

# FLIGHT SUMMARY REPORT

**Flight #:** 92-161  
**Date:** 22 September 1992  
**Sensor Package:** Dual Wild-Heerbrug RC-10  
Dual Hycon HR-732  
Thematic Mapper Simulator (TMS)  
**Area(s) Covered:** Hawaiian Islands

**Investigator(s):** Masumoto, State of Hawaii

**Aircraft #:** 708

**Flight Request:** 2XZ2040

**Julian Date:** 266

## SENSOR DATA

<b>Accession #:</b>	04471	04472	04473
<b>Sensor ID #:</b>	034	026	038
<b>Sensor Type:</b>	RC-10	RC-10	HR-732
<b>Focal Length:</b>	12" 304.66 mm	12" 304.97 mm	24" 609.6 mm
<b>Film Type:</b>	Aerial Color SO-242	High Definition Aerochrome IR SO-131	High Definition Aerochrome IR SO-131
<b>Filtration:</b> -	None	cc.10B	cc.30B
<b>Spectral Band:</b>	400-700 nm	510-900 nm	510-900 nm
<b>f Stop:</b>	4	4	8
<b>Shutter Speed:</b>	1/200	1/200	1/75
<b># of Frames:</b>	120	120	239
<b>% Overlap:</b>	60	60	60
<b>Quality:</b>	Excellent	Excellent	Excellent
<b>Remarks:</b>		4.4 sec. off- set between clock and nav data	

## SENSOR DATA continued

<b>Accession #:</b>	4474	-----
<b>Sensor ID #:</b>	039	101
<b>Sensor Type:</b>	HR-732	TMS
<b>Focal Length:</b>	24" 609.6 mm	-----
<b>Film Type:</b>	High Definition Aerial Film 3414	-----
<b>Filtration:</b>	Wratten-12	-----
<b>Spectral Band:</b>	510-700 nm	-----
<b>f Stop:</b>	8	-----
<b>Shutter Speed:</b>	1/75	-----
<b># of Frames:</b>	232	-----
<b>% Overlap:</b>	60	-----
<b>Quality:</b>	Excellent	Excellent
<b>Remarks:</b>		

## Hurricane Iniki

On September 11, 1992 Hurricane Iniki swept through the Hawaiian Islands causing extensive damage to residential and commercial structures, agricultural crops, and natural vegetation. In response to this disaster, NASA deployed a high altitude ER-2 aircraft to Barbers Point NAS on the island of Oahu. From that operational base the ER-2 flew nine missions from September 16 to October 1 for purposes of acquiring high resolution photography and digital imaging of the devastated areas. These disaster assessment flights are summarized in this volume.

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

## Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a multispectral scanner flown aboard the ER-2 aircraft which simulates spatial and spectral characteristics of the seven Landsat-D Thematic Mapper bands. The specific bands are as follows:

<u>Daedalus Channel</u>	<u>TM Band</u>	<u>Wavelength, <math>\mu\text{m}</math></u>
1	A	0.42 - 0.45
2	1	0.45 - 0.52
3	2	0.52 - 0.60
4	B	0.60 - 0.62
5	3	0.63 - 0.69
6	C	0.69 - 0.75
7	4	0.76 - 0.90
8	D	0.91 - 1.05
9	5	1.55 - 1.75
10	7	2.08 - 2.35
11	6	8.5 - 14.0 low gain
12	6	8.5 - 14.0 high gain

Sensor/aircraft parameters are as follows:

IFOV:	1.25 mrad
Ground Resolution:	81 feet (25 meters) at 65,000 feet
Total Scan Angle:	43°
Swath Width:	8.4 nmi (15.6 km) at 65,000 feet
Pixels/Scan Line:	716
Scan Rate:	12.5 scans/second
Ground Speed:	400 kts (206 m/second)

Information on data tape format, logical record format, and scanner calibration data may be obtained from the NASA-Ames Aircraft Data Facility at (415) 604-6252.

