

# FLIGHT SUMMARY REPORT

**Flight Number:** 95-074  
**Calendar/Julian Date:** 08 April 1995 • 098  
**Sensor Package:** Dual Wild-Heerbrugg RC-10  
 Modis Airborne Simulator (MAS)  
 Millimeter-Wave Imaging  
 Radiometer (MIR)  
 Aerosol Particulate Sampler (APS)  
**Area(s) Covered:** Alaska -- Bering Sea I

**Investigator(s):** Hall, GSFC

**Aircraft #:** 708

## SENSOR DATA

<b>Accession #:</b>	04904	04905	-----	-----	-----
<b>Sensor ID #:</b>	035	031	108	114	024
<b>Sensor Type:</b>	RC-10	RC-10	MAS-50	MIR	APS
<b>Focal Length:</b>	6" 153.46 mm	6" 153.05 mm	-----	-----	-----
<b>Film Type:</b>	Panatomic X Aerographic II 2412	Panatomic X Aerographic II 2412	-----	-----	-----
<b>Filtration:</b>	Wratten 12 + 2.2 AV	Wratten 12 + 2.2 AV	-----	-----	-----
<b>Spectral Band:</b>	510-700 nm	510-700 nm	-----	-----	-----
<b>f Stop:</b>	5.6	5.6	-----	-----	-----
<b>Shutter Speed:</b>	1/200	1/250	-----	-----	-----
<b># of Frames:</b>	126	366	-----	-----	-----
<b>% Overlap:</b>	60	60	-----	-----	-----
<b>Quality:</b>	Excellent	Excellent	-----	-----	-----
<b>Remarks:</b>		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)  
**I<sub>FOV</sub>:** 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 (SSMT-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. 95-074**

**Accession # 04904**

**Sensor # 035**

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	3318-3387	19:19:28	20:26:17	58000/17700	10-60% cumulus (frames 3377-3387); oblique (frame 3318)
B - C	3388-3406	20:27:16	20:44:29	60000/18300	10-30% cumulus; oblique (frame 3388)
C - D	3407-3443	20:45:34	21:20:04	61000/18600	10-30% cumulus (frames 3407-3420); 50- 100% cumulus (frames 3421-3443)
		<b>APS ON/OFF TIME 19:40:00/01:22:00</b>			

