape file in a line-interleaved format, as follows:

record 1 = scanline 1, channel 1
record 2 = scanline 1, channel 2
record 3 = scanline 1, channel 3
.
.
record 12 = scanline 1, channel 12
record 13 = scanline 2, channel 1
record 14 = scanline 2, channel 2
etc.

Users can request that tapes be blocked to contain all channels of a single scanline sequentially in one record. In such cases physical record length equals the number of channels multiplied by the logical record length (766 or 800 bytes).

TMS DATA LOGICAL RECORD FORMAT

| 16-BIT WORD NUMBER | CONTENTS |
|-----------------------|--|
| 1-25 | Channel Scanline Housekeeping Information |
| 1 | Data frame status 0 Good frame 10-16 Interpolated data 20-26 Repeated data 30-36 Zero-fill for data |
| 2 | Run number |
| 3-4 | Scanline number (32-bit integer) |
| 5-6 | Thumbwheel switches (32-bit integer): expressed as 8 digits in the form YYFFFJJJ, where YY is the last two digits of the year FFF is the flight number JJJ is the Julian day of the year |
| 7 | Black body 1 thermal reference temperature (degrees C * 100) |
| 8 | Black body 2 thermal reference temperature (degrees C * 100) |
| 9 | Scan speed (scans/second * 10) |
| 10 | GMT hours |
| 11 | GMT minutes |
| 12 | GMT seconds (* 10) |
| 13 | Demagnification value (* 100) |
| 14 | Filler |
| 15 | Gain value (* 100) |
| 16 | Channel number |
| 17-18 | Time (32-bit integer): expressed as a 7-digit number in the form HHMMSSST |
| 19 | Black body 1 radiance count |
| 20 | Black body 2 radiance count |
| 21 | Aircraft roll angle (signed integer, positive is left): 0.03 degrees per count, 0.06 degrees per pixel, and thus two counts per pixel. |
| 22-25 | Filler |
| 26-383 | Digitized Video Pixel Information |
| 26 | Digitized video pixel no. 1 and no. 2 |
| 27 | Digitized video pixel no. 3 and no. 4 |
| 28 | Digitized video pixel no. 5 and no. 6 |
| ⋮ | ⋮ |
| ⋮ | ⋮ |
| ⋮ | ⋮ |
| 382 | Digitized video pixel no. 713 and no. 714 |
| 383 | Digitized video pixel no. 715 and no. 716 |

NOTE: Housekeeping information consists of 16-bit integers, unless otherwise noted. Video pixel data consist of two 8-bit samples packed into one 16-bit word. Geometrically corrected data contains 750 8-bit pixels, expanding the logical record format to 400 words.

CAMERA FLIGHT LINE DATA
 FLIGHT NO. 88-046

| Sensor # | Check Points | Frame Numbers | Time (GMT-hr, min, sec) | | Altitude, MSL feet/meters | Cloud Cover/Remarks |
|----------|--------------|---------------|-------------------------|----------|------------------------------|---------------------|
| | | | START | END | | |
| 076 | B - C | 1291-1297 | 19:46:16 | 19:48:28 | 65000/19800 | Clear |
| | D - E | 1298-1323 | 19:51:06 | 20:02:30 | " | Clear |
| | F - G | 1324-1343 | 20:10:26 | 20:18:58 | " | Clear |
| | H - I | 1344-1353 | 20:21:06 | 20:24:55 | " | Clear |
| | I - J | 1354-1367 | 20:26:25 | 20:32:05 | " | Clear |
| | K - L | 1368-1375 | 20:34:51 | 20:36:46 | " | Clear |
| | M - N | 1376-1398 | 20:39:36 | 20:49:26 | " | Clear |

CAMERA FLIGHT LINE DATA
 FLIGHT NO. 88-046

| Sensor # | Check Points | Frame Numbers | Time (GMT-hr, min, sec) | | Altitude, MSL feet/meters | Cloud Cover/Remarks |
|----------|--------------|---------------|-------------------------|----------|------------------------------|---------------------|
| | | | START | END | | |
| 070 | A - C | 0010-0193 | 19:26:46 | 19:48:10 | 65000/19800 | Clear |
| | D - E | 0194-0286 | 19:50:59 | 20:02:17 | " | Clear |
| | F - G | 0287-0354 | 20:10:21 | 20:18:34 | " | Clear |
| | H - I | 0355-0388 | 20:21:00 | 20:25:03 | " | Clear |
| | I - J | 0389-0436 | 20:26:09 | 20:32:02 | " | Clear |
| | K - L | 0437-0453 | 20:34:50 | 20:36:40 | " | Clear |
| | M - N | 0454-0523 | 20:39:28 | 20:48:05 | " | Clear |

SCANNER FLIGHT LINE DATA

FLIGHT NO. 88 - 046



DAEDALUS FLIGHT DATA FLIGHT NUMBER: 88-046

| Deck Units | Flightline number | Actual time (GMT) | | Actual scanline | | Altitude feet/meter | Scan Speed (rps) | total Good scanlines | total Interpolated scanlines | total Repeated scanlines | total Zero-fill scanlines |
|---------------|----------------------|----------------------|------------|--------------------|-------|------------------------|------------------------|----------------------------|------------------------------------|--------------------------------|---------------------------------|
| | | begin | end | begin | end | | | | | | |
| D - E | 1 | 19:52:40.0 | 20:02:36.0 | 59733 | 67193 | 65000/19812 | 12.50 | 7132 | 0 | 19 | 0 |
| F - G | 2 | 20:13:43.0 | 20:18:41.0 | 75513 | 79243 | 65000/19812 | 12.50 | 3720 | 0 | 11 | 0 |

FLIGHT 88-04

11 March 1988

Data Run

Iris II 
Iris II / RC-10 
Iris II/RC-10/TMS 