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F58

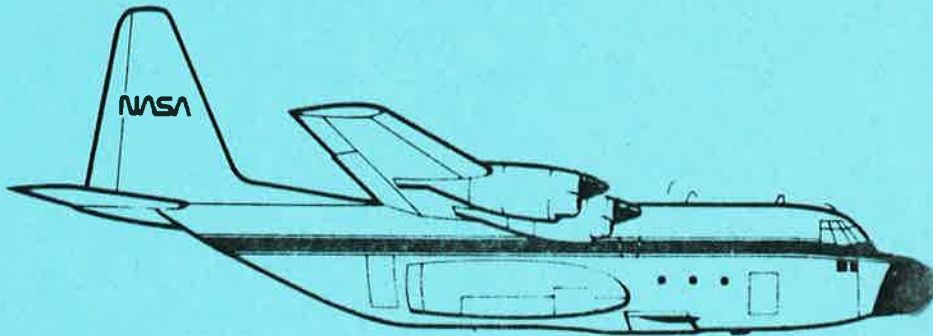
Airborne Instrumentation Research Project

Flight Summary Report

Flight No. 85-005-03

Date 6 June 1985

FSR-



NASA

National Aeronautics and
Space Administration

Ames Research Center
Moffett Field California 94035

Airborne Missions and Applications Division

FLIGHT SUMMARY REPORT

Flight No: 85-005-03

Date: 6 June 1985

FSR No:

Julian Date: 157

Sensor Package: NS001 Multispectral Scanner
Zeiss Camera

Aircraft No: 707

Purpose of Flight: #1049 Support
Requestor: Wrigley

Area(s) Covered: Sewage Treatment Plants,
~~Fresno/San Jose, California~~
Stockton/Fremont - Santa Clara

SENSOR DATA

Accession No:	03456	---
Sensor ID No:	077	072
Sensor Type:	Zeiss	NS001
Focal Length:	6" 153.40mm	---
Film Type:	Aerochrome Infrared, 2443	---
Filtration:	Wratten-12	---
Spectral Band:	510-900nm	see write-up
f Stop:	5.6 ⁺ 4	---
Shutter Speed:	1/200	---
No. of Frames:	35	---
% Overlap:	60	---
Quality:	Good	Good
Remarks:	---	see write-up

FLIGHT SUMMARY

85-005-03

This flight was flown in support of Flight Request #1049 (Wrigley, ARC) under the FY 1985 Airborne Instrumentation Research Program (AIRP) plan. Photographic and NS001 multispectral scanner data were acquired over sewage treatment plants in Fresno and San Jose, California using the NASA C-130 aircraft (see Track Map).

The entire area flown was cloud free. No Camera malfunctions were noted. Processing scratches are present on all of the frames. The quality of the data is rated as good.

NS001 Multispectral Scanner

The NS001 Multispectral Scanner used on the C-130B aircraft contains the seven Landsat-D Thematic Mapper bands plus a band from 1.0 to 1.3 micrometers. The specific bands are:

<u>Band</u>	<u>Spectral bandwidth, um</u>
1	0.45 - 0.52
2	0.52 - 0.60
3	0.63 - 0.69
4	0.76 - 0.90
5	1.00 - 1.30
6	1.55 - 1.75
7	2.08 - 2.35
8	10.4 - 12.5

Sensor specifications are:

IFOV	2.5 mrad
Total scan angle	100°
Pixels/scan line	699

The format of the flight data consists of 838 8-bit words per frame (data for one wavelength band throughout a scan line). Of these, 699 are the video information and the remainder are information on Greenwich time, scan line number, calibration lamp voltage and current, blackbody temperatures, etc.

Computer compatible tapes (CCTs) are produced from the flight tapes, and consist of header information followed by scanner video data.

NS001 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 750 8-bit bytes for raw data and 1004 bytes for geometrically corrected data. The first 50 bytes for all records are house-keeping information; the next 699 (or 953 for geometrically corrected data) are digitized pixel data. A single "filler" byte is added at the end of each logical record to maintain even-numbered lengths.

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

record 1 = scanline 1, channel 1
record 2 = scanline 1, channel 2
record 3 = scanline 1, channel 3
.
.
record 8 = scanline 1, channel 8
record 9 = scanline 2, channel 1
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 (750 or 1004 bytes).

