TCM (Tilt Chopping Mechanism)
Project context

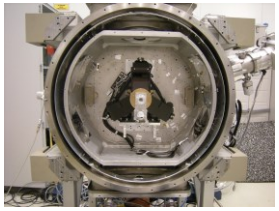
Leszek LISOWSKI

CSEM 2001 – 2015 (mécatronique activités)

http://electronics-lis.wixsite.com/mysite

https://www.facebook.com/electronics1lisowski/

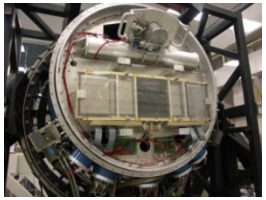
electronics-lis



Sofia (Wako, Palmdale USA)

Gran Telescopio CANARIAS

DTU (Canary Islands Spain)



CALTECH

MOSFIRE

Slit mask (Pasadena California, Big Island Hawaii-USA)

Infrared observation

Space (Hubble telescope)

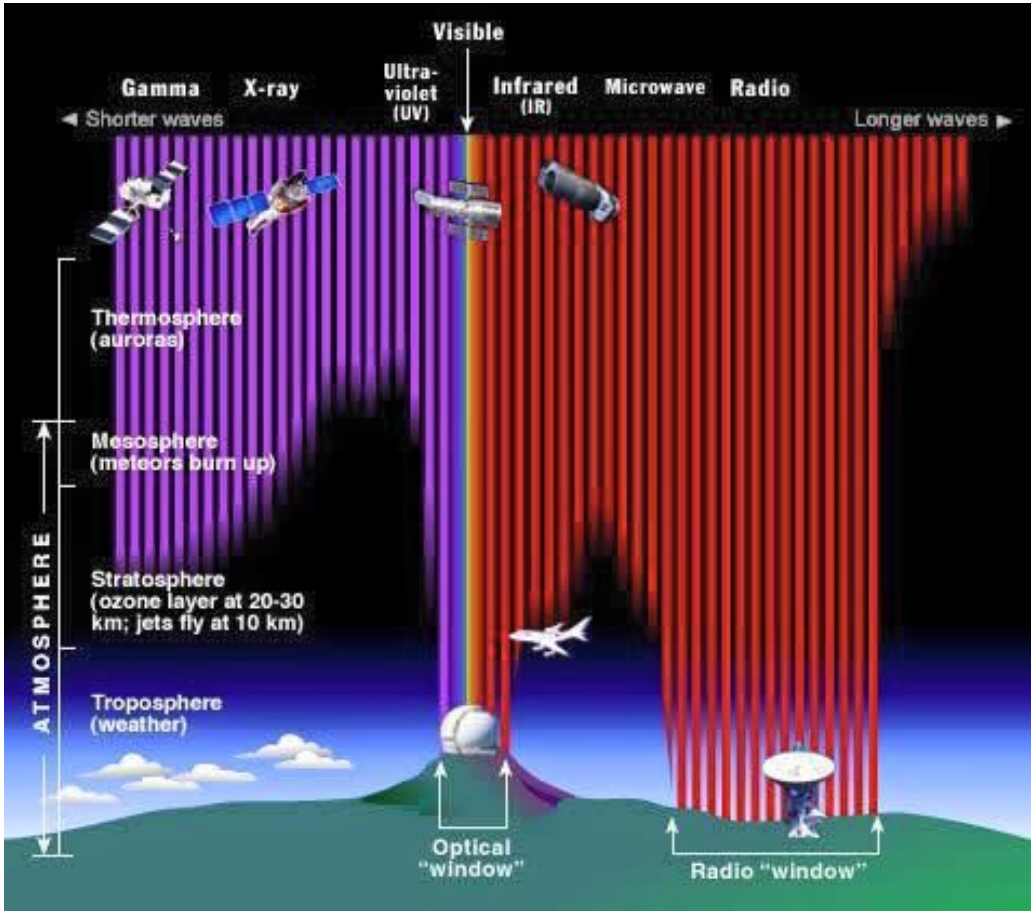
Sofia

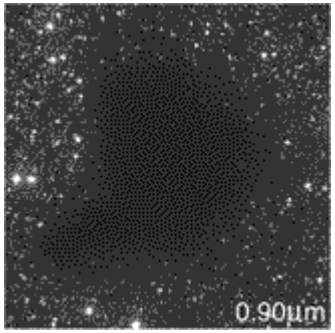
Nasa and DLR project currently managed by Nasa and DSI (Deutsches SOFIA Institut)