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 95-074**

Accession # 04905

Sensor # 031

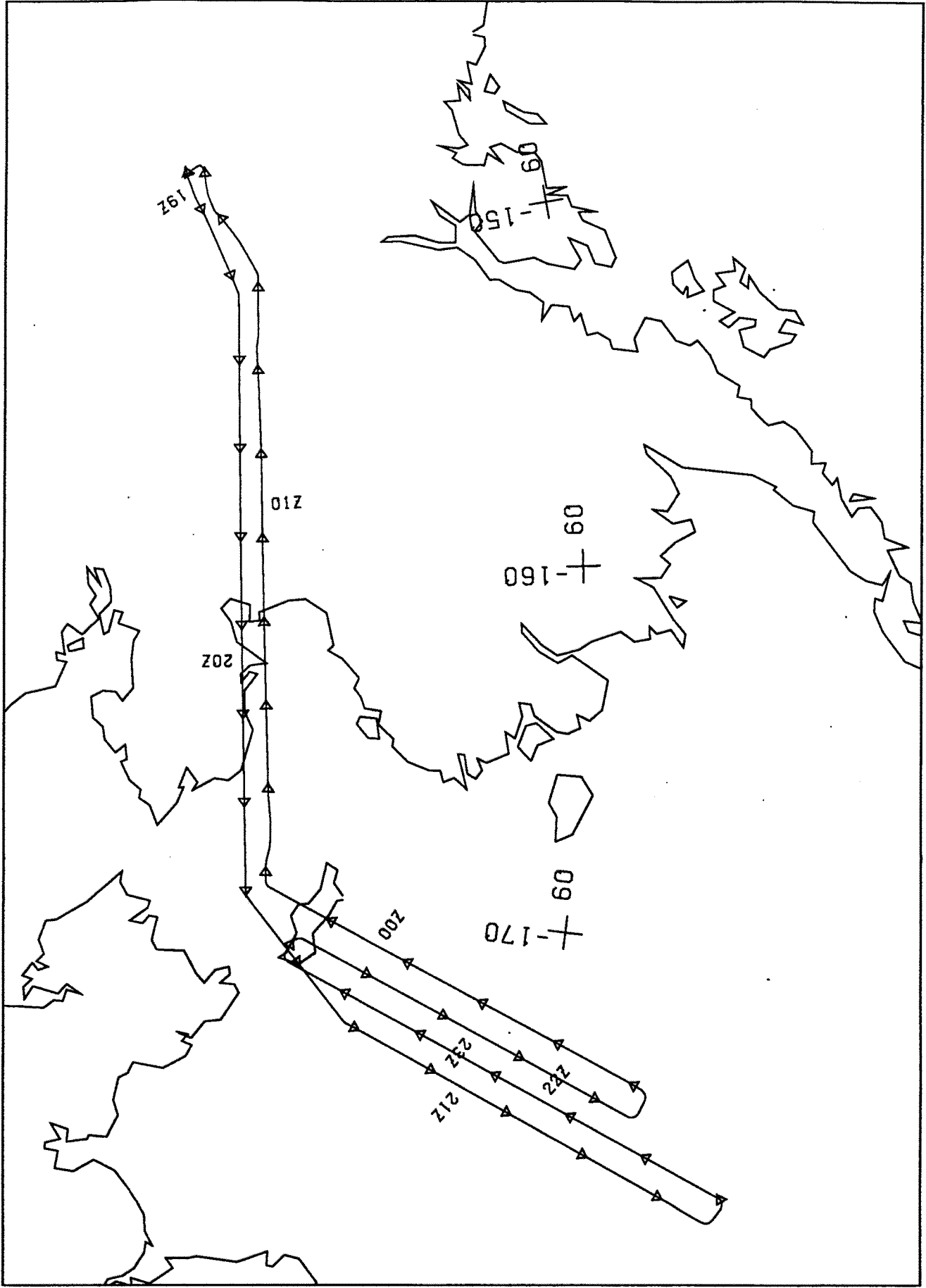
Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	8887-8956	19:19:28	20:26:17	58000/17700	10-60% cumulus (frames 8946-8956); oblique (frame 8887)
B - C	8957-8975	20:27:16	20:44:29	60000/18300	10-30% cumulus; oblique (frame 8957)
C - E	8976-9024	20:45:34	21:31:52	61000/18600	10-30% cumulus (frames 8976-8989); 50- 100% cumulus (frames 8990-9024)
F - G	9025-9083	21:37:10	22:33:28	62000/18900	50-100% cumulus (frames 9025-9066); 10- 30% cumulus (frames 9067-9069); minor- 10% cumulus (frames 9071-9083)
H - I	9084-9127	22:38:55	23:20:27	"	Minor-40% cumulus (frames 9084-9103); 50-100% cumulus (frames 9104-9127)
J - K	9128-9178	23:25:58	00:14:24	"	60-100% cumulus (frames 9128-9149); minor-40% cumulus (frames 9150-9165); minor cumulus (frames 9170-9172); minor- 20% cumulus (frames 9175-9178)

