

# FLIGHT SUMMARY REPORT

**Flight #:** 90-060  
**Date:** 15 March 1990  
**Sensor Package:** Airborne Visible and Infrared Imaging Spectrometer (AVIRIS)  
Thematic Mapper Simulator (TMS)  
Thermal Infrared Multispectral Scanner (TIMS)  
Wild-Heerbrug RC-10  
**Area(s) Covered:** Belize

**Investigator(s):** G. Vane, Jet Propulsion Laboratory      **Aircraft #:** 709  
**Flight Request:** 90E207B      **Julian Date:** 074

## SENSOR DATA

<b>Accession #:</b>	-----	-----	-----	04003
<b>Sensor ID #:</b>	099	074	086	026
<b>Sensor Type:</b>	AVIRIS	TMS	TIMS	RC-10
<b>Focal Length:</b>	-----	-----	-----	12" 304.97 mm
<b>Film Type:</b>	-----	-----	-----	High Definition Aerochrome IR SO-131
<b>Filtration:</b>	-----	-----	-----	cc .10B
<b>Spectral Band:</b>	-----	-----	-----	510-900 nm
<b>f Stop:</b>	-----	-----	-----	4
<b>Shutter Speed:</b>	-----	-----	-----	1/150
<b># of Frames:</b>	-----	-----	-----	104
<b>% Overlap:</b>	-----	-----	-----	60
<b>Quality:</b>	-----	-----	-----	Excellent
<b>Remarks:</b>				

## 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 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 a four-line arrays of detectors to image a 614 pixel swath simultaneously in 224 contiguous spectral bands (0.4-2.4  $\mu\text{m}$ ).

AVIRIS parameters are as follows:

IFOV:	1 mrad
GIFOV (at 20 km):	20 m
FOV:	30°
GFOV (at 20 km):	11 km
Spectral Coverage:	0.41 - 2.45 $\mu\text{m}$
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 $\mu\text{m}$	31	9.4 nm
2	0.68 - 1.27 $\mu\text{m}$	63	9.4 nm
3	1.25 - 1.86 $\mu\text{m}$	63	9.7 nm
4	1.84 - 2.45 $\mu\text{m}$	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 Greene at Jet Propulsion Laboratory, 4800 Oak Grove Drive, Mail Stop 11-116, Pasadena, California 91109-8099.

### Thematic Mapper Simulator

The Daedalus Thematic Mapper Simulator (TMS) is a high altitude 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:	1.3 mr
Ground Resolution:	91 feet (28 meters at 70,000 feet)
Total Scan Angle:	43 <sup>o</sup>
Swath Width:	9.0 nmi (16.6 km at 70,000 feet)
Pixels/Scan Line:	716 (750 following rectification)
Scan Rate:	12.5 scans/second
Ground Speed:	400 kts (206 m/second)

### Thermal Infrared Multispectral Scanner

The Thermal Infrared Multispectral Scanner (TIMS) is a multispectral scanning system using a dispersive grating and a six element mercury cadmium telluride detector array to produce six discrete channels in the 8.2  $\mu\text{m}$  to 12.2  $\mu\text{m}$  region.

<u>Channel</u>	<u>Wavelength, <math>\mu\text{m}</math></u>	<u>NET</u>
1	8.2 - 8.6	< 0.3 <sup>o</sup> C
2	8.6 - 9.0	< 0.3 <sup>o</sup> C
3	9.0 - 9.4	< 0.3 <sup>o</sup> C
4	9.4 - 10.2	< 0.3 <sup>o</sup> C
5	10.2 - 11.2	< 0.3 <sup>o</sup> C
6	11.2 - 12.2	< 0.3 <sup>o</sup> C

Sensor/aircraft parameters are as follows:

I FOV:	2.5 mrad
Ground Resolution:	163 feet (50 meters) at 65,000 feet
Total Scan Angle:	76.56 <sup>o</sup>
Swath Width:	16.9 nmi (31.3 km)
Pixels/Scan Line:	638
Scan Rate:	7.3 (scans/second)
Ground Speed:	400 kts. (206 m/second)