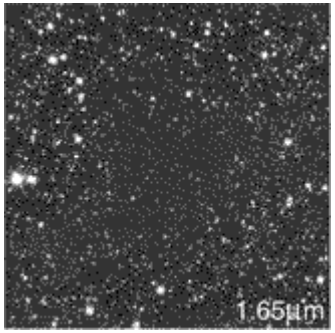
Ground

Infrared observation

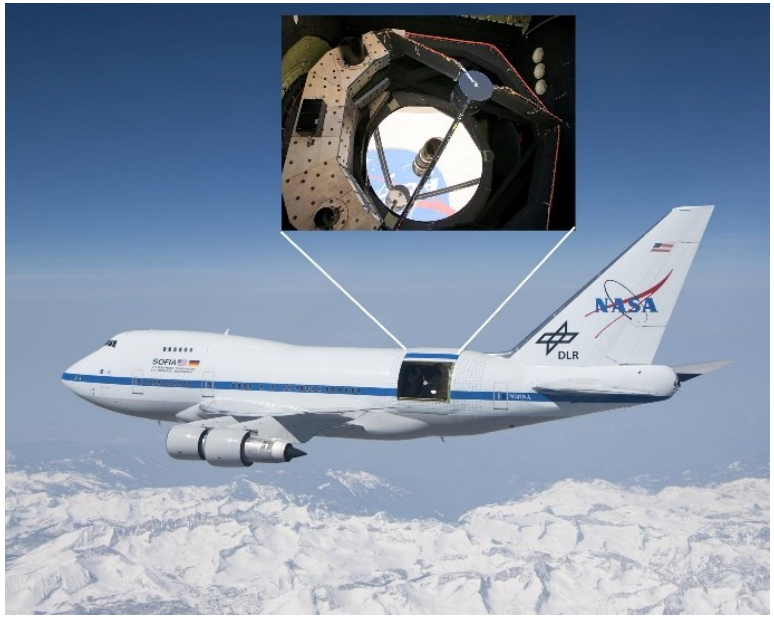
Atmospheric perturbations and IR absorption !!!!