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 95-074**

Accession # 04905

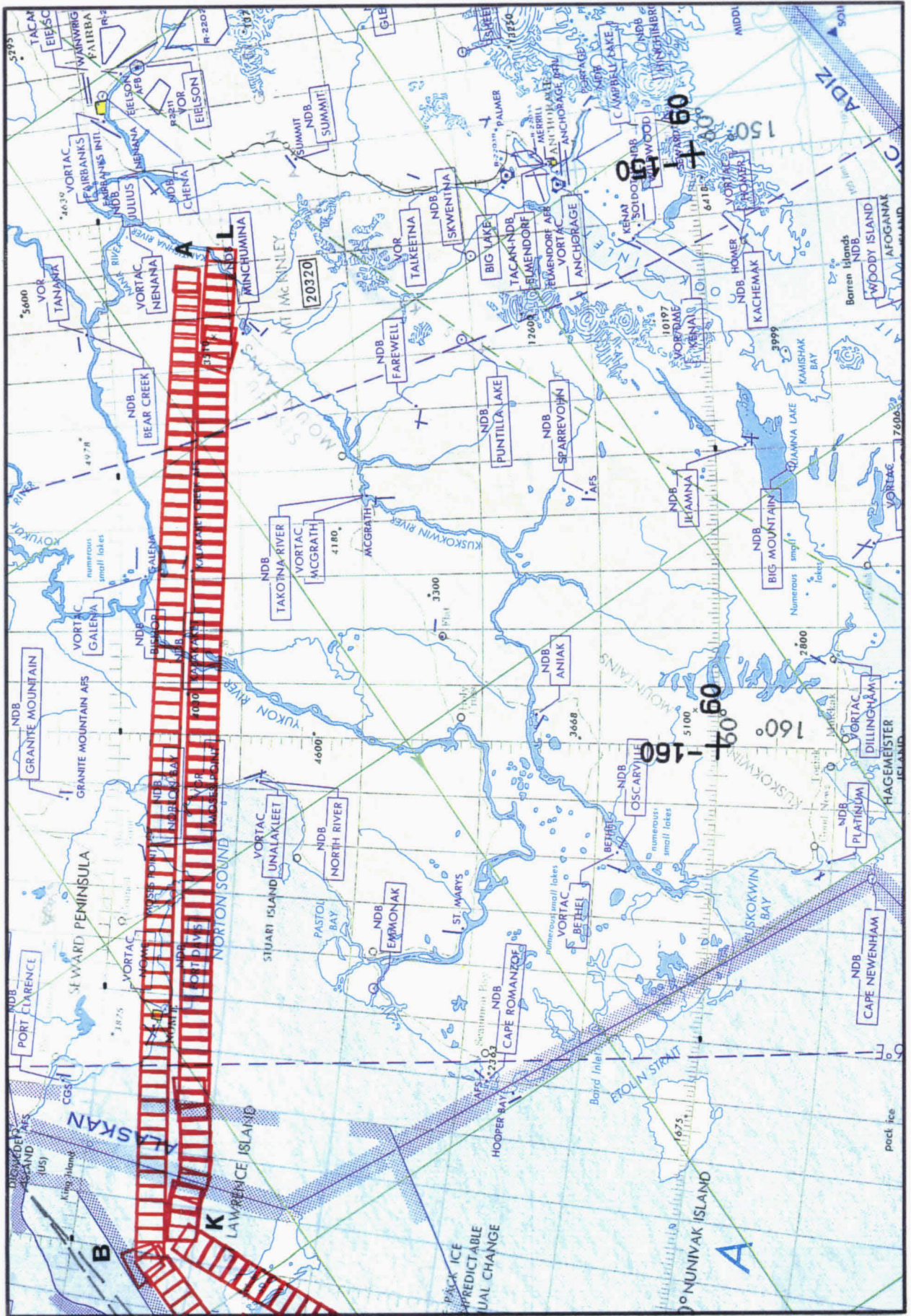
Sensor # 031

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
K - L	9179-9252	00:15:59	01:26:52	62000/18900	20-40% cumulus (frames 9179-9182); 50-90% cumulus (frames 9183-9188); 20% cumulus (frame 9189); minor-40% cirrus (frames 9238-9252 and 9190); oblique (frames 9245-9246)
ANNOTATION BLOCK DID NOT FUNCTION -- DATA TIME DERIVED FROM PILOT LOG					



