

This document was directly transferred over from the PDS3 IRAS catalog documentation.

OBJECT = MISSION  
MISSION\_NAME = "INFRARED ASTRONOMICAL  
SATELLITE"

OBJECT = MISSION\_INFORMATION  
MISSION\_START\_DATE = 1983-01-26  
MISSION\_STOP\_DATE = 1983-11-23  
MISSION\_ALIAS\_NAME = "IRAS"  
MISSION\_DESC = "IRAS was launched on

January 26, 1983 on a Delta rocket from Vandenburg Air Force Base in California at 02h 17m Greenwich Mean Time. The project was initiated in 1975 as a joint program of the United States, the Netherlands, and the United Kingdom. The satellite consisted of two main parts, the spacecraft and the telescope system. The telescope system comprised the upper part of the satellite and was composed of a two mirror, Ritchey-Chretien telescope mounted within a toroidal superfluid helium tank, which in turn was mounted within the evacuated main shell. The optical system was protected from contamination before launch and during the first week of the mission by an aperture cover cooled with supercritical helium. After the cover was ejected, the sunshade limited heat flow to the aperture by blocking direct solar radiation and reflecting away terrestrial infrared radiation. The telescope was cooled by contact with the superfluid helium tank to temperatures ranging from 2 to 5 K. The surfaces of the sunshade which could be viewed by the telescope aperture were cooled by a three-stage radiator to about 95 K.

IRAS was successfully placed into its planned 900 km altitude, 99 degree inclination Sun-synchronous polar orbit with a period of 103 minutes. With the telescope pointing radially outwards from the Earth and perpendicular to the Sun vector, no Earth or sunlight could enter the telescope

and all ecliptic latitudes would be swept out during one orbit while, as the line

of nodes precessed at a rate of about 1 degree per day to remain perpendicular to the Sun vector, all ecliptic longitudes would be covered in a period of 6 months. To allow mission flexibility, the attitude control system and telescope were designed to allow pointing away from the local vertical.

The satellite attitude was controlled by three orthogonal reaction wheels; excess momentum was dumped via magnetic coils to the Earth's magnetic field as necessary. The attitude, and changes in attitude, were sensed by a combination of a horizon sensor, a sun-sensor and three orthogonal gyros. The z-axis gyro was used in all modes of control and was duplicated to provide a redundant backup.

The telescope was constrained to point no further than 120 degrees away from the Sun, since at greater angles the fine Sun sensor could no longer see the Sun well enough to function. It was constrained also to angles no closer than 60 degrees towards the Sun in order to avoid solar radiation falling into the inside of the sunshade. A third pointing constraint arose from prohibiting radiation from the Earth from falling upon the inside of the sunshield or the top of the telescope baffle system.

Infrared radiation from the Moon and the planet Jupiter was sufficiently strong to affect the performance of the detectors for a significant time after being scanned. An avoidance radius of 1 degree from Jupiter was set within which the telescope did not point. For the Moon, an avoidance radius of 25 degrees was used during the first two months of the survey, but was lowered to 20 degrees after April 3 except between August 26 and September 9 where it was lowered to 13 degrees. At 25 degrees significant 'Moon glints' were entered into the data stream. Diffraction spikes from Jupiter were also introduced into the data stream.

Another constraint was a region of high proton density known as the South Atlantic Anomaly (SAA). Proton hits in the detectors when passing through the SAA increased the noise to such an extent that it was impossible to continue observations. Data usually were not taken whenever the satellite entered a geographically fixed flux/energy contour shown in the IRAS Explanatory Supplement. This contour was mapped out during the Presurvey portion of the mission. On May 9, 1983, this avoidance contour was reduced slightly.

Every 10-14 hours, as the satellite passed over its ground station at Chilton, England, observations would cease for typically 10 minutes as data from the preceding 10-14 hour observation period were being transmitted from the on-board tape recorders to the ground and the commands for the next 10-14 hours of observations were being sent to the satellite."

MISSION\_OBJECTIVES\_SUMMARY = "The primary mission of IRAS was to conduct a sensitive and unbiased survey of the sky in four wavelength bands centered at 12, 25, 60, and 100 microns."