NS001
USER TAPE
LOGICAL RECORD FORMAT

16-BIT WORD
NUMBER

CONTENTS OF WORD

1-25	Channel Scanline Housekeeping Information
1	Data Frame Status
	0 Good frame
	10 Interpolated data
	20 Repeated data
	30 Zero-fill for data
2	Radiance Per Count Calibration Values
	. Visible channel (1-7) flight calibration values modified for gain as follows: integer, tens of nanowatts per square centimeter per micron per steradian per count.
	. Thermal channel is not used.
3-4	Scanline Count (32-bit integer)
5	Black Body 1 Thermistor Count
6	Black Body 2 Thermistor Count
7	Black Body 1 Thermal Reference Temperature (degrees C X 100)
8	Black Body 2 Thermal Reference Temperature (degrees C X 100)
9	Scan Speed (X 100)
10	GMT Hours
11	GMT Minutes
12	GMT Seconds (X 10)
13	Demagnification Value (X 100)
14	Filler
15	Gain Value (X 1000)
	. Visible channel (1-7) gain value is defined as as 1000 times (word 24 minus word 19) divided by (the laboratory value of reference lamp less tare).
	. Thermal channel (8) is not used.
16	Channel Number
17-18	Time (GMT)
	Expressed as a 7-digit number HHMMSSST (32-bit integer)
19	Black Body 1 Radiance Count
20	Black Body 2 Radiance Count
21	Reference Lamp Voltage
22	Reference Lamp Current
23	Reference Lamp State (16 bits 000000000ab00000)
	a=1 means reference lamp selected as visible high-level calibration source
	b=0 means lamp has degraded below predetermined level of 12.8V
	b=1 means lamp has not degraded below predetermined level
24	Reference Lamp Radiance Count
25	Filler

16-BIT WORD NUMBER	CONTENTS OF WORD
26-375	Digitized Video Pixel Information (see note below)
26	Digitized Video Pixels #699 and #698
27	Digitized Video Pixel #697 and #696
.	.
.	.
.	.
375	Byte 1 is Digitized Video Pixel #1 Byte 2 is filler

NOTE: Housekeeping information consists of 16-bit integers, unless otherwise noted. Video pixel data consists of two 8-bit samples packed into one 16-bit word. Geometrically corrected data contains 953 pixels, expanding the logical record format to 502 words. Digitized video pixels are reversed to compensate for the fact that the NS001 scans right to left; pixel no. 1 is the leftmost pixel, and pixel no. 2 is the rightmost.

SCANNER FLIGHT LINE DATA
FLIGHT NO. 85-005-03

NS001 FLIGHT DATA
 FLIGHT NUMBER: 85-006-01

Check Points	flightline number	A c t u a l t i m e		A c t u a l s c a n l i n e		Altitude feet/meter	Scan Speed (rps)	total G o o d scanlines	total Interpolated scanlines	total Repeated scanlines	total Zero-fill scanlines
		begin	end	begin	end						
A-B	1	2004471	2006248	67	2022	8000/2439	20.0	1952	0	4	0
A-B	2	2012261	2013390	9248	10705	.	20.0	1454	0	4	0
A-B	3	2020076	2021501	18478	20527	.	20.0	2048	0	2	0
C-D	4	2033241	2036258	34287	37740	.	19.0	3454	0	0	0

NS001 SCANNER CALIBRATION VALUES

NS001 CALIBRATION VALUES

FLIGHT LINE	Channel 1		Channel 2		Channel 3		Channel 4		Channel 5		Channel 6		Channel 7		Channel 8		Degrees per Count	
	TARE	CALIB	TARE	CALIB	TARE	CALIB	TARE	CALIB	TARE	CALIB	TARE	CALIB	TARE	CALIB	REF SOURCE (Degrees C)	RESPONSE (Counts)		
1	10	45.8	9	56.3	9	73.6	11	10 1.6	10	61.5	11	20 .0	12	6.52	21.80	39.90	20.5111.2	.200
2	10	48.7	9	56.4	11	73.7	11	10 1.8	10	61.4	10	19.9	12	6.68	21.80	39.90	20.1110.3	.201
3	11	48.2	9	56.3	11	72.3	11	10 1.9	11	61.5	11	19.4	12	6.60	21.80	39.90	42.6133.0	.200*
4	10	61.2	9	77.5	11	99.6	11	123.7	11	68.3	11	21.6	12	6.64	21.84	39.90	42.4132.2	.201

* This value varied excessively over the flightline.

