

# FLIGHT SUMMARY REPORT

**Flight Number:** 95-004  
**Calendar/Julian Date:** 08 October 1994 • 281  
**Sensor Package:** Wild-Heerbrug RC-10  
Airborne Visible and Infrared Imaging  
Spectrometer (AVIRIS)  
Modis Airborne Simulator (MAS)  
**Area(s) Covered:** Idaho, Montana, Oregon Fires

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

**Aircraft #:** 706

## SENSOR DATA

<b>Accession #:</b>	04830	----	----
<b>Sensor ID #:</b>	034	099	108
<b>Sensor Type:</b>	RC-10	AVIRIS	MAS
<b>Focal Length:</b>	12" 304.66 mm	----	----
<b>Film Type:</b>	Aerochrome IR SO-060	----	----
<b>Filtration:</b>	Wratten 12	----	----
<b>Spectral Band:</b>	510-900 nm	----	----
<b>f Stop:</b>	8	----	----
<b>Shutter Speed:</b>	1/200	----	----
<b># of Frames:</b>	164	----	----
<b>% Overlap:</b>	70	----	----
<b>Quality:</b>	Excellent	----	Good
<b>Remarks:</b>	Camera clock offset 1.6 seconds from navigation data		

## 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.

## Airborne Visible and Infrared Imaging Spectrometer

The Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) is the second in the series of imaging spectrometer instruments developed at the Jet Propulsion Laboratory (JPL) for earth remote sensing. This instrument uses scanning optics and four spectrometers to image a 614 pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4  $\mu m$ ).

AVIRIS parameters are as follows:

IFOV:	1 mrad
Ground Resolution:	66 feet (20 meters) at 65,000 feet
Total Scan Angle:	30°
Swath Width:	5.7 nmi (10.6 km) at 65,000 feet
Spectral Coverage:	0.41-2.45 $\mu m$
Pixels/Scan Line:	614
Number of Spectral Bands:	224
Digitization:	10-bits
Data Rate:	17 MBPS

<u>Spectrometer</u>	<u>Wavelength Range</u>	<u>Number of Bands</u>	<u>Sampling Interval</u>
1	0.41 - 0.70 $\mu m$	31	9.4 nm
2	0.68 - 1.27 $\mu m$	63	9.4 nm
3	1.25 - 1.86 $\mu m$	63	9.7 nm
4	1.84 - 2.45 $\mu m$	63	9.7 nm

All AVIRIS data is decommutated and archived at JPL and not currently available for public distribution. For further information contact Rob Green at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 183-501, Pasadena, California 91109-8099.

## Modis Airborne Simulator

The Modis Airborne Simulator (MAS) is a modified Daedalus multispectral scanner. It records up to twelve 8-bit channels, which can be selected from an array of fifty available spectral bands. The band selection is made prior to flight and the instrument is hard-wired to that configuration. Channel 1 is used to store additional bits which provide 10-bit resolution for channels 9 through 12. The following MAS band combination (configuration SCAR-C) was used on this flight for SCAR-C data acquisition:

<u>Data System Channel</u>	<u>MAS Channel</u>	<u>Band edges <math>\mu\text{m}</math></u>
1	--	-----
2	1	0.529 - 0.572
3	10	1.595 - 1.652
4	10	1.595 - 1.652
5	15	1.855 - 1.905
6	20	2.126 - 2.173
7	46	11.799 - 12.246
8	32	3.825 - 3.975
9*	2	0.635 - 0.688
10*	7	0.852 - 0.893
11*	45	10.791 - 11.239
12*	32	3.825 - 3.975

\* 10-bit resolution

### Sensor/Aircraft Parameters:

Spectral Channels:	50
Output Channels:	Seven 8-bit and four 10-bit
IFOV:	2.5 mrad
Ground Resolution:	163 feet (50 meters at 65,000 feet)
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.)

## 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-Heerbrug 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

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).

