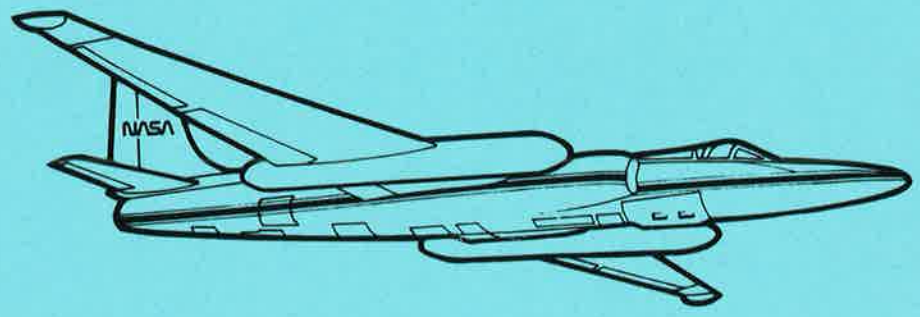
Airborne Instrumentation Research Project

Flight Summary Report

Flight No. 88-112

Date 26 July 1988



Science and Applications Aircraft Division

NASA
National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035

FLIGHT SUMMARY REPORT

Flight Number: 88-112

Date: 26 July 1988

Julian Date: 208

Aircraft No: 706

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

Purpose of Flight: # 88B217C
Requestor: Brass, NASA/ARC

Area(s) Covered: Southern California

131 x #4.80 = #628.80

SENSOR DATA

Accession No:	03763	-----
Sensor ID No:	076	074
Sensor Type:	RC-10	TMS
Focal Length:	12-inch 304.89 mm	-----
Film Type:	High Definition Aerochrome Infrared, SO-131	----- -----
Filtration:	cc .10C	-----
Spectral Band:	510-900 nm	See write up.
f Stop:	4	-----
Shutter Speed:	1/225	-----
No. of Frames:	131	-----
% Overlap:	60	-----
Quality:	Excellent	Good
Remarks:	See write up.	See write up.

FLIGHT SUMMARY

88-112

This flight was flown in support of Flight Request #88B217C, (Brass, NASA / ARC) under the FY 1988 Airborne Instrumentation Research Program (AIRP) Plan. RC-10 color infrared photographic data and Thematic Mapper Simulator scanner data were acquired selected sites in 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:

Daedalus Channel	TM Band	Wavelength um	
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: 88-112

Daedalus Channel Number	TM Channel Number	Radiance/Count (mW/cm2*um*sr/count)
1	A	0.0197
2	1	0.0309
3	2	0.0511
4	B	0.0690
5	3	0.1105
6	C	0.1087
7	4	0.0957
8	D	0.0472
9	5	0.0114
10	7	0.0065

(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 HHMMSST
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. 88-112