OBJECT =  
MISSION\_PHASE\_INFORMATION  
SPACECRAFT\_ID = "IRAS"  
TARGET\_NAME = "DUST"  
MISSION\_PHASE\_TYPE = "PRESURVEY"  
SPACECRAFT\_OPERATIONS\_TYPE = "TEST"  
MISSION\_PHASE\_START\_TIME = 1983-01-26  
MISSION\_PHASE\_STOP\_TIME = 1983-02-10  
MISSION\_PHASE\_DESC = "After launch, numerous

checks were required to verify the health and safety of the satellite and to determine the best modes of operation. The cooled aperture cover was kept on for the first six days to allow sufficient time for contaminants carried up with the satellite to outgas and disperse so that they would not freeze on the cold optics when the cover was ejected. The

eight days after cover ejection were used to test those aspects of the instrument that could not be tested with the cover on."

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END_OBJECT =  
MISSION_PHASE_INFORMATION  
  
OBJECT =  
MISSION_PHASE_INFORMATION  
SPACECRAFT_ID = "IRAS"  
TARGET_NAME = "DUST"  
MISSION_PHASE_TYPE = "MINISURVEY"  
SPACECRAFT_OPERATIONS_TYPE = "TEST"  
MISSION_PHASE_START_TIME = 1983-02-09  
MISSION_PHASE_STOP_TIME = 1983-02-16  
MISSION_PHASE_DESC = "
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The Presurvey period was followed by the repeated surveying of a limited region of sky to verify the survey strategy and the data processing facilities. The scans of the minisurvey were hand-tailored for maximum efficiency coverage. The area of the sky chosen, approximately 900 square degrees, consisted of two strips of sky centered approximately on ecliptic longitudes 60 and 252 degrees. The region of the sky was that area available immediately after cover ejection. No part of the sky above galactic latitude 40 degrees was scanned. Part of the minisurvey area was covered with four hours-confirming sets of scans to provide a basis for testing the processing of the survey. Minisurvey scans included observations during SOPs 29, 30, 33, 34, 37, 38, 41, and 43. More information on the minisurvey may be found in the IRAS Explanatory Supplement and Rowan-Robinson et al (1984)."

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END_OBJECT =  
MISSION_PHASE_INFORMATION  
  
OBJECT =  
MISSION_PHASE_INFORMATION  
SPACECRAFT_ID = "IRAS"
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TARGET_NAME	= "DUST"
MISSION_PHASE_TYPE	= "SURVEY"
SPACECRAFT_OPERATIONS_TYPE	= "STRIP SCAN"
MISSION_PHASE_START_TIME	= 1983-02-10
MISSION_PHASE_STOP_TIME	= 1983-08-26
MISSION_PHASE_DESC	= "During this period,

the strategy was to acquire four coverages (two sets of hours-confirming coverages, HCON 1 and HCON 2) of the sky.

This was achieved by defining an area of sky ('lune') between two ecliptic meridians 30 degrees apart which was 'painted' by survey scans, one after another, as they passed through the viewing window of the telescope. Using two gyros the spacecraft scan rate was adjusted so that the sky was scanned at a rate of 3.85 arcminutes per second, independent of the solar elongation angle. The first scan in a lune was placed so that it crossed the ecliptic at the lower longitude boundary of the lune. Successive scans were laid down at increasing ecliptic longitudes, each one shifted over by 14.23 arcminutes, that is by half the width of the focal plane minus a safety margin. The overlap ensured that measurements of the same area of sky were repeated within a few orbits (for hours-confirmation) and by generally restricting scans to be within 80 to 100 degrees solar elongation, the curvature of scans would not be too severe. The criterion for hours-confirmation was that the hours-confirming scan had to be made within 34-38 hours of each other. After a lune was filled, a second lune in the same hemisphere was started. It overlapped half of the first lune, ensuring that another hour's-confirming set of scans was repeated after about one to two weeks, thus providing the required repetition on the time scale of 7 to 11 days. During this phase, 95 percent of the sky was covered."