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). Additional information regarding ER-2 acquired photographic and digital data is also available through the Aircraft Data Facility.

**CAMERA FLIGHT LINE DATA**  
**FLIGHT NO. 95-004**

Accession # 04830

Sensor # 034

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Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	7775-7795	17:55:11	18:01:45	65000/19800	Thin cirrus (frames 7775-7784); 10-40% cirrus and cumulus (frames 7785-7795)
C - D	7796-7805	18:12:08	18:15:05	"	Thin cirrus (frames 7796-7798); 10% cirrus (frame 7805)
E - F	7806-7818	18:21:34	18:25:30	"	40-80% cumulus (frames 7806-7811); minor-20% cumulus (frames 7812-7818)
G - H	7819-7820	18:28:44	18:29:04	"	20-30% cumulus
F - E	7821-7833	18:40:50	18:44:46	"	Minor-10% cumulus (frames 7823-7828); 10-40% cumulus (frames 7831-7833)
I - J	7834-7843	18:49:24	18:52:21	"	Clear
K - L	7844-7848	18:59:56	19:01:14	"	Minor-20% cumulus
M - N	7849-7851	19:11:59	19:12:38	"	Clear

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 95-004**

Accession # 04830

Sensor # 034

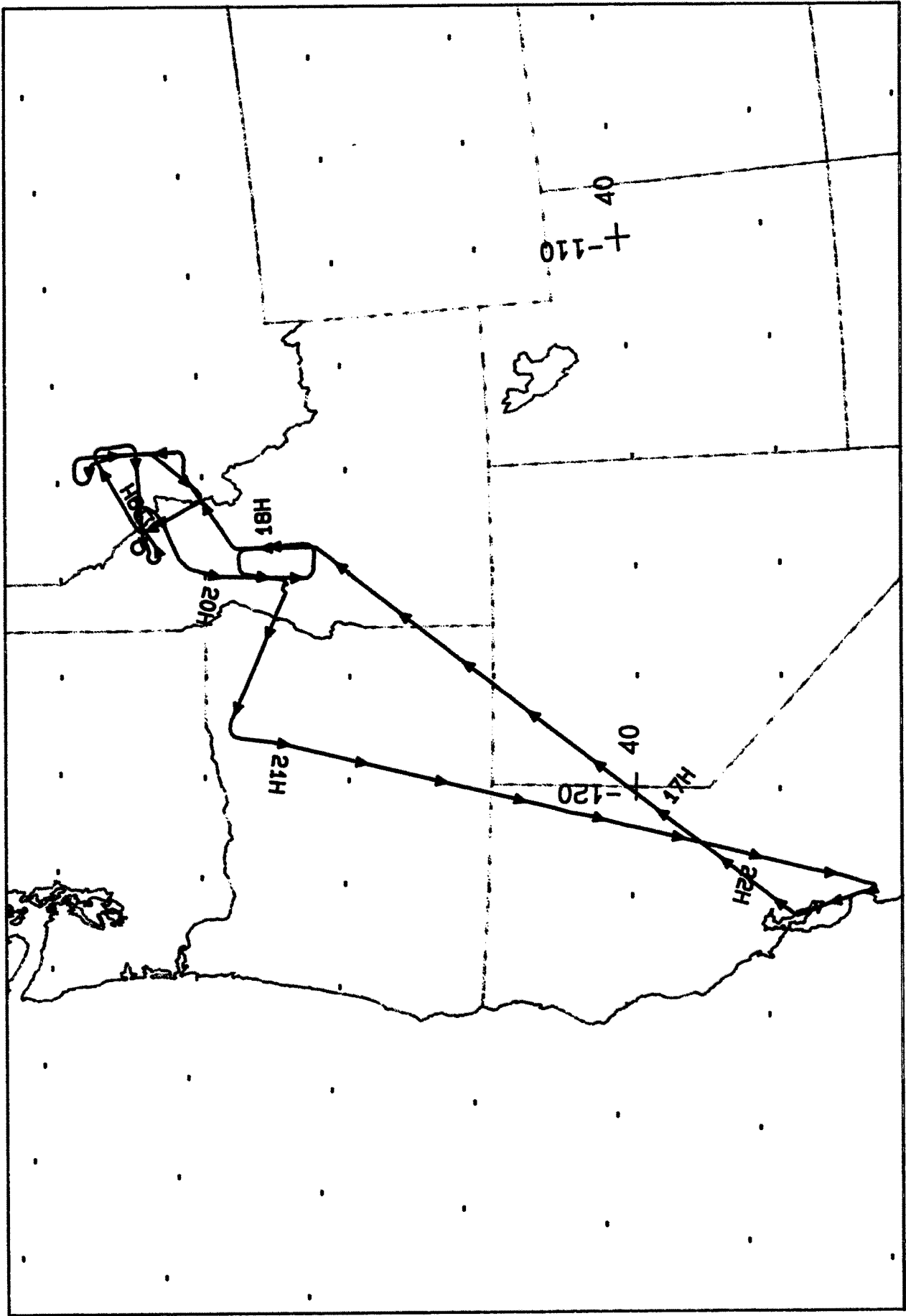
Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
O - P	7852-7854	19:17:03	19:17:42	65000/19800	Minor cumulus (frames 7853-7854)
Q - R	7855-7865	19:26:52	19:30:09	"	10-30% cumulus (frames 7855-7862); thin cirrus (frames 7864-7865)
S - T	7866-7876	19:42:11	19:45:28	"	Thin cirrus (frames 7866-7871); 10-20% cumulus (frames 7874-7876)
U - V	7877-7894	20:03:38	20:09:14	"	Minor-20% cirrus (frames 7877-7888)
W - B	7895-7913	20:17:25	20:23:21	"	10-20% cirrus (frames 7895-7896 and 7899-7913)
X - V	7914-7924	20:29:34	20:32:52	"	Minor-10% cirrus (frames 7914-7915)
Y - Z	7925-7938	20:55:44	21:00:00	"	10-20% cirrus (frames 7934-7938)