**NOTE:** 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 or FTS 464-6252.

**CAMERA FLIGHT LINE DATA  
FLIGHT NO. 90-060**

Accession # 04003

Sensor # 026

Check Points	Frame Numbers	Time (GMT-hr, min, sec)		Altitude, MSL feet/meters	Cloud Cover/Remarks
		START	END		
A - B	0300-0314	20:14:27	20:20:29	65000/19800	60-70% cumulus (frames 0300-0314)
B - A	0315-0329	20:26:12	20:32:15	"	10-60% cumulus (frames 0315-0329)
A - B	0330-0344	20:37:53	20:43:55	"	40-60% cumulus (frames 0330-0344)
B - A	0345-0359	20:49:42	20:55:44	"	10-60% cumulus (frames 0345-0359)
A - B	0360-0374	21:01:26	21:07:28	"	30-60% cumulus (frames 0360-0374)
B - A	0375-0389	21:13:27	21:19:29	"	10-60% cumulus (frames 0375-0389)
C - D	0390-0395	21:35:23	21:37:17	"	Clear
E - F	0396-0403	21:42:45	21:44:57	"	10-40% cumulus (frames 0396-0403)

# TIMS SCANNER FLIGHT LINE DATA

## FLIGHT NO. 90-060

TIMS FLIGHT DATA  