END_OBJECT	=
MISSION_PHASE_INFORMATION	
OBJECT	=
MISSION_PHASE_INFORMATION	
SPACECRAFT_ID	= "IRAS"

TARGET_NAME	= "DUST"
MISSION_PHASE_TYPE	= "SURVEY"
SPACECRAFT_OPERATIONS_TYPE	= "STRIP SCAN"
MISSION_PHASE_START_TIME	= 1983-08-26
MISSION_PHASE_STOP_TIME	= 1983-11-22
MISSION_PHASE_DESC	= "A third set of hours-

confirming coverage of the sky (HCON 3) was undertaken. Half circles rather than lunes were used during this period, beginning with solar elongations near 60 and 120 degrees in general, and working towards solar elongations nearer 90 degrees on succeeding scans. During this mission phase, 72 percent of the sky was covered."

END_OBJECT	=
MISSION_PHASE_INFORMATION	

OBJECT	=
MISSION_PHASE_INFORMATION	
SPACECRAFT_ID	= "IRAS"
TARGET_NAME	= "POINT SOURCES"
MISSION_PHASE_TYPE	= "POINTED OBSERVATIONS"
SPACECRAFT_OPERATIONS_TYPE	= "RASTER SCAN"
MISSION_PHASE_START_TIME	= 1983-02-10
MISSION_PHASE_STOP_TIME	= 1983-11-22
MISSION_PHASE_DESC	= "Roughly 40 percent of

the IRAS mission time was devoted to pointed observations of selected objects. Nearly 10,000 of these observations were made of virtually every kind of astronomical object. Raster scans were made of these objects with scan lengths ranging between 1.6 and 6 degrees, different numbers of scan legs, different sizes of cross-scan steps between legs, and different scan rates."

END_OBJECT	=
MISSION_PHASE_INFORMATION	

END_OBJECT	= MISSION_INFORMATION
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OBJECT =
MISSION_REFERENCE_INFORMATION
  REFERENCE_KEY_ID = "BEICHMANETAL1988"
END_OBJECT =
MISSION_REFERENCE_INFORMATION

OBJECT =
MISSION_REFERENCE_INFORMATION
  REFERENCE_KEY_ID = "NEUGEBAUERETAL1984"
END_OBJECT =
MISSION_REFERENCE_INFORMATION

OBJECT =
MISSION_REFERENCE_INFORMATION
  REFERENCE_KEY_ID = "ROWAN-ROBINSONETAL84"
END_OBJECT =
MISSION_REFERENCE_INFORMATION

OBJECT =
MISSION_REFERENCE_INFORMATION
  REFERENCE_KEY_ID = "YOUNGETAL1985"
END_OBJECT =
MISSION_REFERENCE_INFORMATION

END_OBJECT = MISSION

END

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## **The IRAS 9p Images and Photometry Mission Phase Descriptions**

PRESURVEY

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After launch, numerous checks were required to verify the health and safety of the satellite and to determine the best modes of operation. The cooled aperture cover was kept on for the first six days to allow sufficient time for contaminants carried up with the satellite to outgas and disperse so that they would not

freeze on the cold optics when the cover was ejected. The eight days after cover ejection were used to test those aspects of the instrument that could not be tested with the cover on.

SPACECRAFT\_ID : IRAS  
TARGET\_NAME : SKY  
MISSION\_PHASE\_START\_TIME : 1983-01-26  
MISSION\_PHASE\_STOP\_TIME : 1983-02-10  
SPACECRAFT\_OPERATIONS\_TYPE : TEST

#### MINISURVEY

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The Presurvey period was followed by the repeated surveying of a limited region of sky to verify the survey strategy and the data processing facilities. The scans of the minisurvey were hand-tailored for maximum efficiency coverage. The area of the sky chosen, approximately 900 square degrees, consisted of two strips of sky centered approximately on ecliptic longitudes 60 and 252 degrees. The region of the sky was that area available immediately after cover ejection. No part of the sky above galactic latitude 40 degrees was scanned. Part of the minisurvey area was covered with four hours-confirming sets of scans to provide a basis for testing the processing of the survey. Minisurvey scans included observations during SOPs 29, 30, 33, 34, 37, 38, 41, and 43. More information on the minisurvey may be found in the IRAS Explanatory Supplement by Beichman et al. 1988 [BEICHMANETAL1988] and the IRAS Minisurvey by Rowan-Robinson et al. 1984 [ROWAN-ROBINSETAL1984].

