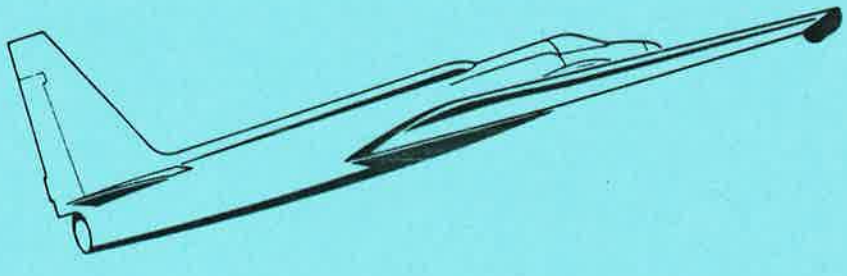
Airborne Instrumentation Research Project

Flight Summary Report

Flight No. 84-061

Date 12 April 1984

FSR- 1884



NASA
National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035

Airborne Missions and Applications Division

FLIGHT SUMMARY REPORT

Flight No: 84-061

Date: 12 April 1984

FSR No: 1884

Julian Date: 103

Sensor Package: Dual RC-10 Cameras, Daedalus Thematic Mapper Simulator (TMS), Aerosol Particulate Sampler (APS)

Aircraft No: 706

Purpose of Flight: #FCF Support
Requestor: Project Support

Area(s) Covered: Central California
S.F. Bay Area

SENSOR DATA

Accession No:	03332	03333	-	-
Sensor ID No:	026	033	024	074
Sensor Type:	RC-10	RC-10	APS	Daedalus TMS
Focal Length:	12" 304.97mm	6" 153.17mm	-	-
Film Type:	High Definition Aerochrome Infrared SO-131	High Definition Aerochrome Infrared SO-131	-	-
Filtration:	CC.30B	CC .30B+2.2AV	-	-
Spectral Band:	510-900nm	510-900nm	-	See Write-up
f Stop:	5.6	4.0	-	-
Shutter Speed:	1/25	1/75	-	-
No. of Frames:	63	33	-	-
% Overlap:	60	60	-	-
Quality:	Excellent	Excellent	-	Excellent
Remarks:	See Write-up	-	Non-Imaging Sensor	-

FLIGHT SUMMARY

84-061

This Flight was flown as Project Support under the FY 1984 Airborne Instrumentation Research Project (AIRP) plan. Color infrared photography along with Daedalus Thematic Mapper Simulator (TMS) Data were acquired over Central California and the San Francisco Bay Area (See Track map). Additionally, Aerosol Particulate Sampling was acquired throughout the flight above 60,000 Feet.

The entire area flown was cloud free. No camera, sensor, or processing malfunctions were noted, and the quality of the data is rated as excellent.

Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a high altitude multi-spectral 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 low gain	10.4 - 12.5
12	6 high gain	10.4 - 12.5

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)

Aerosol Particulate Sampler

The APS has been developed and is operated by Dr. Guy Ferry of the NASA-Ames Research Center Atmospheric Experiments Branch. The sampler is a non-imaging sensor designed to gather high altitude dust particles for laboratory research.

FLIGHT SUMMARY

U-2 Thematic Mapper Simulator Calibration Data

84-061

Daedalus Channel Number	TM Channel Number	Radiance/Count $mW/cm^2-\mu m-sr$ Count	Sensitivity (NER)
1	A	0.065	< .81
2	1	0.074	< .076
3	2	0.080	< .054
4	B	0.134	< .121
5	3	0.086	< .038
6	C	0.074	< .040
7	4	0.099	< .020
8	D	0.101	< .030
9	5	0.013	< .067
10	7	0.006	< .031

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

Thermal Data

Flight Line	Reference Sources BB#1(°C)	BB#2(°C)	Ch. 11 Response BB#1(Cts)	BB#2(Cts)	Ch. 12 Response BB#1(Cts)	BB#2(Cts)
All	2.35	35.55	94	177	59	206

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.

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).