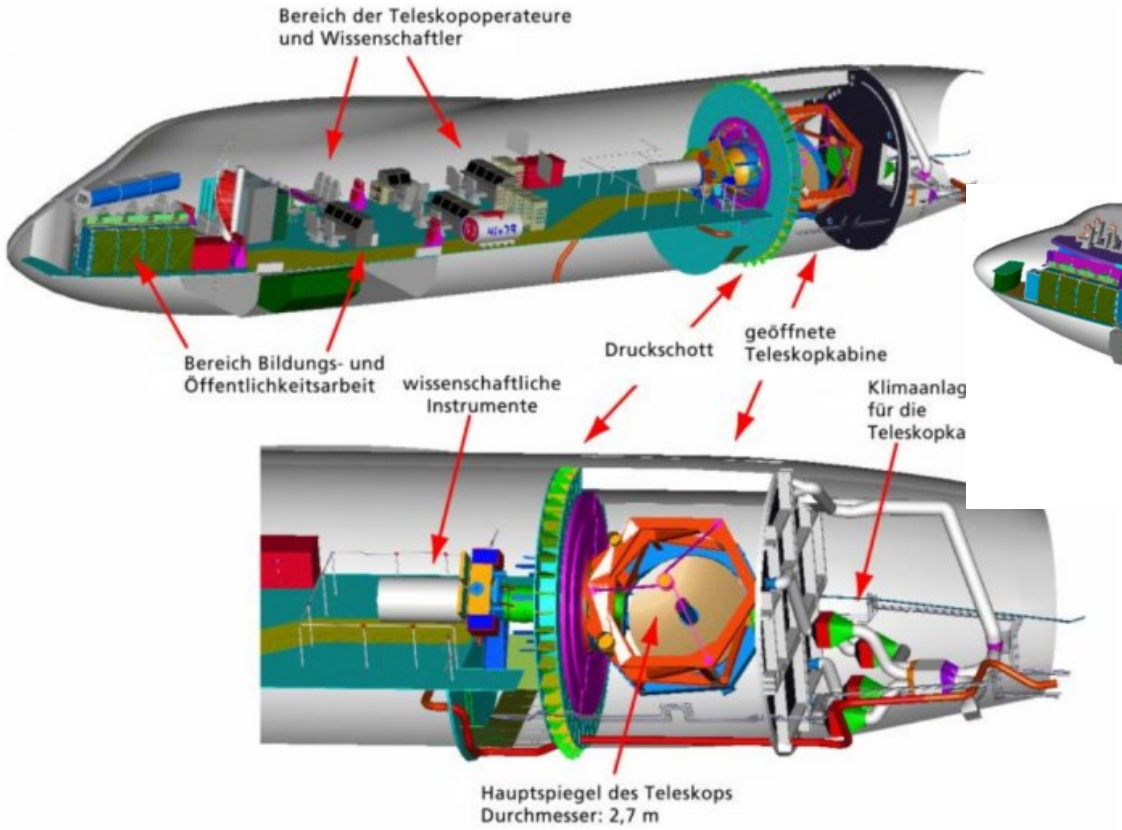


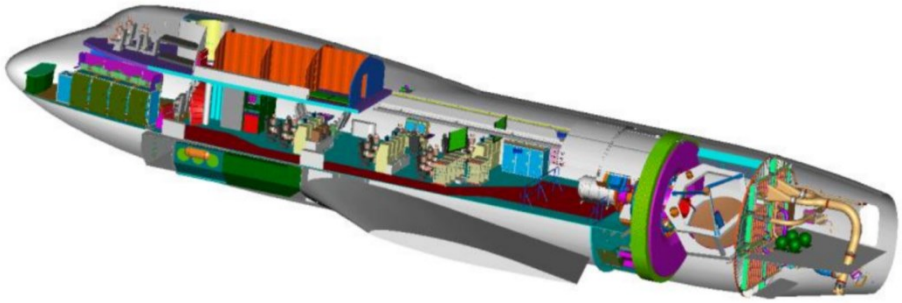
Aircraft configuration



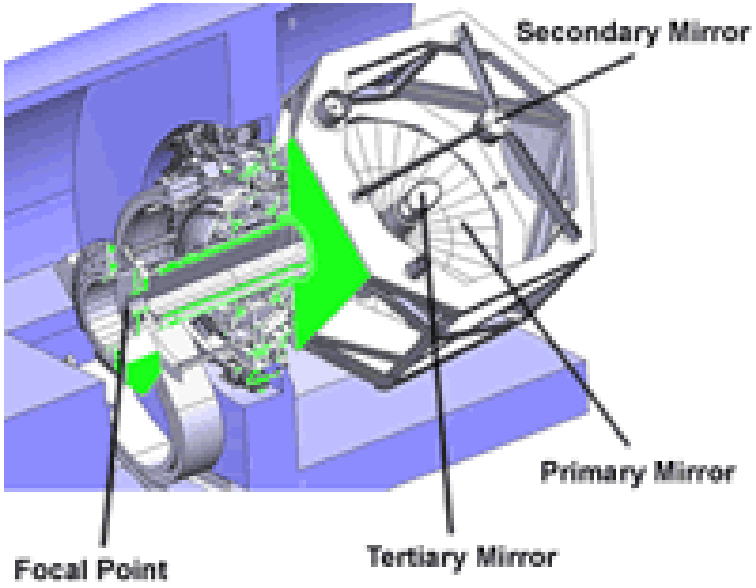
* acquired by Pan American World Airways and was delivered in May of 1977.
* 1977-the 50th anniversary of his history-making first solo flight from New York to Paris in 1927.
* In February 1986, United Airlines purchased the plane
* December 1995, and it was purchased by NASA in 1997.
* On April 26, 2007, SOFIA again flew the skies over Waco, Texas during its first test flight.
* On January 14, 2007, at the end of its closed-door