UNITS: tens of nanowatts per square centimeter per micron per steradian

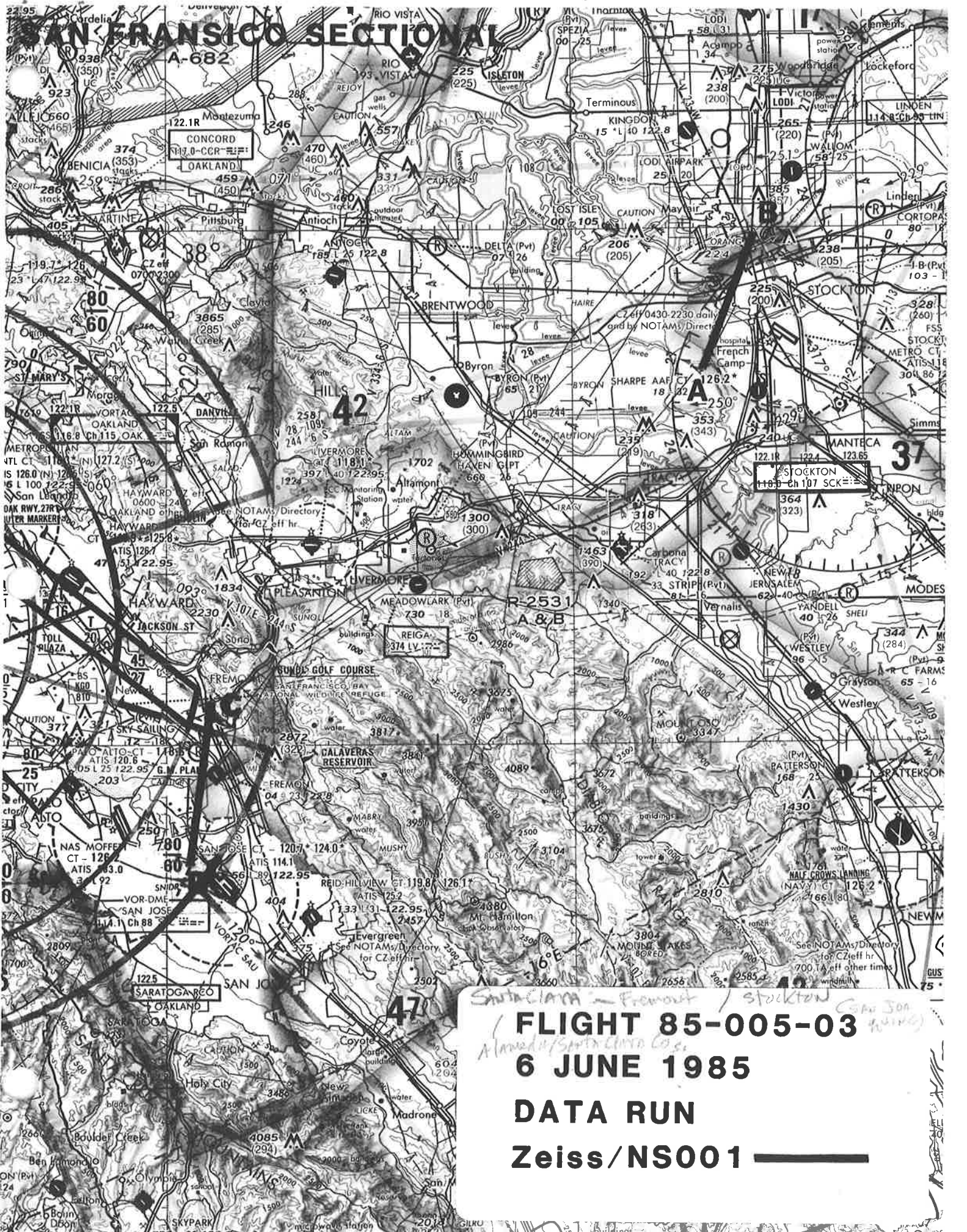
Calibration Procedures for Visible Bands

To obtain calibrated ground radiance, subtract the black body radiance count tare value (contained in word 19 of each tape scanline record) from the digital video counts (contained in words 26 through 375). Multiply the results by the calibration value (word 2). This calibration value is derived from a laboratory measurement using a known radiance and a gain value deduced from the in-flight reference lamp count. Black Body No. 1 (BB1) has been used throughout for consistency in the determination of the tare value.

A detailed account of NS001 calibration procedures is obtainable from NASA Airborne Missions and Applications Division. The calibration values listed on this page were generated by the Applications Aircraft Data Management Facility.

CAMERA FLIGHT LINE DATA
FLIGHT NO. 85-005-03

Sensor #	Check Points	Frame Numbers	Time (GMT—hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
			START	END		
077	A-B	0005-0010	20:05:04	20:06:03	8000/2439	processing scratches
	A-B	0011-0015	20:12:59	20:13:51	"	"
	A-B	0016-0023	20:20:41	20:22:05	"	frame 0020 change in exposure setting; processing scratches
	C-D	0024-0039	20:33:52	20:36:48	"	processing scratches



Santa Clara - Fremont / Stockton San Joaquin
FLIGHT 85-005-03
Alameda/Santa Clara Co.
6 JUNE 1985
DATA RUN
Zeiss/NS001