Accession No. 03763

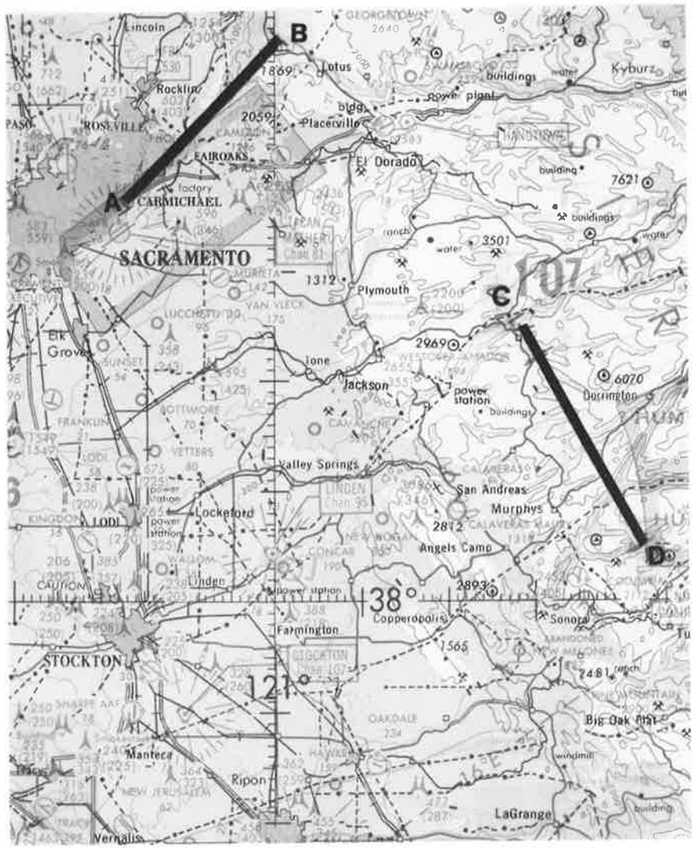
Sensor # 076

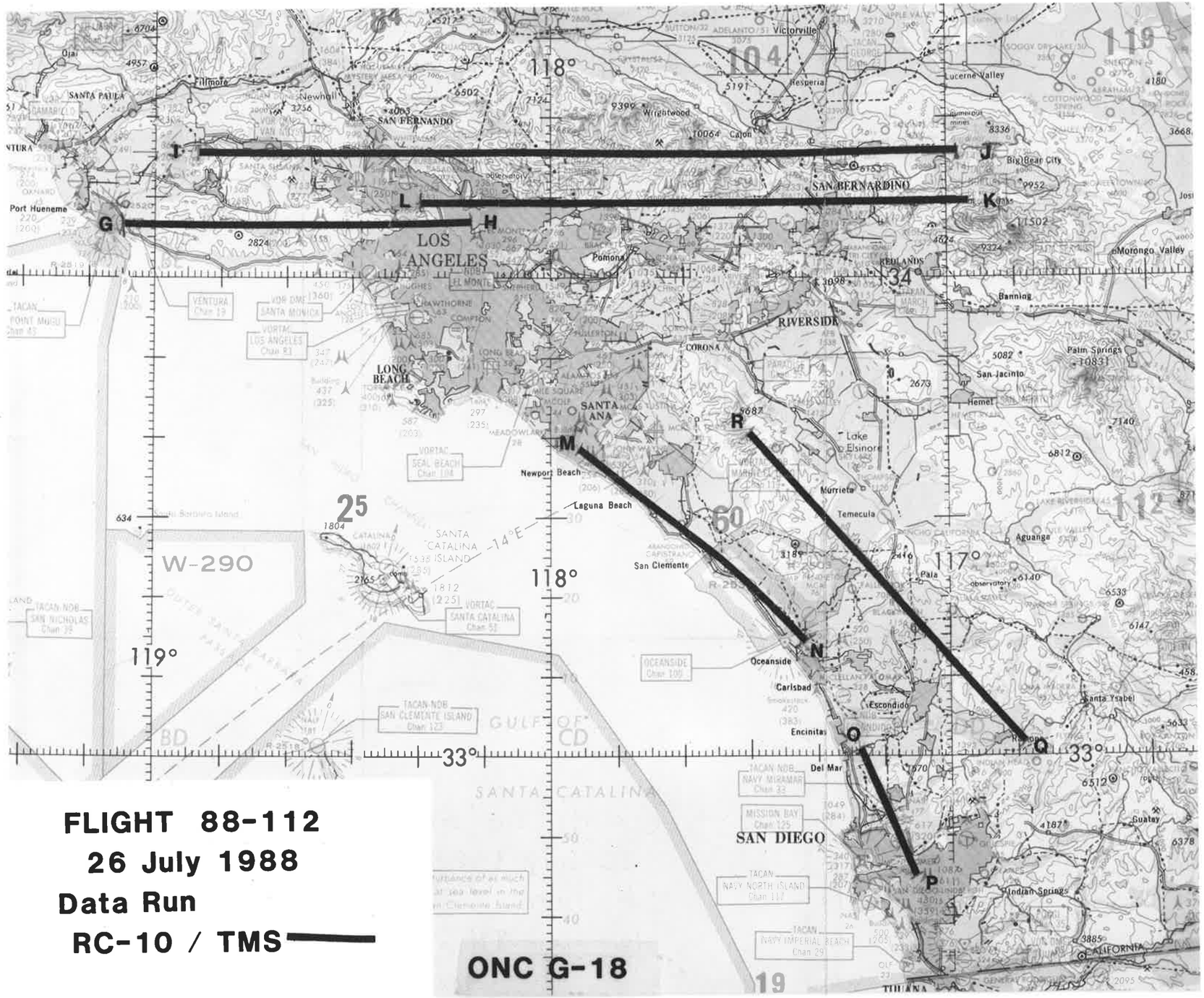
Check Points	Frame Numbers	Time (GMT-hr, min, sec) START	Time (GMT-hr, min, sec) END	Altitude, MSL feet/meters	Cloud Cover/Remarks
A - B	5067-5072	18:19:48	18:21:59	65000/19800	Heavy strato-cumulus; frames 5067-5068
C - D	5073-5081	18:28:33	18:31:41	"	Clear
-----	5082-5088	18:36:39	18:37:42	"	Minor cumulus; frames 5082-5088 Oblique frames over Yosemite Valley
E - F	5089-5094	18:41:45	18:43:45	"	Clear
G - H	5095-5108	19:13:11	19:18:55	"	Coastal stratus; frames 5095-5099
I - J	5109-5139	19:31:11	19:44:51	"	Clear
K - L	5140-5161	19:52:41	20:02:06	"	Clear
M - N	5162-5174	20:10:32	20:15:44	"	Coastal stratus
O - P	5175-5180	20:18:38	20:20:34	"	Coastal stratus
Q - R	5181-5197	20:27:43	20:34:46	"	Clear; Stepwedge overprinted on frames 5196-5197

SCANNER FLIGHT LINE DATA
FLIGHT NO. 88-112

DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 88-112

flightline number	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	18:19: 2.Ø	18:21:18.Ø	34714	36416	65ØØØ/19812	12.5Ø	17Ø2	1	Ø
C - D	18:27:55.Ø	18:3Ø:59.Ø	41374	43679	65ØØØ/19812	12.5Ø	23Ø4	Ø	2
E - F	18:41: 2.Ø	18:43:28.Ø	51214	53Ø33	65ØØØ/19812	12.5Ø	1817	Ø	3
G - H	19:12:32.Ø	19:18:33.Ø	74836	79347	65ØØØ/19812	12.5Ø	4497	1	14
I - J	19:3Ø:32.Ø	19:44:3Ø.Ø	88334	988Ø9	65ØØØ/19812	12.5Ø	1Ø458	1	17
K - L	19:52: 1.Ø	2Ø:Ø1:44.Ø	1Ø4453	111736	65ØØØ/19812	12.5Ø	7279	Ø	5
M - N	2Ø:Ø9:53.Ø	2Ø:15:23.Ø	117852	121988	65ØØØ/19812	12.5Ø	4122	Ø	7
O - P	2Ø:17:58.Ø	2Ø:2Ø: 1.Ø	123916	125448	65ØØØ/19812	12.5Ø	1533	Ø	Ø
Q - R	2Ø:27: 4.Ø	2Ø:37: 3.Ø	13Ø735	138221	65ØØØ/19812	12.5Ø	7461	Ø	26





FLIGHT 88-112
26 July 1988
Data Run
RC-10 / TMS

ONC G-18