### 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. 92-161**

Accession # 04471

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	6730-6733	19:20:31	19:21:57	59000/18000	Minor-10% scattered cumulus
C - F	6734-6739	19:25:17	19:27:41	61000/18600	Minor scattered cumulus (frames 6736-6738)
G - H	6740-6743	19:48:32	19:49:58	"	20-30% scattered cumulus and strato-cumulus
I - J	6744-6747	19:51:56	19:53:22	"	20-30% scattered cumulus
K - L	6748-6751	19:58:42	20:00:08	60000/18300	20-30% scattered cumulus
M - N	6752-6756	20:02:13	20:04:08	"	Minor-30% scattered cumulus
O - P	6757-6763	20:06:40	20:09:31	59000/18000	Minor-30% scattered cumulus
P - O	6764-6770	20:16:16	20:19:07	60000/18300	10-30% scattered cumulus
Q - S	6771-6786	20:31:37	20:38:44	"	Minor-40% scattered cumulus; slightly oblique (frame 6784)
R - U	6787-6796	20:45:00	20:49:16	59000/18000	Minor-50% scattered cumulus and strato-cumulus

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 92-161**

Accession # 04471

Sensor # 034

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
V - W	6797-6807	20:51:07	20:55:51	59000/18000	Minor-30% scattered cumulus
X - Y	6808-6812	21:03:11	21:05:05	"	Minor scattered cumulus (frames 6809-6812)
Z - 1	6813-6816	21:08:05	21:09:30	60000/18300	10-60% scattered cumulus
Z - 3	6817-6819	21:12:08	21:13:05	"	30-60% cumulus
4 - 5	6820-6824	21:17:09	21:19:02	"	Minor-20% scattered cumulus
6 - V	6825-6829	21:21:26	21:23:19	"	10-30% scattered cumulus
2 - Q	6830-6839	21:30:18	21:34:32	"	10-40% scattered cumulus (frames 6830-6838)
7 - 8	6840-6844	21:43:43	21:45:35	"	10-40% scattered cumulus
J - I	6845-6849	21:53:03	21:54:56	59000/18000	20-60% scattered cumulus and strato-cumulus

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 92-161**

Accession # 04472

Sensor # 026

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	2056-2059	19:20:06	19:21:34	59000/18000	Minor-10% scattered cumulus
C - F	2060-2065	19:24:52	19:27:18	61000/18600	Minor scattered cumulus (frames 2062-2064)
G - H	2066-2069	19:48:07	19:49:33	"	20-30% scattered cumulus and strato-cumulus
I - J	2070-2073	19:51:30	19:52:56	"	20-30% scattered cumulus
K - L	2074-2077	19:58:17	19:59:43	60000/18300	20-30% scattered cumulus
M - N	2078-2082	20:01:48	20:03:43	"	Minor-30% scattered cumulus
O - P	2083-2089	20:06:15	20:09:06	59000/18000	Minor-30% scattered cumulus
P - O	2090-2096	20:15:51	20:18:42	60000/18300	10-30% scattered cumulus
Q - S	2097-2112	20:31:12	20:38:17	"	Minor-40% scattered cumulus; slightly oblique (frame 2110)
R - U	2113-2122	20:44:35	20:48:49	59000/18000	Minor-50% scattered cumulus and strato- cumulus

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 92-161**

Accession # 04472

Sensor # 026

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
V - W	2123-2133	20:50:42	20:55:25	59000/18000	Minor-30% scattered cumulus
X - Y	2134-2138	21:02:46	21:04:38	"	Minor scattered cumulus (frames 2135-2138)
Z - 1	2139-2142	21:07:40	21:09:04	60000/18300	10-60% scattered cumulus
2 - 3	2143-2145	21:11:43	21:12:39	"	30-60% cumulus
4 - 5	2146-2150	21:16:43	21:18:35	"	Minor-20% scattered cumulus
6 - V	2151-2155	21:21:01	21:22:53	"	10-30% scattered cumulus
2 - Q	2156-2165	21:29:53	21:34:04	"	10-40% scattered cumulus (frames 2156 2164)
7 - 8	2166-2170	21:43:17	21:45:08	"	10-40% scattered cumulus
J - I	2171-2175	21:52:38	21:54:29	59000/18000	20-60% scattered cumulus and strato-cumulus