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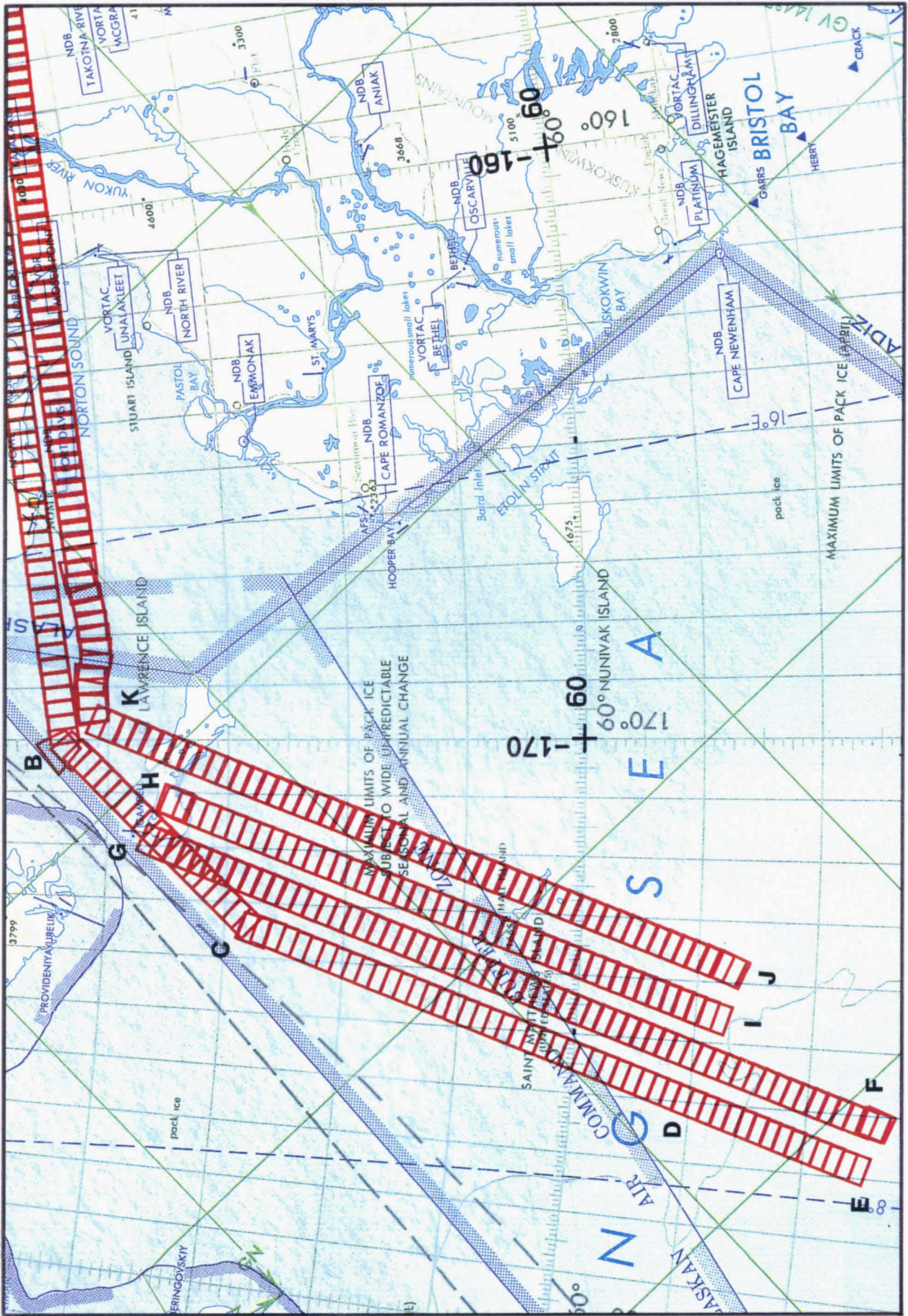
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DUAL RC-10 / MAS-50

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FLIGHT 95-074

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A/C 708

DUAL FC-10 / MAS-50

GNC 6