

FLIGHT SUMMARY REPORT

Flight Number: 95-076
Calendar/Julian Date: 21 April 1995 • 111
Sensor Package: Dual Wild-Heerbrugg RC-10
 Modis Airborne Simulator (MAS)
 Millimeter-Wave Imaging
 Radiometer (MIR)
 Aerosol Particulate Sampler (APS)
Area(s) Covered: Fairbanks, Alaska

Investigator(s): Hall, GSFC

Aircraft #: 708

SENSOR DATA

Accession #:	04913	04914	----	----	----
Sensor ID #:	035	031	108	114	024
Sensor Type:	RC-10	RC-10	MAS-50	MIR	APS
Focal Length:	6" 153.46 mm	6" 153.05 mm	----	----	----
Film Type:	Panatomic X Aerographic II 2412	Panatomic X Aerographic II 2412	----	----	----
Filtration:	Wratten 12 + 2.2 AV	Wratten 12 + 2.2 AV	----	----	----
Spectral Band:	510-700 nm	510-700 nm	----	----	----
f Stop:	4	5.6	----	----	----
Shutter Speed:	1/125	1/100	----	----	----
# of Frames:	161	161	----	----	----
% Overlap:	60	60	----	----	----
Quality:	Excellent	Excellent	----	----	----
Remarks:		Annotation block failed			

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(s) and camera(s) used for data collection during this flight.

Camera Systems

Various camera systems and films are used for photographic data collection. Film types include high definition color infrared, natural color, and black and white emulsions. Available photographic systems are as follows:

- Wild-Heerbrugg RC-10 metric mapping camera
 - 9 x 9 inch film format
 - 6 inch focal length lens provides area coverage of 16 x 16 nautical miles from 65,000 feet
 - 12 inch focal length lens provides area coverage of 8 x 8 nautical miles from 65,000 feet
- Hycon HR-732 large scale mapping camera
 - 9 x 18 inch film format
 - 24 inch focal length lens provides area coverage of 4 x 8 nautical miles from 65,000 feet
- IRIS II Panoramic camera
 - 4.5 x 34.7 inch film format
 - 24 inch focal length lens
 - 90 degree field of view provides area coverage of 2 x 21.4 nautical miles from 65,000 feet

Aerosol Particulate Sampler

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

Modis Airborne Simulator

The Modis Airborne Simulator (MAS) is a modified Daedalus multispectral scanner configured to replicate the capabilities of the Moderate-Resolution Imaging Spectrometer (MODIS), an instrument to be orbited on an EOS platform. MODIS is designed for the measurement of biological and physical processes and atmospheric temperature sounding. The Modis Airborne Simulator records fifty 12-bit channels of multispectral data and is configured as follows:

Spectral Channel	Band center (µm)	Bandwidth (µm)	Spectral Range
1	0.549	0.044	0.527-0.571
2	0.658	0.053	0.631-0.684
3	0.704	0.042	0.683-0.725
4	0.745	0.041	0.725-0.766
5	0.786	0.041	0.765-0.807
6	0.827	0.042	0.806-0.848
7	0.869	0.042	0.848-0.891
8	0.909	0.033	0.893-0.926
9	0.947	0.046	0.924-0.970
10	1.608	0.053	1.582-1.635
11	1.670	0.052	1.644-1.695
12	1.723	0.05	1.698-1.748
13	1.775	0.05	1.750-1.800
14	1.825	0.046	1.802-1.849
15	1.88	0.045	1.856-1.901
16	1.93	0.45	1.909-1.954
17	1.98	0.048	1.955-2.003
18	2.03	0.048	2.005-2.053
19	2.08	0.047	2.056-2.103
20	2.128	0.047	2.105-2.152
21	2.177	0.047	2.154-2.201
22	2.227	0.047	2.203-2.250
23	2.276	0.047	2.253-2.300
24	2.326	0.047	2.303-2.350
25	2.375	0.047	2.351-2.398

Spectral Channel	Band center (µm)	Bandwidth (µm)	Spectral Range
26	2.958	0.136	2.889-3.026
27	3.119	0.123	3.058-3.181
28	3.265	0.146	3.192-3.338
29	3.437	0.142	3.366-3.509
30	3.565	0.144	3.493-3.637
31	3.747	0.138	3.668-3.816
32	3.893	0.156	3.815-3.971
33	4.064	0.143	3.992-4.135
34	4.156	0.065	4.124-4.189
35	4.389	0.113	4.332-4.446
36	4.514	0.140	4.444-4.584
37	4.647	0.144	4.575-4.720
38	4.823	0.179	4.734-4.913
39	4.992	0.145	4.919-5.064
40	5.139	0.122	5.078-5.120
41	5.275	0.124	5.214-5.337
42	8.557	0.396	8.359-8.755
43	9.711	0.509	9.457-9.966
44	10.473	0.441	10.252-10.693
45	10.976	0.439	10.757-11.196
46	11.929	0.421	11.719-12.140
47	12.822	0.376	12.634-13.010
48	13.190	0.447	12.966-13.413
49	13.661	0.587	13.368-13.954
50	14.155	0.395	13.957-14.352

