

FLIGHT SUMMARY REPORT

Flight Number: 99-020
Calendar/Julian Date: 16 December 1998 • 350
Sensor Package: Modis Airborne Simulator (MAS)
Airborne Multi-angle Imaging Spectro
Radiometer (MISR)
Scanning High-Resolution Interferometer
Sounder (HIS)
Area(s) Covered: Rogers Dry Lake

Investigator(s): Functional Check Flight

Aircraft #: 806

SENSOR DATA

Accession #:	----	----	----
Sensor ID #:	108	120	083
Sensor Type:	MAS 50	Air MISR	S-HIS
Focal Length:	----	----	----
Film Type:	----	----	----
Filtration:	----	----	----
Spectral Band:	----	----	----
f Stop:	----	----	----
Shutter Speed:	----	----	----
# of Frames:	----	----	----
% Overlap:	----	----	----
Quality:	----	----	----
Remarks:			

Airborne Science Program

The Airborne Science Program at NASA's Dryden Flight Research Center, Edwards, California, operates two ER-2 high altitude aircraft in support of NASA earth science research. 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 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 16-bit channels of multispectral data and is configured as follows:

Spectral Channel	Band center (µm)	Bandwidth (µm)	Spectral Range
1	0.4649	0.0397	0.4451-0.4848
2	0.5494	0.0417	0.5285-0.5703
3	0.6550	0.0511	0.6294-0.6805
4	0.7024	0.0415	0.6816-0.7231
5	0.7431	0.0420	0.7221-0.7641
6	0.8248	0.0427	0.8034-0.8461
7	0.8667	0.0414	0.8460-0.8874
8	0.9072	0.0409	0.8867-0.9276
9	0.9476	0.0397	0.9277-0.9674
10	1.6422	0.0519	1.6163-1.6682
11	1.6975	0.0505	1.6722-1.7228
12	1.7499	0.0506	1.7245-1.7752
13	1.8014	0.0491	1.7768-1.8259
14	1.8548	0.0489	1.8303-1.8792
15	1.9044	0.0487	1.8801-1.9288
16	1.9553	0.0483	1.9312-1.9794
17	2.0048	0.0487	1.9804-2.0291
18	2.0551	0.0484	2.0309-2.0793
19	2.1037	0.0486	2.0794-2.1280

Spectral Channel	Band center (µm)	Bandwidth (µm)	Spectral Range
26	3.1192	0.1616	3.0384-3.2000
27	3.2809	0.1486	3.2066-3.3552
28	3.4330	0.1617	3.3521-3.5138
29	3.5940	0.1539	3.5170-3.6709
30	3.7449	0.1449	3.6724-3.8174
31	3.9069	0.1602	3.8267-3.9870
32	4.0707	0.1554	3.9929-4.1484
33	4.1699	0.0669	4.1365-4.2034
34	4.4029	0.1255	4.3401-4.4656
35	4.5404	0.1512	4.4648-4.6160
36	4.6979	0.1591	4.6184-4.7775
37	4.8536	0.1516	4.7778-4.9294
38	5.0033	0.1468	4.9298-5.0767
39	5.1588	0.1400	5.0888-5.2288
40	5.3075	0.1327	5.2412-5.3738
41	5.3977	0.0755	5.3590-5.4365
42	8.5366	0.3950	8.3391-8.7341
43	9.7224	0.5365	9.4541-9.9906
44	10.5071	0.4579	10.278-10.736

20	2.1532	0.0483	2.1291-2.1774
21	2.2019	0.0481	2.1779-2.2259
22	2.2522	0.0486	2.2278-2.2675
23	2.3021	0.0487	2.2777-2.3265
24	2.3512	0.0476	2.3274-2.3750
25	2.4005	0.0483	2.3764-2.4246

45	11.0119	0.4710	10.776-11.247
46	11.9863	0.4196	11.776-12.196
47	12.9013	0.3763	12.713-13.089
48	13.2702	0.4584	13.041-13.500
49	13.8075	0.5347	13.540-14.075
50	14.2395	0.3775	14.051-14.428

NOTE: Bandpass centers approximate

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.)