SPACECRAFT\_ID : IRAS  
TARGET\_NAME : SKY  
MISSION\_PHASE\_START\_TIME : 1983-02-09  
MISSION\_PHASE\_STOP\_TIME : 1983-02-16  
SPACECRAFT\_OPERATIONS\_TYPE : TEST



## SURVEY

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During this period, the strategy was to acquire four coverages (two sets of hours-confirming coverages, HCON 1 and HCON 2) of the sky. This was achieved by defining an area of sky ('lune') between two ecliptic meridians 30 degrees apart which was 'painted' by survey scans, one after another, as they passed through the viewing window of the telescope. Using two gyros the spacecraft scan rate was adjusted so that the sky was scanned at a rate of 3.85 arcminutes per second, independent of the solar elongation angle. The first scan in a lune was placed so that it crossed the ecliptic at the lower longitude boundary of the lune. Successive scans were laid down at increasing ecliptic longitudes, each one shifted over by 14.23 arcminutes, that is by half the width of the focal plane minus a safety margin. The overlap ensured that measurements of the same area of sky were repeated within a few orbits (for hours-confirmation) and by generally restricting scans to be within 80 to 100 degrees solar elongation, the curvature of scans would not be too severe. The criterion for hours-confirmation was that the hours-confirming scan had to be made within 34-38 hours of each other. After a lune was filled, a second lune in the same hemisphere was started. It overlapped half of the first lune, ensuring that another hour's-confirming set of scans was repeated after about one to two weeks, thus providing the required repetition on the time scale of 7 to 11 days. During this phase, 95 percent of the sky was covered.

See Beichman et al. 1988 [BEICHMANETAL1988].

SPACECRAFT_ID	: IRAS
TARGET_NAME	: SKY
MISSION_PHASE_START_TIME	: 1983-02-10
MISSION_PHASE_STOP_TIME	: 1983-08-26
SPACECRAFT_OPERATIONS_TYPE	: STRIP SCAN

## SURVEY

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A third set of hours-confirming coverage of the sky (HCON 3) was undertaken. Half circles rather than lunes were used during this period, beginning with solar elongations near 60 and 120 degrees in general, and working towards solar elongations nearer 90 degrees on succeeding scans. During this mission phase, 72 percent of the sky was covered. See Beichman et al. 1988 [BEICHMANETAL1988].

SPACECRAFT\_ID : IRAS  
TARGET\_NAME : SKY  
MISSION\_PHASE\_START\_TIME : 1983-08-26  
MISSION\_PHASE\_STOP\_TIME : 1983-11-22  
SPACECRAFT\_OPERATIONS\_TYPE : STRIP SCAN

#### POINTED OBSERVATIONS

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Roughly 40 percent of the IRAS mission time was devoted to pointed observations of selected objects. Nearly 10,000 of these observations were made of virtually every kind of astronomical object. Raster scans were made of these objects with scan lengths ranging between 1.6 and 6 degrees, different numbers of scan legs, different sizes of cross-scan

steps between legs, and different scan rates.

See Young et al. 1985 [YOUNGETAL1985].

SPACECRAFT\_ID : IRAS  
TARGET\_NAME : POINT SOURCES  
MISSION\_PHASE\_START\_TIME : 1983-02-10  
MISSION\_PHASE\_STOP\_TIME : 1983-11-22  
SPACECRAFT\_OPERATIONS\_TYPE : RASTER SCAN"

MISSION\_OBJECTIVES\_SUMMARY = "

Mission Objectives Overview

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The primary mission of IRAS was to conduct a sensitive and unbiased survey of the sky in four wavelength bands centered at 12, 25, 60, and 100 microns."

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END_OBJECT = MISSION_INFORMATION

OBJECT = MISSION_HOST
  INSTRUMENT_HOST_ID = "IRAS"

  OBJECT = MISSION_TARGET
    TARGET_NAME = "DUST"
  END_OBJECT = MISSION_TARGET
END_OBJECT = MISSION_HOST

OBJECT =
MISSION_REFERENCE_INFORMATION
  REFERENCE_KEY_ID = { "BEICHMANETAL1988",
                       "NEUGEBAUERETAL1984",
                       "ROWAN
ROBINSETAL1984",
                       "YOUNGETAL1985" }

  END_OBJECT =
MISSION_REFERENCE_INFORMATION

END_OBJECT = MISSION

END

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