**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 92-161**

Accession # 04473

Sensor # 038

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Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	0001-0007	19:20:09	19:21:32	59000/18000	Minor-10% scattered cumulus (frames 0001-0006)
C - F	0008-0019	19:24:55	19:27:27	61000/18600	Minor scattered cumulus (frames0013-0015)
G - H	0020-0028	19:48:10	19:49:59	"	10-30% scattered cumulus and strato-cumulus
I - J	0029-0036	19:51:34	19:53:10	"	10-40% scattered cumulus
K - L	0037-0043	19:58:20	19:59:42	60000/18300	10-40% scattered cumulus
M - N	0044-0053	20:01:51	20:03:54	"	Minor-30% scattered cumulus
O - P	0054-0067	20:06:18	20:09:15	59000/18000	Minor-30% scattered cumulus
P - O	0068-0081	20:15:54	20:18:50	60000/18300	Minor-30% scattered cumulus
Q - S	0082-0114	20:31:15	20:38:27	"	Minor-50% scattered cumulus; minor emulsion abrasions (frames 0089-0090); slightly oblique (frame 0109)

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 92-161**

Accession # 04473

Sensor # 038

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
R - U	0115-0135	20:44:38	20:49:08	59000/18000	Minor-60% scattered cumulus and strato-cumulus (frames 0116-0135)
V - W	0136-0157	20:50:45	20:55:28	"	10-30% cumulus (frames 0136-0137); minor cumulus (frames 0138-0144); minor-40% scattered cumulus (frames 0147-0157)
X - Y	0158-0167	21:02:49	21:04:50	"	Minor scattered cumulus (frames 0160-0167)
Z - 1	0168-0175	21:07:43	21:09:17	60000/18300	Minor-70% scattered cumulus
2 - 3	0176-0180	21:11:46	21:12:40	"	10-80% cumulus
4 - 5	0181-0190	21:16:46	21:18:47	"	Minor-20% scattered cumulus
6 - V	0191-0199	21:21:04	21:22:52	"	Minor-30% scattered cumulus
2 - Q	0200-0218	21:29:55	21:33:57	"	Minor-40% scattered cumulus
7 - 8	0219-0228	21:43:20	21:45:21	"	Minor-50% scattered cumulus
J - I	0229-0239	21:52:41	21:54:55	59000/18000	10-70% scattered cumulus and strato-cumulus

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 92-161**

Accession # 04474

Sensor # 039

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Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	0001-0007	19:20:11	19:21:35	59000/18000	Minor-10% scattered cumulus (frames 0001-0006)
C - F	0008-0019	19:24:57	19:27:29	61000/18600	Minor scattered cumulus (frames 0013-0015)
G - H	0020-0028	19:48:12	19:50:02	"	10-30% scattered cumulus and strato-cumulus
I - J	0029-0036	19:51:36	19:53:12	"	10-40% scattered cumulus
K - L	0037-0043	19:58:23	19:59:44	60000/18300	10-40% scattered cumulus
M - N	0044-0053	20:01:54	20:03:56	"	Minor-30% scattered cumulus
O - P	0054-0067	20:06:20	20:09:17	59000/18000	Minor-30% scattered cumulus
P - O	0068-0081	20:15:56	20:18:52	60000/18300	Minor-30% scattered cumulus
Q - S	0082-0114	20:31:18	20:38:28	"	Minor-50% scattered cumulus; slightly oblique (frame 0109)
R - U	0115-0135	20:44:40	20:49:10	59000/18000	Minor-60% scattered cumulus and strato-cumulus (frames 0116-0135)