FLIGHT NUMBER: 90-060

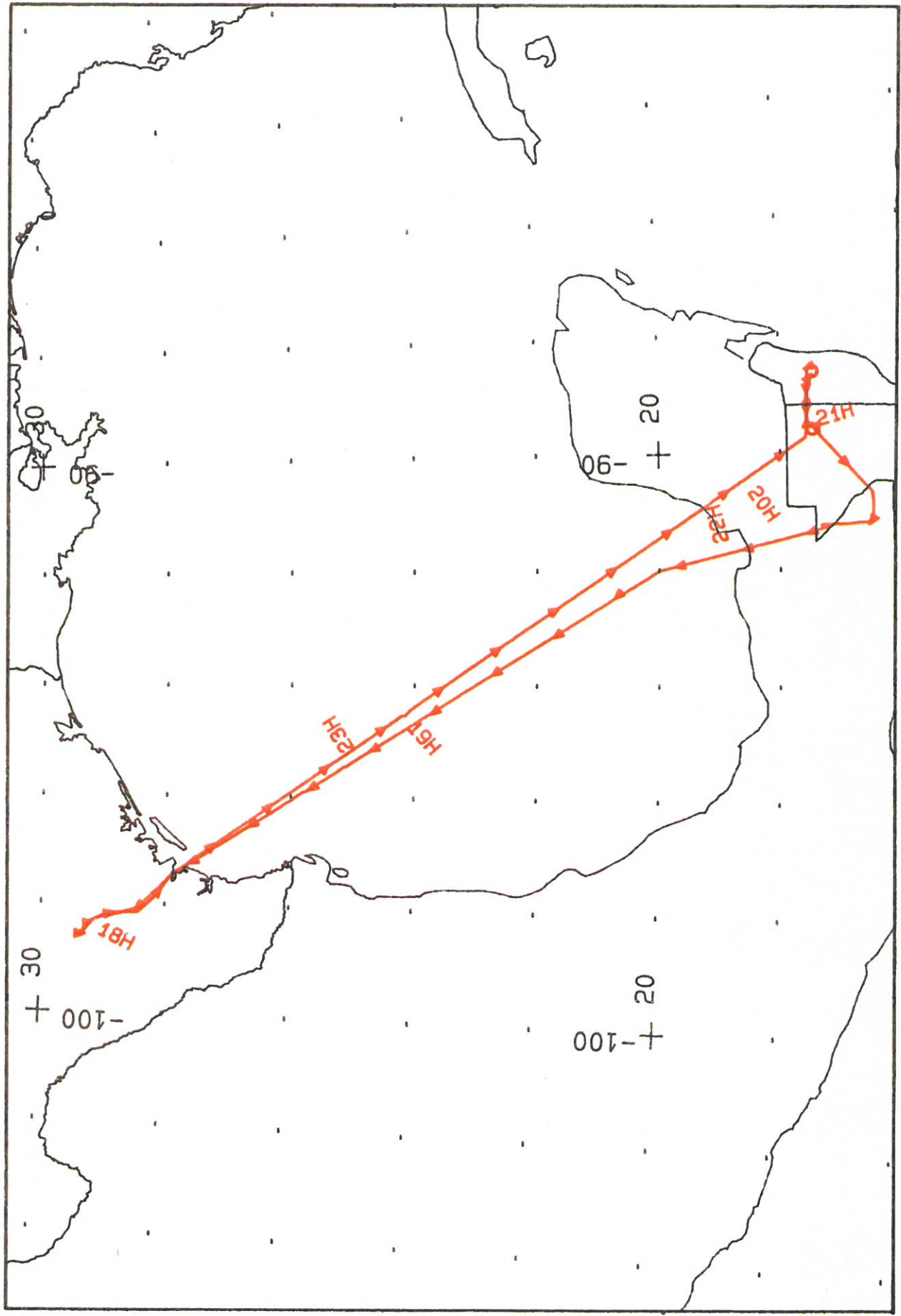
Check Points	A c t u a l t i m e b e g i n e n d (GMT)	A c t u a l s c a n l i n e b e g i n e n d	A l t i t u d e f e e t / m e t e r	Scan S p e e d (rps)	t o t a l G o o d s c a n l i n e s	t o t a l I n t e r p o l a t e d s c a n l i n e s	t o t a l R e p e a t e d s c a n l i n e s
A-B	20:13:38.0 20:19:42.0	63417 66080	65000/19812	7.30	2662	0	2
C-D	20:25:21.0 20:31:36.0	68556 71298	65000/19812	7.30	2743	0	0
E-F	20:37: 1.0 20:43: 8.0	73677 76360	65000/19812	7.30	2684	0	0
G-H	20:48:50.0 20:55: 3.0	78857 81586	65000/19812	7.30	2725	0	5
I-J	21:00:34.0 21:06:41.0	84004 86690	65000/19812	7.30	2681	0	6
K-L	21:12:35.0 21:18:46.0	89274 91989	65000/19812	7.30	2715	1	0
M-N	21:34:31.0 21:36:50.0	98896 99912	65000/19812	7.30	1017	0	0
O-P	21:41:53.0 21:43:39.0	102128 102901	65000/19812	7.30	774	0	0

