

# FLIGHT SUMMARY REPORT

**Flight Number:** 93-144  
**Calendar/Julian Date:** 29 July 1993 • 210  
**Sensor Package:** Wild-Heerbrug RC-10  
 Dual Hycon HR-732  
 Modis Airborne Simulator (MAS)  
**Area(s) Covered:** St. Louis, MO; Kansas River, Big  
 Blue River, and Republican River, KS

**Investigator(s):** Federal Emergency Management Agency (FEMA) and NASA Headquarters      **Aircraft #:** 708

## SENSOR DATA

<b>Accession #:</b>	04601	4602	4603	----
<b>Sensor ID #:</b>	035	038	039	108
<b>Sensor Type:</b>	RC-10	HR-732	HR-732	MAS
<b>Focal Length:</b>	6" 153.46 mm	24" 609.6 mm	24" 609.6 mm	----
<b>Film Type:</b>	High Definition Aerochrome IR SO-131	High Definition Aerochrome IR SO-131	High Definition Aerial Film 3414	----
<b>Filtration:</b>	cc.10B + 2.2 AV	cc.10B	Wratten 12	----
<b>Spectral Band:</b>	510-900 nm	510-900 nm	510-700 nm	----
<b>f Stop:</b>	4	8	8	----
<b>Shutter Speed:</b>	1/150	1/75	1/75	----
<b># of Frames:</b>	65	243	213	----
<b>% Overlap:</b>	60	60	60	----
<b>Quality:</b>	Excellent	Good	Good	Fair
<b>Remarks:</b>	Camera clock offset 1.97 seconds from navigation data	Camera clock offset 1.04 seconds from navigation data	Camera clock offset 3.37 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.

### 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 SCARP1) was used on this flight for Smoke, Cloud, and Radiation (SCAR) experiments:

<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	2	0.635 - 0.688
4	7	0.852 - 0.893
5	9	0.926 - 0.969
6	15	1.855 - 1.905
7	20	2.126 - 2.173
8	31	3.659 - 3.810
9*	42	8.342 - 8.738
10*	45	10.791 - 11.239
11*	48	13.023 - 13.375
12*	46	11.799 - 12.246

\* 10-bit resolution

### Sensor/Aircraft Parameters:

Spectral Channels:	50
Output Channels:	Seven 8-bit and four 10-bit
I FOV:	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).

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. 93-144**

Accession # 04601

Sensor # 035

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	1779-1783	15:03:29	15:07:23	65000/19800	Clear
C - D	1784-1798	15:33:22	15:47:01	"	10-50% cumulus (frames 1792-1798); oblique (frame 1798)
E - F	1799-1818	15:51:57	16:09:04	"	30% cumulus and cirrus (frame 1799); oblique (frames 1811 and 1814)
G - H	1819-1843	16:24:39	16:46:44	"	10-60% cumulus and cirrus (frames 1826- 1843); oblique (frame 1837)

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 93-144**

Accession # 04602

Sensor # 038

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	0001-0019	15:03:29	15:07:45	65000/19800	Clear
C - D	0020-0077	15:33:22	15:46:55	"	10% cirro-cumulus (frames 0058-0060); 10-50% cirro-cumulus (frames 0068-0077); soft (frames 0037, 0040, 0042, and 0070)
E - F	0078-0151	15:51:56	16:09:38	"	20% cirro-cumulus (frame 0078); soft (frames 0094, 0096, and 0137); oblique (frames 0096, 0126, 0137, and 0139)
G - H	0152-0243	16:24:39	16:46:42	"	10-90% cirro-cumulus (frames 0182-0207); 20-70% cirro-cumulus (frames 0209-0221); 10-80% cirro-cumulus (frames 0024-0243); soft (frames 0208, 0210-0212, and 0238); oblique (frames 0197, 0223-0225, and 0237)

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 93-144**

Accession # 04603

Sensor # 039

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	0001-0017	15:03:39	15:07:45	65000/19800	Clear; shutter malfunction (frames 0001-0002)
C - D	0018-0073	15:33:22	15:46:55	"	10% cirro-cumulus (frames 0054-0056); 10% cirro-cumulus (frames 0064-0065); 10-60% cirro-cumulus (frames 0068-0073); soft (frames 0033, 0036, 0038, and 0066); shutter malfunction (frames 0019-0020)
E - F	0074-0146	15:51:56	16:09:38	"	10-20% cirro-cumulus (frames 0074-0075); soft (frames 0090, 0092, 0107, and 0133); oblique (frames 0092, 0122, 0133, and 0135); shutter malfunction (frame 0145)
G - H	0147-0213	16:24:39	16:44:59	"	10-90% cirro-cumulus (frames 0177-0204); 10-30% cirro-cumulus (frames 0206-0213); oblique (frames 0192 and 0206); shutter malfunction (frames 0194, 0201-0211)

# MAS SCANNER FLIGHT LINE DATA

FLIGHT NO. 93-144

## MEDALUS FLIGHT DATA FLIGHT NUMBER: 93-144

Check Points	A c t u a l t i m e b e g i n e n d	A c t u a l s c a n l i n e b e g i n e n d	A l t i t u d e f e e t / m e t e r	S c a n S p e e d (r p s)	t o t a l G o o d s c a n l i n e s	t o t a l I n t e r p o l a t e d s c a n l i n e s	t o t a l R e p e a t e d s c a n l i n e s
A - B	15:03:32.0 15:03:45.0	47984 47931	65000/19812	6.20	1948	0	0
B - C	15:09:49.0 15:31:50.0	50327 50544	65000/19812	6.20	8716	0	0
C - D	15:35: 9.0 15:46:41.0	57039 61038	65000/19812	6.20	5050	0	0
E - F	15:52:15.0 16:09:29.0	66167 72602	65000/19812	6.20	6436	0	0
G - H	16:21:36.0 16:47:56.0	78245 86737	65000/19812	6.20	8712	1	0