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 92-161**

Accession # 04474

Sensor # 039

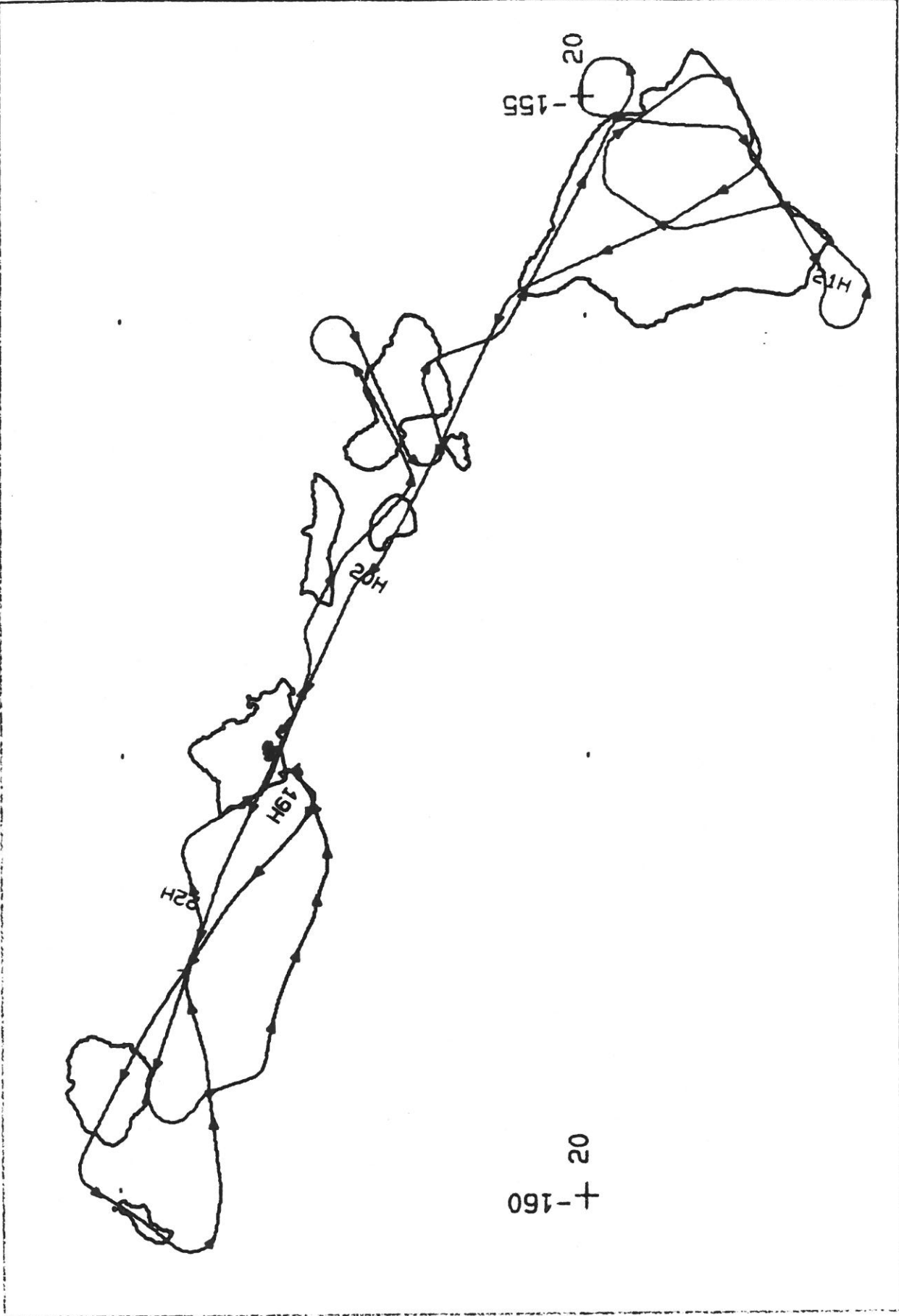
Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
V - W	0136-0157	20:50:47	20:55:30	59000/18000	10-30% cumulus (frames 0136-0137); minor scattered cumulus (frames 0138-0144); minor-40% scattered cumulus (frames 0147-0157)
X - Y	0158-0167	21:02:51	21:04:52	"	Minor scattered cumulus (frames 0160-0167)
Z - 1	0168-0175	21:07:45	21:09:19	60000/18300	Minor-70% scattered cumulus
2 - 3	0176-0180	21:11:48	21:12:42	"	10-80% cumulus
4 - 5	0181-0190	21:16:48	21:18:48	"	Minor-20% scattered cumulus
6 - V	0191-0199	21:21:06	21:22:54	"	Minor-30% scattered cumulus
2 - Q	0200-0216	21:29:58	21:33:58	"	Minor-50% scattered cumulus; splice between frames 0204-0205
7 - 8	0217-0224	21:43:22	21:44:56	"	Minor-50% scattered cumulus; splice between frames 0224-0225
J - I	0225-0232	21:52:43	21:54:43	59000/18000	10-70% scattered cumulus and strato-cumulus; splice between frames 0228-0229