Sensor/Aircraft Parameters:

Spectral Bands: 50 (digitized to 16-bit resolution)
 IFOV: 2.5 mrad
 Ground Resolution: 163 feet (50 meter at 65,000 feet)
 Swath Width: 22.9 mi/19.9 nmi (36 km)
 Total Scan Angle: 85.92°
 Pixels/Scan Line: 716
 Scan Rate: 6.25 scans/second
 Ground Speed: 400 kts (206 m/second)
 Roll Correction: Plus or minus 3.5 degrees (approx.)

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for NASA-Ames aircraft acquired photographic and digital imagery. For information regarding photography and digital data (including areas of coverage, products, and product costs) contact EROS Data Center, Customer Services, Sioux Falls, South Dakota 57198 (Telephone: 605-594-6151)

Millimeter-Wave Imaging Radiometer

The Millimeter-Wave Imaging Radiometer (MIR) is a nine channel radiometer developed for atmospheric research. Three dual pass band channels are centered about the strongly opaque 183 GHz water absorption line and a fourth channel is located at 150 GHz. These four channels have varying degrees of opacity from which the water vapor profile can be inferred. There are two additional channels located at 89 GHz and 220 GHz. The design includes three additional channels centered about 325 GHz which are supplied by the Georgia Institute of Technology.

Frequencies and polarization were chosen to match those of the Advanced Microwave Sounding Unit-B (AMSU-B) planned for NOAA operational polar weather satellites and the Earth Observing System (EOS). Frequencies also match closely with those of the Special Sensor Microwave Temperature Sounder-2 (SSM/T-2) now aboard the DMSP satellite.

Information regarding this instrument may be obtained from Paul Racette, NASA-Goddard Space Flight Center, Code 975, Greenbelt, MD 20771.

Additional information regarding ER-2 acquired photographic and digital data is available through the Aircraft Data Facility at Ames Research Center. For specific information regarding flight documentation, sensor parameters, and areas of coverage contact the Aircraft Data Facility, NASA-Ames Research Center, Mail Stop 240-6, Moffett Field, California 94035-1000 (Telephone: 415-604-6252).

**CAMERA FLIGHT LINE DATA
FLIGHT NO. 95-076**

Accession # 04913

Sensor # 035

Page 1/2

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	3740-3746	15:28:42	15:34:36	62071/18919	10-30% cirrus
C - D	3747-3766	15:38:31	15:57:13	64050/19522	10-30% cirrus (frames 3747-3750); minor-10% cirrus (frames 3754-3761)
D - E	3767-3786	15:59:11	16:17:52	64840/19763	Minor-30% cirrus; oblique (frame 3767)
F - G	3787-3805	16:21:48	16:39:29	64563/19679	10-40% cirrus (frames 3787-3791); minor-10% cirrus (frames 3794-3796); 10-30% cirrus (frames 3798-3805)
H - I	3806-3824	16:44:25	17:02:06	65084/19838	10-80% cirrus
J - K	3825-3843	17:06:03	17:23:45	65142/19855	30-90% cirrus (frames 3825-3830); 10-20% cirrus (frames 3831-3837, 3840-3843)
L - M	3844-3862	17:27:41	17:45:23	65542/19977	10% cirrus (frames 3844-3846); minor cirrus (frames 3848-3850); 10-50% cirrus (frames 3851-3862)

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Accession # 04913

Sensor # 035

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
N - O	3863-3880	17:49:19	18:06:01	65889/20083	10-50% cirrus (frames 3863-3875)
P - Q	3881-3900	18:09:58	18:28:39	65740/20038	10-70% cirrus (frames 3881-3898)
APS ON/OFF TIME 15:26:00/18:26:00					