FLIGHT LINE DATA

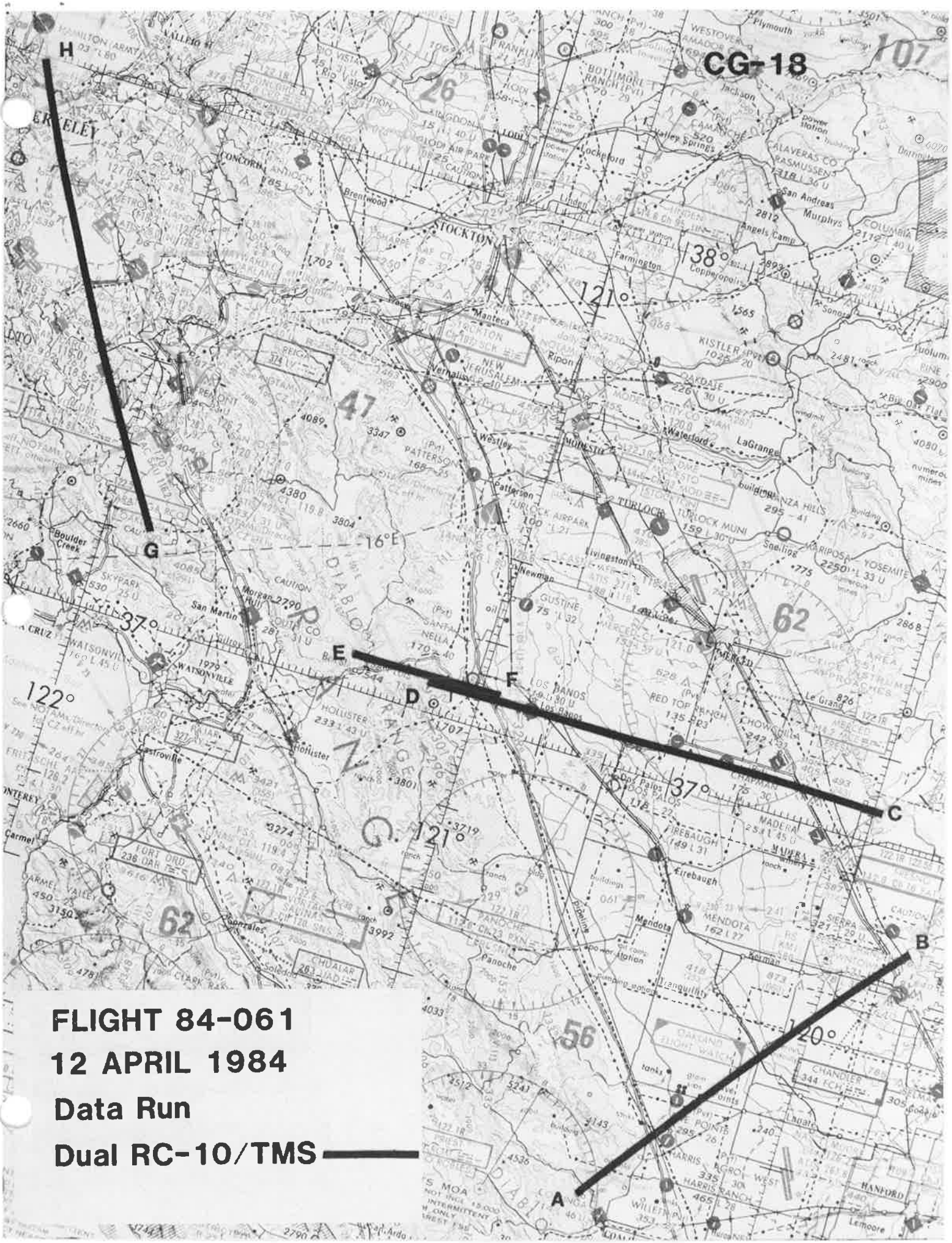
FLIGHT NO. 84-061

Sensor#	Check Points	Frame Numbers	Time (GMT—hr, min, sec) START	Time (GMT—hr, min, sec) END	Altitude, MSL feet/meters	Cloud Cover/Remarks	Line #
026	A-B	5809-5825	20:01:09	20:08:48	65,000/19800	Clear; Contrail on Frames 5809-5818	1
	C-D	5826-5844	20:12:15	20:20:51	"	Clear	2
	E-F	5845-5852	20:28:14	20:31:35	"	"	3
	G-H	5853-5871	20:47:01	20:55:35	"	"	4
033	A-B	3581-3589	20:02:03	20:09:41	65,000/19800	Clear; Contrail on Frames 3581-3586	1
	C-D	3590-3599	20:13:12	20:21:46	"	Clear	2
	E-F	3600-3603	20:29:10	20:32:00	"	"	3
	G-H	3604-3613	20:47:56	20:56:28	"	"	4
024	-	-	19:53:00	20:57:00	"	APS#2 Exposed for 1 hour and 4 minutes above 60,000 Feet.	

SCANNER FLIGHT LINE DATA
FLIGHT NO.

DAEDALUS FLIGHT DATA
FLIGHT NUMBER: 84-Ø61

Check Points	flightline number	Actual time begin	Actual time end	Actual scanline begin	Actual scanline end	Altitude feet/meter	Scan Speed (rps)	total Good scanlines	total Interpolated scanlines	total Repeated scanlines	total Zero-fill scanlines
A-B	1	2ØØØ39Ø	2ØØ837Ø	67366	73337	65ØØØ/19812	12.5	5967	Ø	5	Ø
C-D	2	2Ø1145Ø	2Ø2Ø33Ø	75694	82286	65ØØØ/19812	12.5	6592	1	Ø	Ø
E-F	3	2Ø2744Ø	2Ø33Ø3Ø	87683	91660	65ØØØ/19812	12.5	3978	Ø	Ø	Ø
G-H	4	2Ø4631Ø	2Ø55Ø9Ø	1Ø1764	1Ø8234	65ØØØ/19812	12.5	6461	Ø	1Ø	Ø


CG-18
H
G
E
F
D
C
B
A
FLIGHT 84-061
12 APRIL 1984
Data Run
Dual RC-10/TMS