# TMS SCANNER FLIGHT LINE DATA

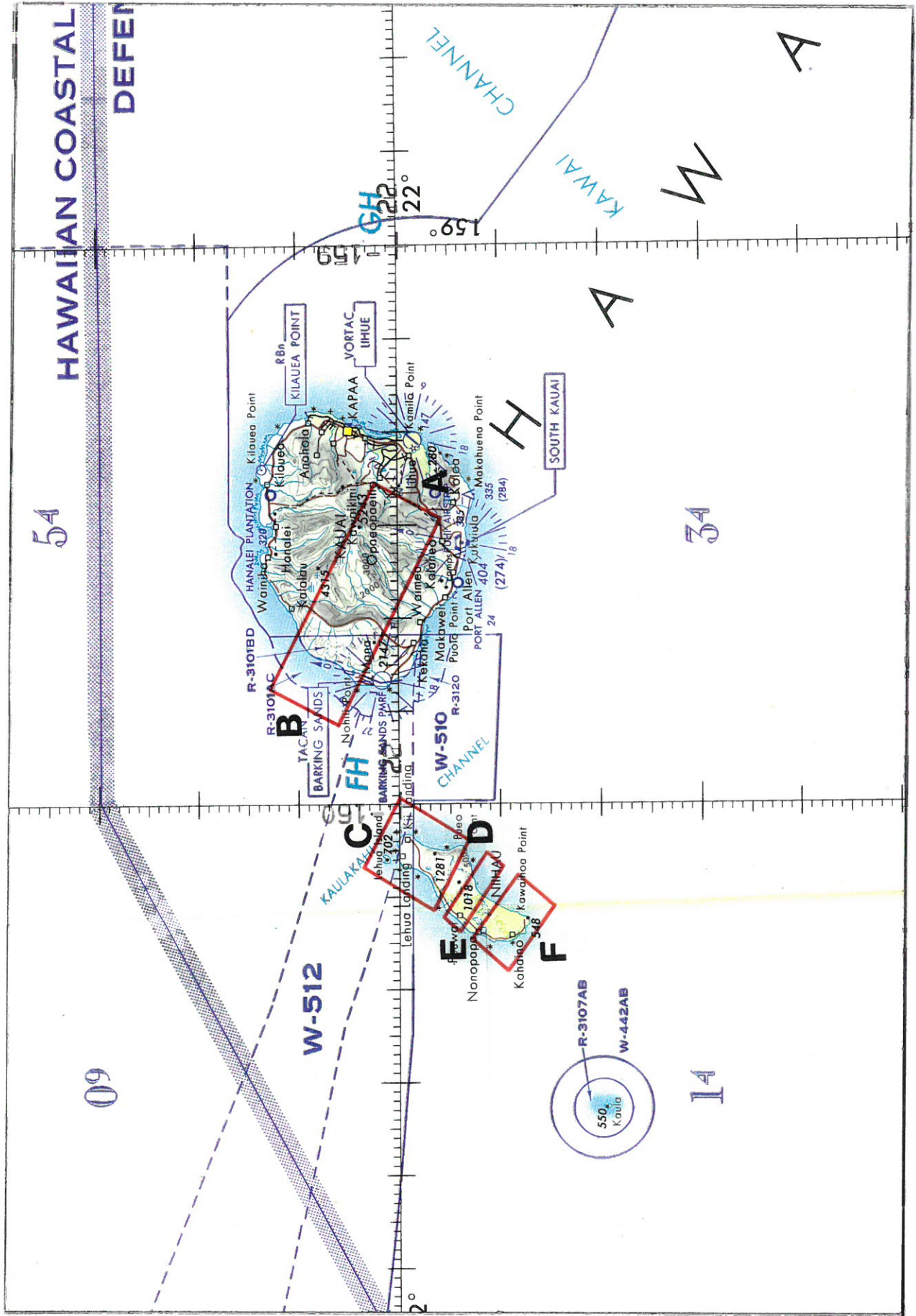
## FLIGHT NO. 92-161

DAEDALUS FLIGHT DATA  
FLIGHT NUMBER: 92-161

Check Points	A c t u a l t i m e b e g i n e n d (GMT)	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 (rps)	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	19:19: 1.0 19:22:23.0	18765 21290	59000/17983	12.50	2501	0	25
C-D	19:24:49.0 19:26: 2.0	23120 24033	61000/18592	12.50	896	0	18
D-E	19:26:14.0 19:26:32.0	24185 24410	61000/18592	12.50	226	0	0
E-F	19:26:40.0 19:27:23.0	24510 25043	61000/18592	12.50	534	0	0
G-H	19:47:11.0 19:49:55.0	39892 41949	61000/18592	12.50	2001	0	57
I-J	19:51:24.0 19:54: 5.0	40062 45066	61000/18592	12.50	2001	0	4
K-L	19:58: 6.0 20:00:14.0	48078 49686	60000/18288	12.50	1600	1	8
M-N	20:01:42.0 20:03:51.0	50788 52096	60000/18288	12.50	1601	0	8
O-P	20:05:59.0 20:09:21.0	54000 56516	59000/17983	12.50	2501	0	16