# MAS SCANNER FLIGHT LINE DATA

## FLIGHT NO. 95-004

DAEDALUS FLIGHT DATA  
FLIGHT NUMBER: 95-004

Check Points	Actual time 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	17:55: 9.0	18:03:55.0	35077	38344	65000/19812	6.25	3268	0	0
C-D	18:11: 5.0	18:15: 3.0	41017	42502	65000/19812	6.25	1486	0	0
E-F	18:19:34.0	18:25:56.0	44185	46561	65000/19812	6.25	2377	0	0
G-H	18:27: 0.0	18:29: 7.0	46957	47749	65000/19812	6.25	793	0	0
F-E	18:39: 3.0	18:44:47.0	51450	53590	65000/19812	6.25	2141	0	0
I-J	18:47:58.0	18:52:29.0	54778	56461	65000/19812	6.25	1684	0	0
K-L	18:58: 3.0	19:01:14.0	58540	59728	65000/19812	6.25	1189	0	0
M-N	19:09:59.0	19:12:39.0	62995	63985	65000/19812	6.25	991	0	0
O-P	19:15:34.0	19:17:41.0	65074	65866	65000/19812	6.25	793	0	0
Q-R	19:25:23.0	19:31:13.0	68737	70915	65000/19812	6.25	2179	0	0
S-T	19:41:34.0	19:45:17.0	74776	76162	65000/19812	6.25	1387	0	0
U-V	20:02: 0.0	20:11:34.0	82399	85963	65000/19812	6.25	3565	0	0
W-B	20:17:24.0	20:24:34.0	88141	90814	65000/19812	6.25	2674	0	0
X-V	20:29:20.0	20:33: 3.0	92596	93982	65000/19812	6.25	1387	0	0
Y-Z	20:55:52.0	21:00:39.0	102496	104278	65000/19812	6.25	1783	0	0