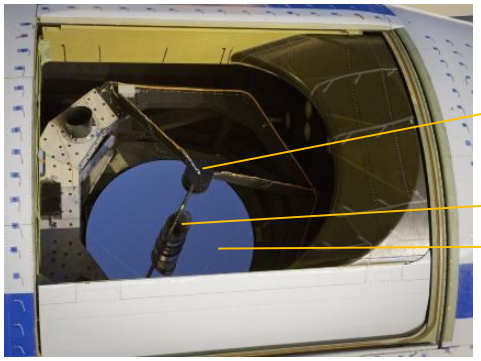
Aircraft configuration

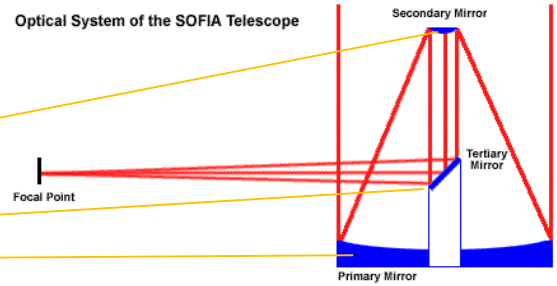




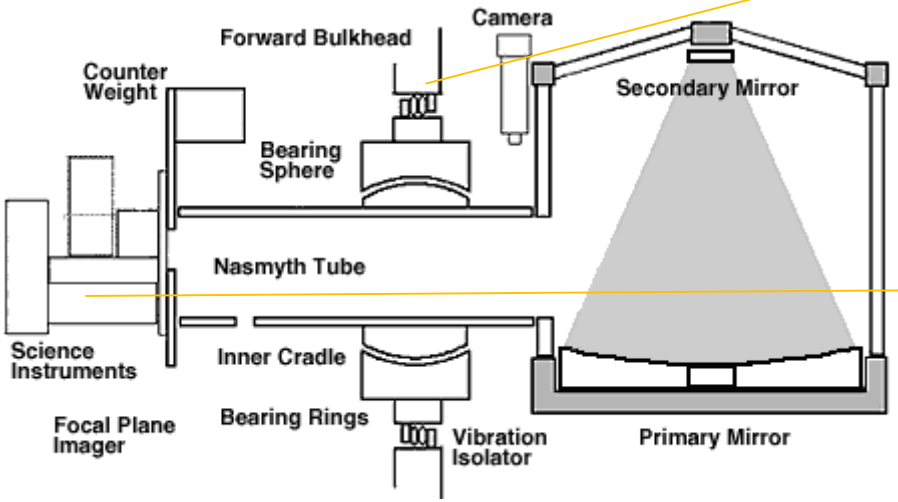
Telescope and mirrors

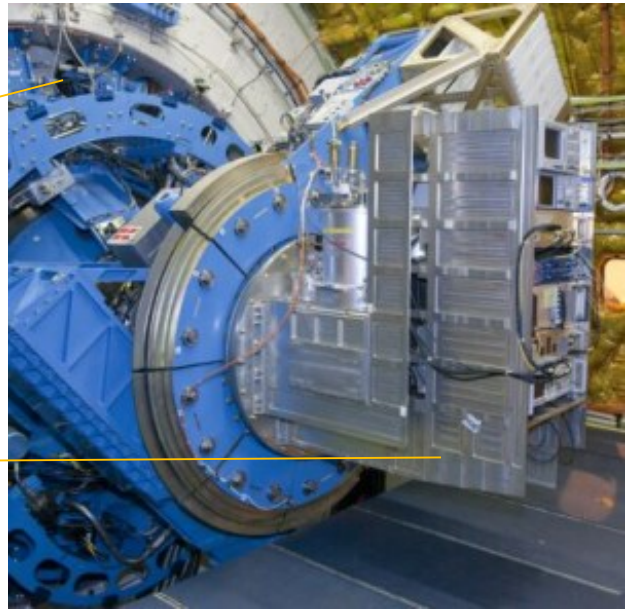






Telescope and mirrors



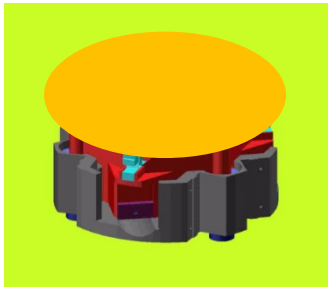


Telescope and mirrors

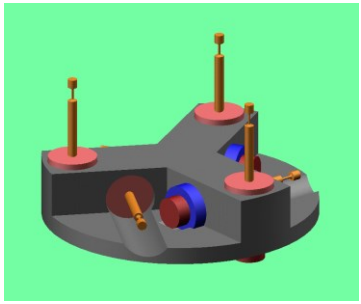
The telescope's primary mirror blank was cut from a blank of Zerodur (TM) developed by Schott Glaswerke in Mainz, Germany (near Frankfurt). Zerodur was selected because it is a unique glass-ceramic material with a zero thermal expansion.

The mirror blank started out measuring over 3 meters in diameter and weighting 3,800 kg. Through the lightweighting process, the mirror blank became the SOFIA telescope mirror of 2.7 meter with a svelte weight of 880 kg (1,940 lbs).

CSEM and Sofia project SMA (Second Mirror Assembly ; mechanism & electronic)



TCM (Tilt Chopping Mechanism)
•Three voice coils (5A@35V)