P-Q	20:15:34.0 20:18:55.0	61185 63695	60000/18288	12.50	2501	0	10
Q-R	20:30:59.0 20:37: 0.0	72753 77263	60000/18288	12.50	4501	0	10
R-S	20:37:23.0 20:38:29.0	77563 78377	60000/18288	12.50	800	1	14
R-T	20:44:29.0 20:46:53.0	82881 87681	59000/17983	12.50	1801	0	0
T-U	20:47: 9.0 20:49: 1.0	84881 86281	59000/17983	12.50	1401	0	0
V-W	20:50:29.0 20:55:34.0	87391 91197	59000/17983	12.50	3801	0	6
X-Y	21:02:15.0 21:04:48.0	96215 98134	59000/17983	12.50	1901	0	19
Z-1	21:07: 4.0 21:09:22.0	99834 101561	60000/18288	12.50	1701	0	27
2-3	21:11:15.0 21:12:43.0	102969 104069	60000/18288	12.50	1101	0	0
4-5	21:16:11.0 21:18:51.0	106673 108679	60000/18288	12.50	2005	0	2
6-V	21:20:52.0 21:22:52.0	110188 111690	60000/18288	12.50	1501	0	2
2-Q	21:29:13.0 21:34: 3.0	116462 120091	60000/18288	12.50	3604	0	26
7-8	21:42:42.0 21:45:31.0	126571 128687	60000/18288	12.50	2101	0	16
J-I	21:52: 2.0 21:55: 6.0	133579 135884	59000/17983	12.50	2300	1	5