**CAMERA FLIGHT LINE DATA
FLIGHT NO. 95-076**

Accession # 04914

Sensor # 031

Page 1/2

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	9294-9300	15:28:42	15:34:36	62071/18919	10-30% cirrus
C - D	9301-9320	15:38:31	15:57:13	64050/19522	10-30% cirrus (frames 9301-9304); minor-10% cirrus (frames 9308-9315)
D - E	9321-9340	15:59:11	16:17:52	64840/19763	Minor-30% cirrus; oblique (frame 9321)
F - G	9341-9359	16:21:48	16:39:29	64563/19679	10-40% cirrus (frames 9341-9345); minor-10% cirrus (frames 9348-9350); 10-30% cirrus (frames 9352-9359)
H - I	9360-9378	16:44:25	17:02:06	65084/19838	10-80% cirrus
J - K	9379-9397	17:06:03	17:23:45	65142/19855	30-90% cirrus (frames 9379-9384); 10-20% cirrus (frames 9385-9391 and 9394-9397)
L - M	9398-9416	17:27:41	17:45:23	65542/19977	10% cirrus (frames 9398-9399); minor cirrus (frames 9402-9404); 10-50% cirrus (frames 9405-9416)

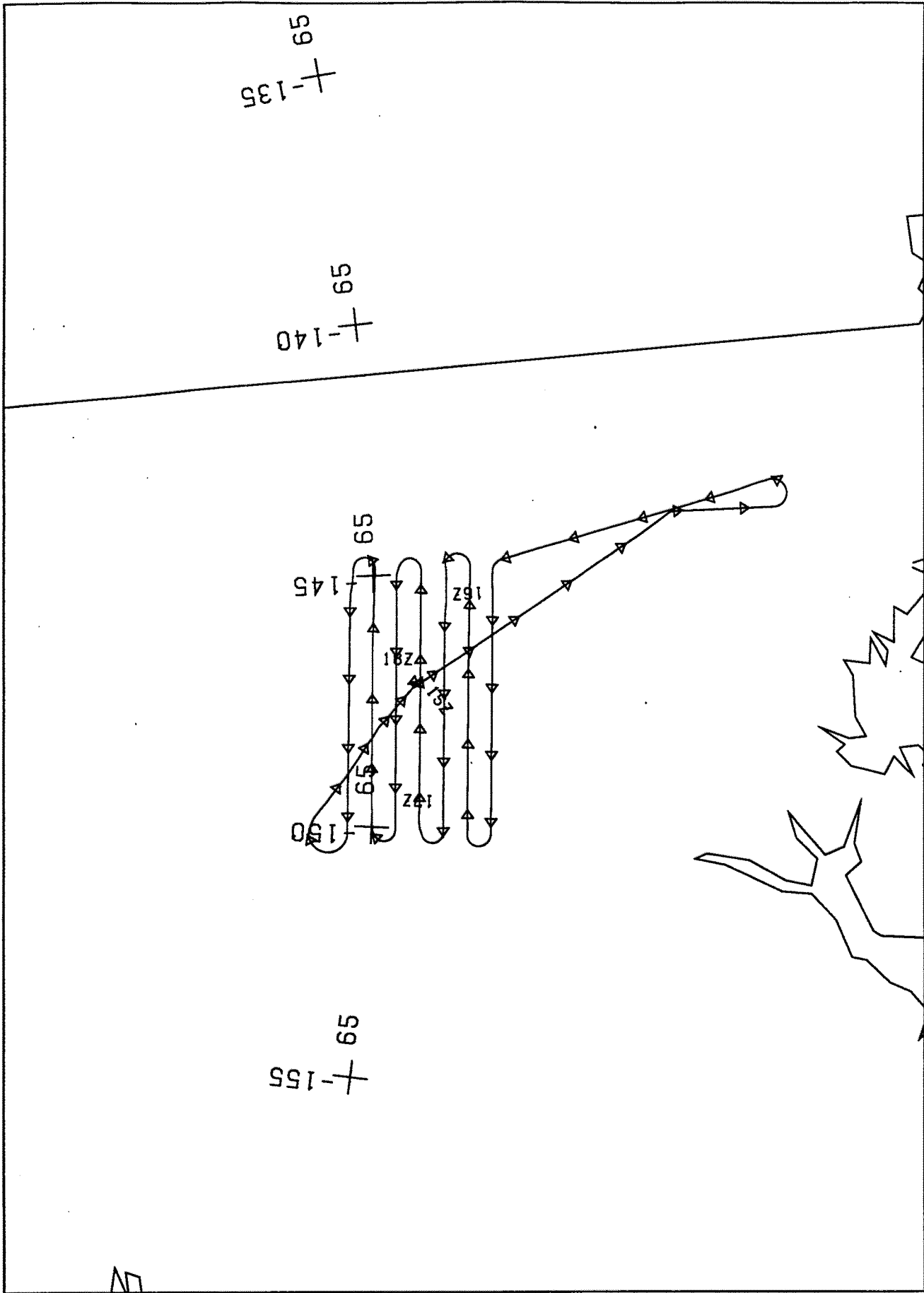
**CAMERA FLIGHT LINE DATA
FLIGHT NO. 95-076**

Accession # 04914

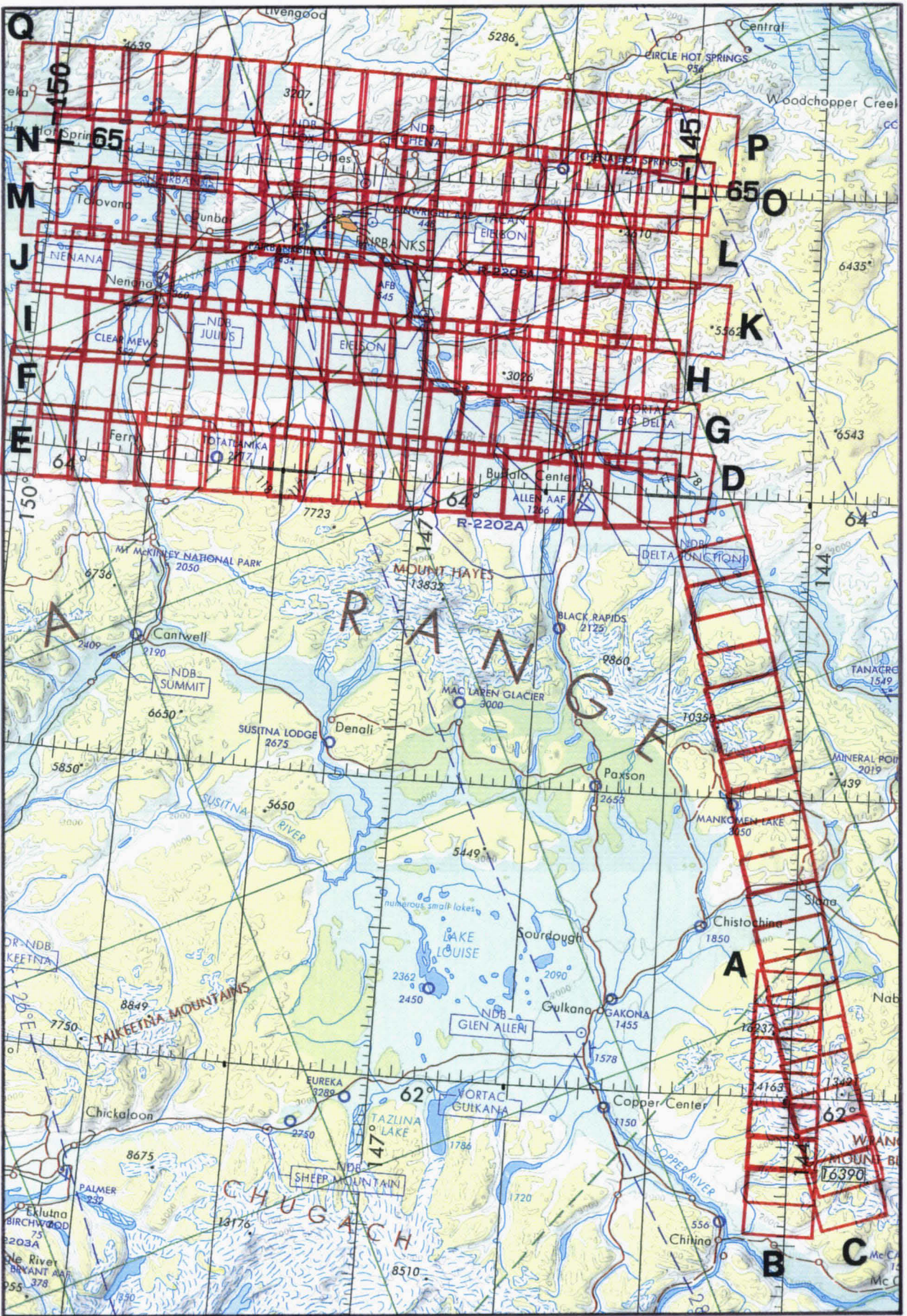
Sensor # 031

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
N - O	9417-9434	17:49:19	18:06:01	65889/20083	10-50% cirrus (frames 9417-9427)
P - Q	9435-9454	18:09:58	18:28:39	65740/20038	10-70% cirrus (frames 9435-9452)

ANNOTATION BLOCK DID NOT FUNCTION. DATA TIMES DERIVED FROM SENSOR #035, ROLL #04913



FLIGHT 95-076 21 APRIL 1995 A/C 708 RC-10 / MAS / MIR



JNC 16

RC-10 / MAS-50

A/C 708

21 APRIL 1995

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