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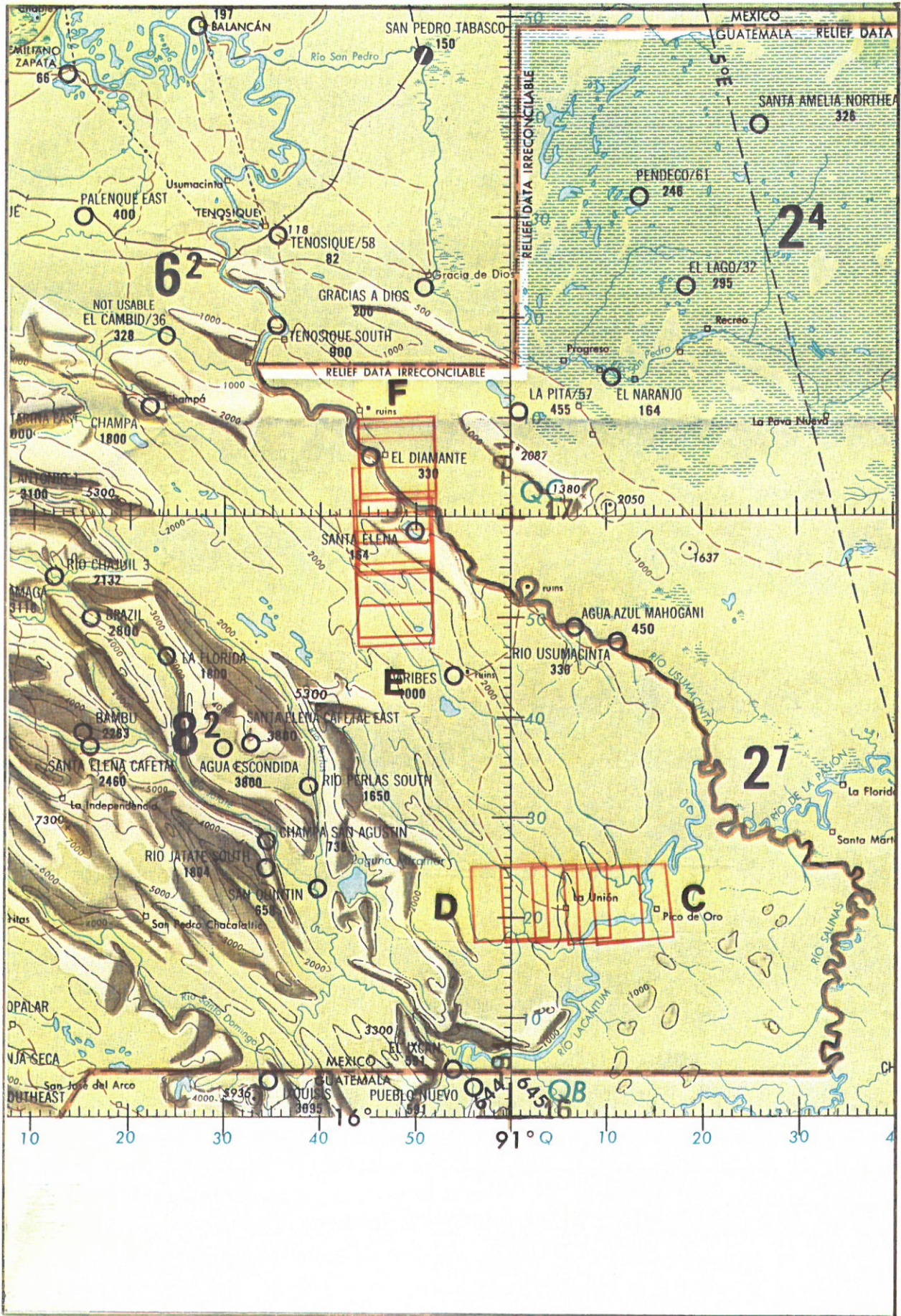
Check Points	A c t u a l t i m e b e g i n e n d (GMT)	A c t u a l s c a n l i n e b e g i n e n d	A l t i t u d e f e e t / m e t e r	Scan S p e e d (rps)	t o t a l G o o d s c a n l i n e s	t o t a l I n t e r p o l a t e d s c a n l i n e s	t o t a l R e p e a t e d s c a n l i n e s
A-B	20:13:38.0 20:19:42.0	63417 66080	65000/19812	7.30	2662	0	2
C-D	20:25:21.0 20:31:36.0	68556 71298	65000/19812	7.30	2743	0	0
E-F	20:37:1.0 20:43:8.0	73677 76360	65000/19812	7.30	2684	0	0
G-H	20:48:50.0 20:55:3.0	78857 81586	65000/19812	7.30	2725	0	5
I-J	21:00:34.0 21:06:41.0	84004 86690	65000/19812	7.30	2681	0	6
K-L	21:12:35.0 21:18:46.0	89274 91989	65000/19812	7.30	2715	1	0
M-N	21:34:31.0 21:36:50.0	98896 99912	65000/19812	7.30	1017	0	0
O-P	21:41:53.0 21:43:39.0	102128 102901	65000/19812	7.30	774	0	0



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