FLIGHT 92-161      22 SEPTEMBER 1992      A/C 706      DUAL HR-732 / DUAL RC-10 / TMS



HAWAIIAN COASTAL  
DEFENSE

54

09

W-512

BARKING SANDS

CHANNEL

KAWAI

W

A

A

H

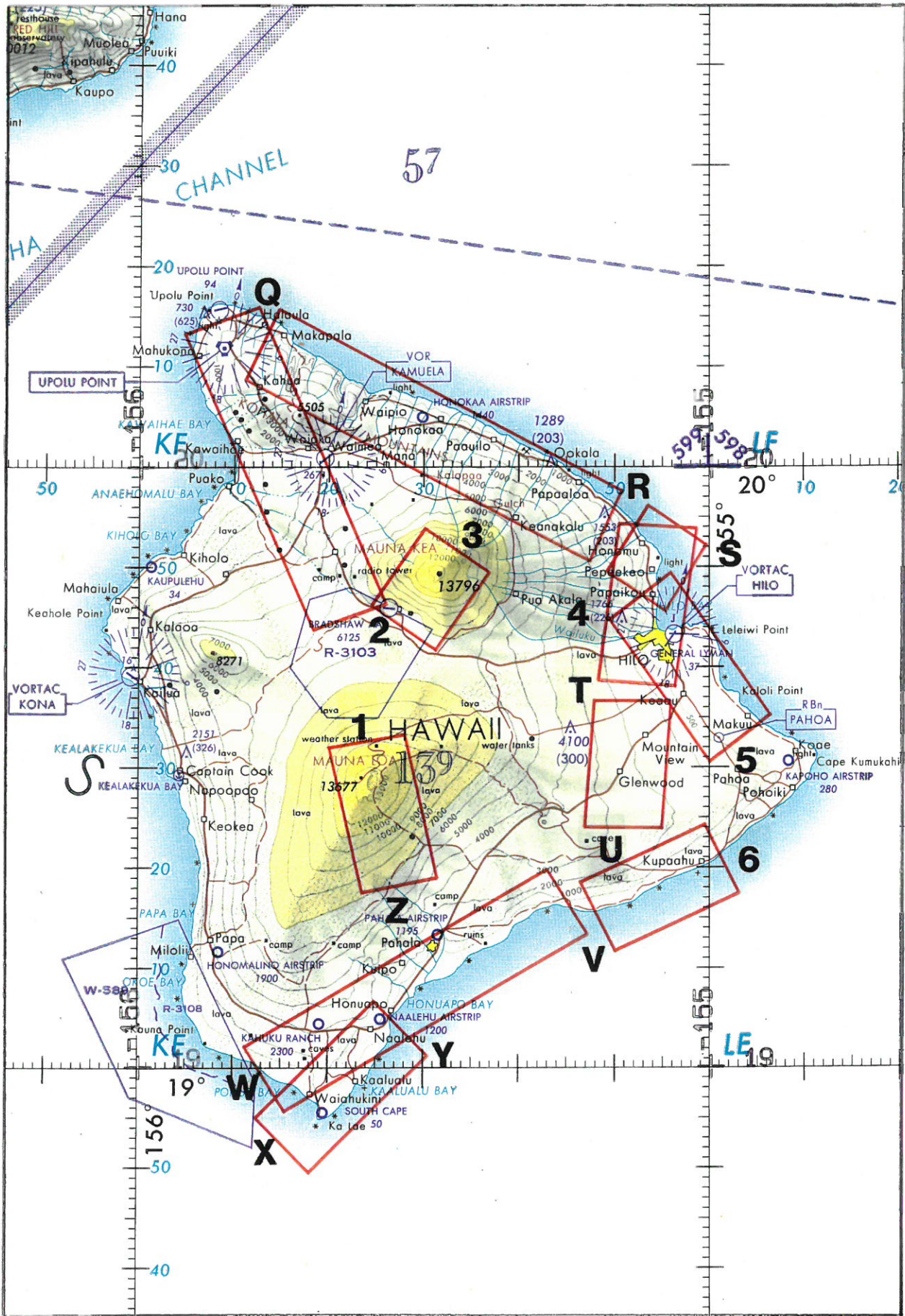
34

R-3107AB  
W-442AB  
550  
Kaula

14







FLIGHT 02-161  
 22 SEPTEMBER 1992  
 A/C 708  
 TWS / DUAL RC-10 / DUAL FH-732  
 ONC J-19