Airborne Multi-angle Imaging SpectroRadiometer

The Airborne MISR (AirMISR) is currently flown aboard the ER-2 to facilitate the development and test the capabilities of the satellite MISR before it is launched in orbit in 1999. The spaceborne Multi-angle Imaging SpectroRadiometer (MISR) is a new type of instrument, designed to view the Earth with cameras pointed in nine different directions. MISR is being built for NASA by the Jet Propulsion Laboratory in Pasadena, California. MISR is one of five instruments scheduled to be launched into polar orbit aboard the first Earth Observing System spacecraft (EOS-AM1) in June 1999, as part of NASA's Mission to Planet Earth. The spacecraft will fly in a "sun-synchronous" orbit, designed so that it crosses the equator every 98 minutes, always at 10:30 a.m. local time, as the Earth rotates below. As the instrument flies overhead, each piece of the Earth's surface below is successively imaged by the nine cameras comprising the MISR system, in each of four wavelengths (blue, green, red, and near-infrared).

In addition to improving our understanding of scattering of sunlight in the Earth environment, MISR data can also distinguish different types of clouds, particles, and surfaces. Specifically, MISR will monitor the monthly, seasonal, and long-term trends in:

- The amount and type of atmospheric particles (aerosols), including those formed by natural sources and by human activities
- The amounts, types, and heights of clouds
- The distribution of land surface cover, including vegetation canopy structure

To accomplish its scientific objectives, the MISR instrument will measure the Earth's brightness in four spectral bands, at each of nine look angles spread out in the forward and aft directions along the flight path. Spatial samples are acquired every 275 meters. Over a period of seven minutes, a 360 km wide swath of Earth comes into view at all nine angles. Special attention has been paid to providing highly accurate absolute and relative calibration, using on-board hardware consisting of deployable solar diffuser plates and several types of photodiodes. To complement the on-board calibration effort, a validation program of *in situ* measurements is planned, involving field instruments, one of which is the "PARABOLA III", which

automatically scans the sky and ground at many angles. The aircraft camera, AirMISR will continue to operate on the ER-2 also as a complement to the orbiting MISR. Global coverage with the satellite MISR will be acquired about once in nine days at the equator; the nominal mission lifetime is six years.

Further information regarding MISR is available on the following web page: <http://www-misr.jpl.nasa.gov>

Scanning High-Resolution Interferometer Sounder

The Scanning High-Resolution Interferometer Sounder (S-HIS) is a scanning MWIR to LWIR interferometer obtaining 2 km resolution with 36 kilometer swath width. S-HIS measures upwelling infrared spectral radiance at the aircraft altitude with high absolute accuracy using a passive Michelson interferometer and precision onboard blackbody calibration sources. The instrument has a single nadir staring field of view with observed spectra obtained every six seconds. The spectra cover the range 16.6 microns to 3.3 microns with a spectral resolution of 0.3 to 0.5 cm^{-1} . The primary use of the instrument is as an atmospheric sounder of temperature and water vapor. The spectra also contain important information on trace gases and surface properties. The S-HIS was developed by the University of Wisconsin at Madison and is a prototype instrument for advanced infrared satellite sounders. For information on the Scanning HIS and HIS instruments refer to these web pages:

<http://cimss.ssec.wisc.edu/wintex/instruments.html>
<http://cimss.ssec.wisc.edu/his/hishome.html>

Data Availability

The U.S. Geological Survey's EROS Data Center at Sioux Falls, South Dakota serves as the archive and product distribution facility for Airborne Science Program aircraft acquired photographic and digital imagery. The photographic archive consists of photography acquired by the program from 1971 to April 1996. 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).

As of April 1996 the EROS Data Center no longer receives an archive copy of newly acquired Airborne Science Program photography. Original photography is archived with the Airborne Sensor Facility at Ames Research Center and a user copy of the photography is provided to the principal investigators for each flight. Principal investigators are cited on the first page of their respective flight summary reports. For information regarding photography acquired from April 1996 to the present contact the Airborne Sensor Facility (address provided in following paragraph).