• High dynamics performances (± 7deg@15 ms)
• No reaction on spider

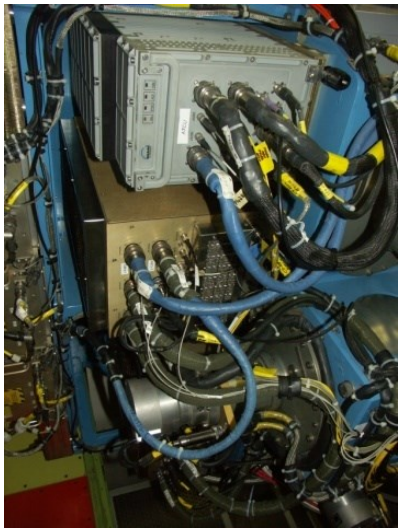


FCM (Focus Centring Mechanism)
•Six Brushless actuators
• High precision performances
• Hexapod configuration
• Actuators extremely high integration

CSEM and Sofia project SMA (Second Mirror Assembly ; mechanism & electronic)

Wako (Texas 2007)

What is wrong ?

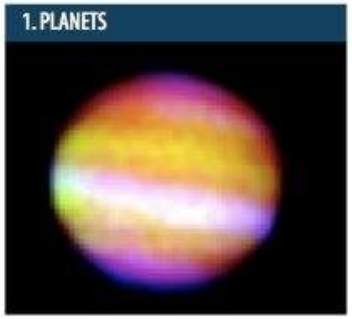


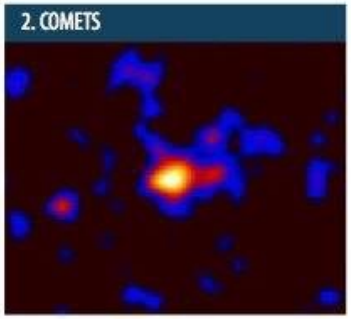
SMA control

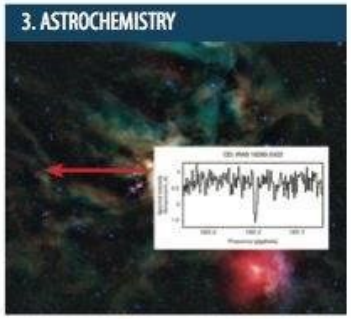
Palmdale (California 2014)

https://www.sofia.usra.edu/
https://www.dsi.uni-stuttgart.de/
https://www.facebook.com/SOFIAtelescope

SOFIA today







SOFIA

Stratospheric Observatory for Infrared Astronomy

STUDIES

The SOFIA observatory studies mid- and far-infrared wavelengths (30-300 microns) providing data that cannot be obtained by any other astronomical facility on the ground or in space, including all past, present, or those observatories now under development.

