Stratospheric Observatory for Infrared Astronomy (SOFIA)
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WHY Infra-Red?

An object can appear radically different depending on the type of light collected from it:

view at visual wavelengths  far-infrared view

Constellation Orion
What is SOFIA?

A 2.5 m telescope in a modified B747SP aircraft
- Optical-mm performance
- The obscured Infrared (IR) (30-300 um) is most important

Joint Program between the US (NASA - 80%) and Germany (DLR- 20%)
- USRA and the Deutsches SOFIA Institute (DSI, University of Stuttgart) are the science mission contractors

Built for 20 year lifetime
- Operates at 39,000 to 45,000 feet.
- Above > 99% of obscuring water vapor.
- Wide instrument range. Future Instrumentalists

World Wide Deployments, will ramp up to ~1000 science hours per year
- Science flights to originate from NASA Dryden Flight Research Center (DFRC).
- Science Center is located at NASA Ames Research Center.
Basic Roles & Responsibilities

Dryden Flight Research Center (DFRC)
- Overall Program Management (may be transferred to Ames at full operations).
- Aircraft development, testing, operations and maintenance.
- Palmdale Regional Airport Operating Location

Ames Research Center (ARC)
- “Science Project” management

USRA and DSI
- Science Mission Contractors – Instruments, Observing Time, etc.
- Together form a roughly 76 person Science Center at Full Operational Capability
  - 32 Personnel at Palmdale
  - 44 Personnel at ARC
- DSI is an associate contractor to USRA
  - USRA relations with DSI are very strong.
The Science Mission Operations has Split Geographic Locations:

**SOFIA Science Center at NASA Ames Research Center**
- Science Mission Operations Director & Deputy in place
- Science Staff**
- Science Data Network (SOFIA Data Cycle System & Archive)
- Mirror Coating Facility
- Mission Planning
- Systems Integration Laboratory
- Science Instrument Laboratories
- Education & Public Outreach

**SOFIA Operations Center at NASA Dryden Aircraft Operations Facility in Palmdale**
- Telescope Assembly & Science Instrument Integration Team
- Operations Staff
- Early Science Instrument Laboratories
- Systems Integration Laboratory
- Mission Systems Development (Flight Data & Observatory Data Cache)

**PhD Internships being sponsored between University of Stuttgart and USRA.**
SOFIA in the Palmdale Hanger
Observers in pressurized cabin have ready access to the focal plane.
Coated Mirror on SOFIA
We are here!

- **Arrival at Dryden**
- First Door Closed Flight
- HIPO Line Ops
- Door open Flight
- First In-Flight Light
- **Basic Science TA V&V**
- **Instrument Commissioning**
  - Inst 1
  - Inst 2
  - Inst 3
  - Inst 4
  - Inst 5
  - Inst 6
- Backup & Heavy Maint.

**Timeline:**
- CY07
- CY08
- CY09
- CY10
- CY11
- CY12
- CY13
- CY14
- CY15

**Operations:**
- Segment 3 Downtime Elements
  - Avionics Upgrade (Part 2)
  - Cavity Insulation
  - CECS
  - MCCS
  - Observatory Upgrades

**Key Points:**
- ISF = Initiation of Science Flights
- FOC = Full Operational Capability
- SS = Short Science

**Legend:**
- Green: Science Flight activity
- Blue: Engineering flights
- Yellow: A/C Testing/Work
The Four “First Light” Instruments are in an advanced state of readiness

High Speed Imaging Photometer for Occultation (HIPO) instrument performed characterization operations on Telescope Assembly during Dec 2008

Second SI to fly, German Receiver for Astronomy at Terahertz Frequencies (GREAT) Bonn, Germany February 2011

Faint Object InfraRed Camera for the SOFIA Telescope (FORCAST) First Science Instrument (SI) May 2010

Field Imaging Far-Infrared Line Spectrometer (FIFI-LS), Garching Germany, Will be flying 2012
## First Light Flight Plan

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Visible light image

SOFIA infrared image
(5.4, 24.2, and 37.1 µm)
First Light - Galaxy

M82

Inset (visible light)

Visible light image

SOFIA infrared image (19.7, 31.5, and 37.1 μm)
Education
Research flight experience for educators
Summer workshops for college faculty and students to encourage research, Production and dissemination of curricula & class activities; school visits

Public Outreach
Displays at public events
April: “Spaceward Bound,” Yuri’s night
May: SOFIA podcast for “365 days of astronomy” for “First Light” flight

Public Affairs (Public Information & Press Relations)
Press releases and media productions:
  First open-door flight
  First Light flight
  Short Science results
  SOFIA Branding

Science Community Outreach
SOFIA exhibits, talks, posters at science conferences
Support for colloquia by SOFIA scientists and engineers
Convince the Community that we are real
SOFIA modeled after the Kuiper Airborne Observatory FOSTER educator flight program
Program making progress!

- First Light (Heat) with FORCAST was a great success.
- Aircraft handles well even with door open.
- Envelope now cleared to 45,000ft
- First science in 2010

SOFIA will be one of the primary facilities for far-IR and sub-millimeter astronomy for many years
SOFIA First Light Image, May 25, 2010

Red = 37.1um, Green = 24.2um, Blue = 5.4um