Flight Documentation and Data Archive Searches

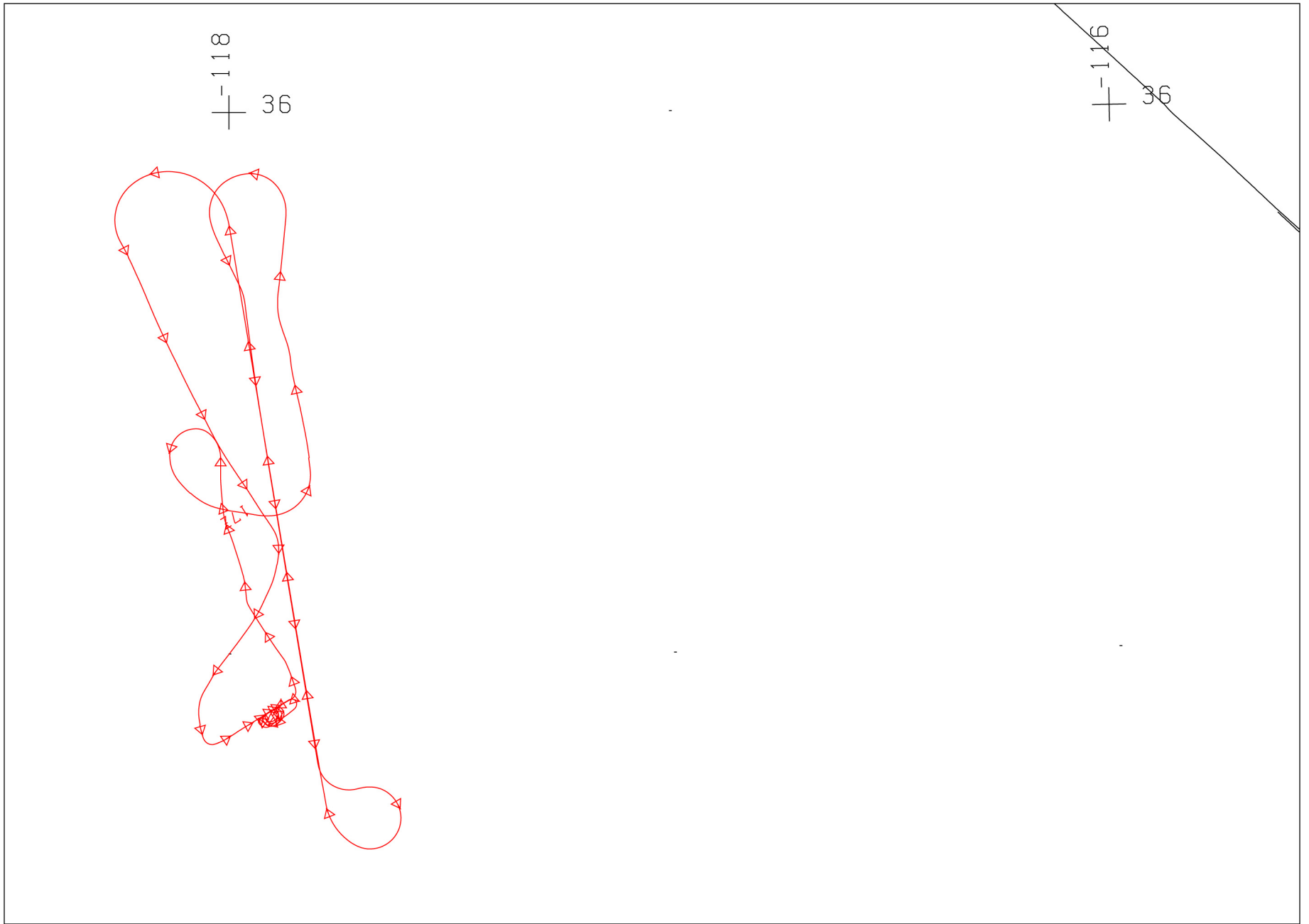
The following is the web site for flight documentation published by the Airborne Sensor Facility at NASA Ames Research Center: <http://asapdata.arc.nasa.gov/er-2fsr.html>

Additional information regarding flight documentation to include data archive searches, data availability, sensor parameters, and areas of coverage may be obtained from the following: Airborne Sensor Facility, MS 240-6, NASA Ames Research Center, Moffett Field, CA 94035-1000, Telephone: 650.604.6252 (FAX 4987).

MODIS AIRBORNE SIMULATOR (MAS) FLIGHT LINE INFORMATION FOR 16-DEC-1998 FLIGHT 99-020

START OF FLIGHT LINE							END OF FLIGHT LINE					
LINE	TIME HH:MM:SS	LAT DEG	LON DEG	SOLAR ZEN AZIM		START HEADING	TIME HH:MM:SS	LAT DEG	LON DEG	SOLAR ZEN AZIM		SCAN LINES
1	16:28:37	35.638	-117.966	75.5	133.5	172.85	16:36:01	34.801	-117.801	73.7	134.8	2771
2	16:39:55	34.726	-117.784	73.0	135.7	350.44	16:44:51	35.269	-117.894	72.7	136.7	1846

NUMBER OF FILES FOR THIS FLIGHT = 2
 TOTAL NUMBER OF SCAN LINES = 4617
 DATE THESE FILES WERE PROCESSED = 16-Mar-99
 DATE THIS LIST WAS CREATED = 17-Mar-99
 GRANULE VERSION = 9



FLIGHT 99-020

16 DECEMBER 1998

A/C 806

RC-10 / MISR / MAS50 / SCANNING HIS