INSTRUMENT SUITE

EXES • spectrometer • 4.5–28.3 microns

FIFI-LS • spectrometer • 50–200 microns

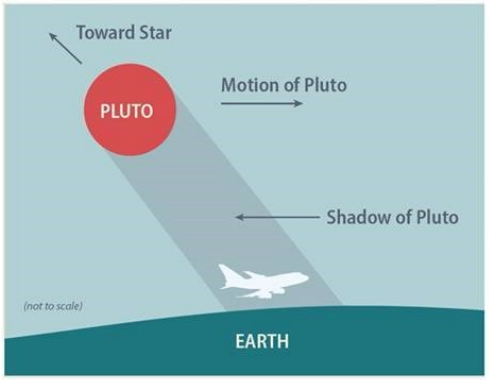
FLITECAM • near IR test camera • 1–5 microns

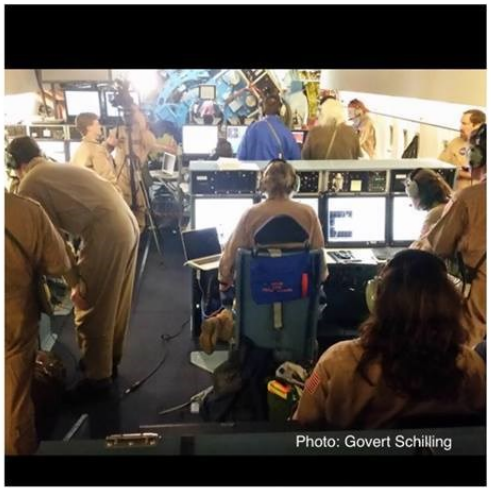
FORCAST • mid/far IR camera • 5–40 microns

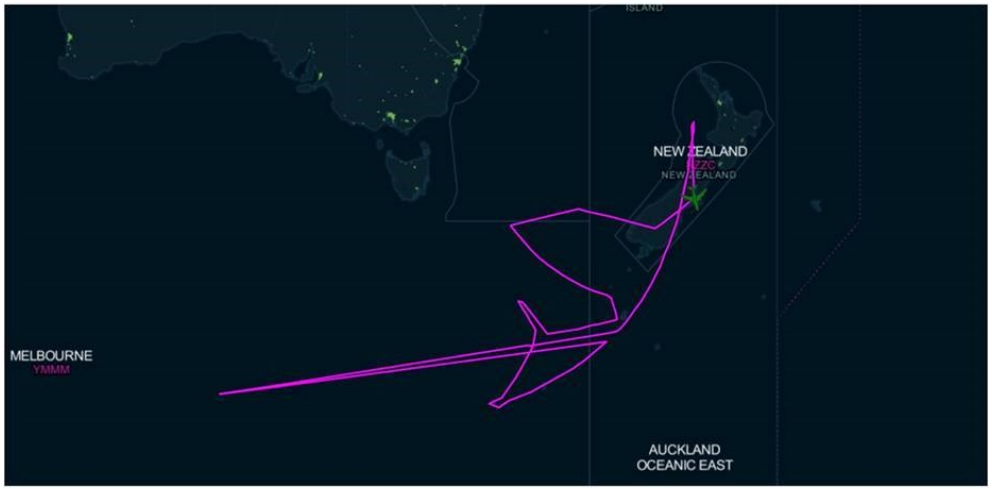
GREAT • spectrometer • 60–200 microns

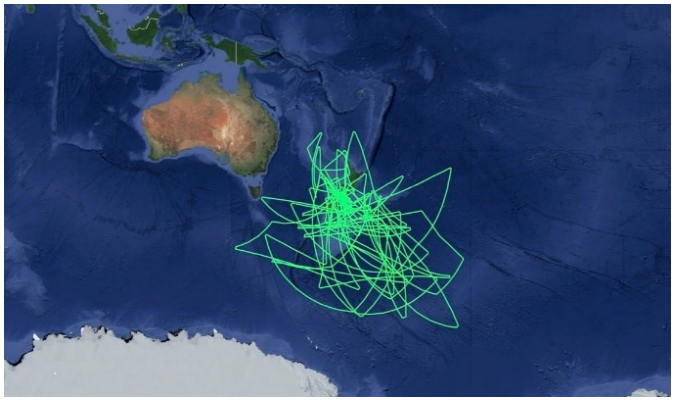
HIPO • photometer • 0.3–1.1 microns

SOFIA's missions









New Zealand (2015 Eclipses of Pluto)

SOFIA's missions