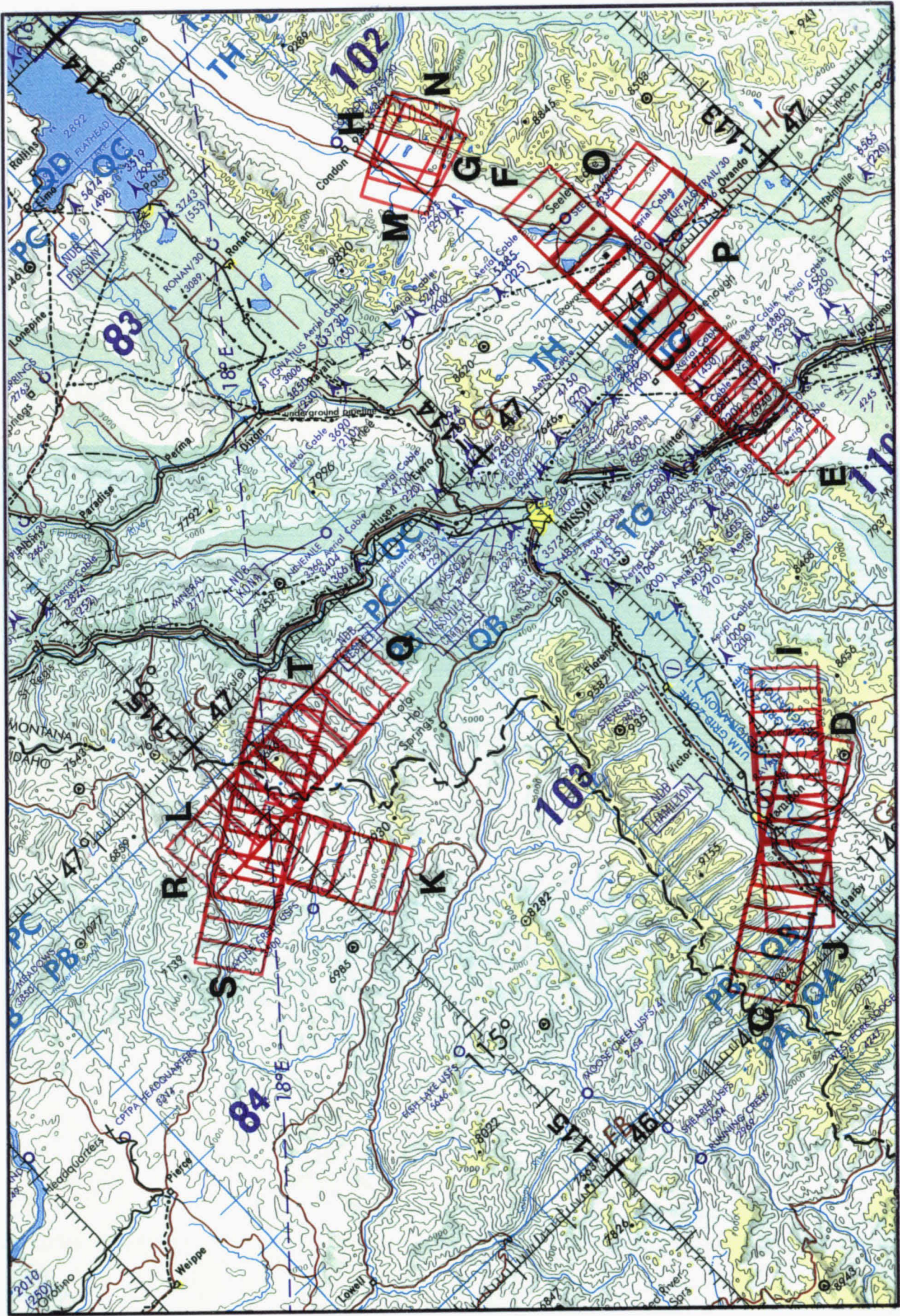


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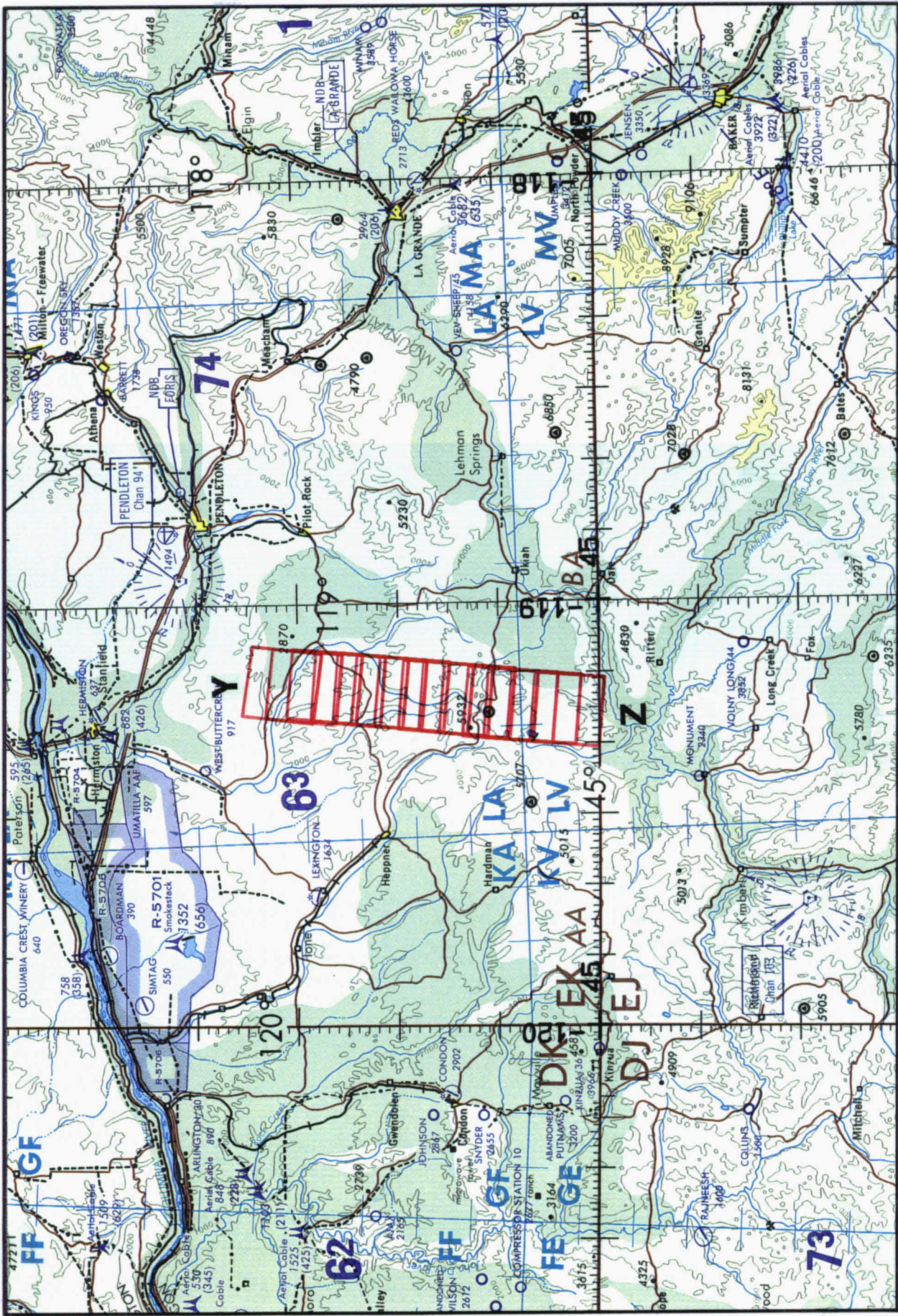
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ONC F-16





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