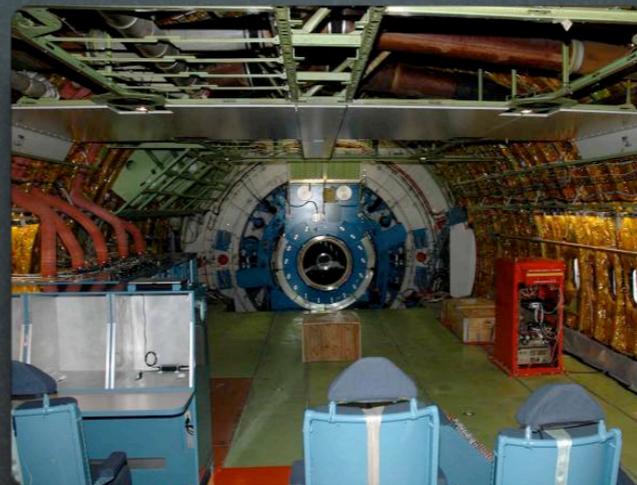
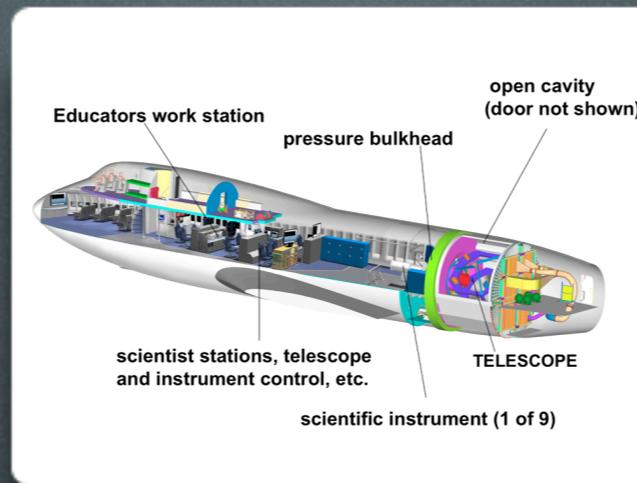


The Case Against SOFIA

Stop the Billion-Dollar Boondoggle



Awesome Pictures of SOFIA we Stole
from John Lacy's Talk

Compressed SOFIA Timeline

- 1984: Ad hoc group of IR astronomers propose a Stratospheric Observatory For Infrared Astronomy
- 1997: NASA purchases a Boeing 747SP (built in 1977) from United Airlines
- 1997 to present: modifications of aircraft, design and construction of telescope and instruments, lots of dilly-dallying, making excuses, etc
- present state: ongoing flight tests at Dryden Flight Research Center, Edward AFB

SOFIA's Future Timeline

- Science flights planned to begin in 2009
 - We're skeptical
- The plan is for SOFIA to fly 180 nights per year for 20 years, with total price-tag estimated at \$3 billion
- Each science flight will burn 30,000 gallons of jet fuel and provide 6 hours for observations
- The cost per flight will turn out to be \$830,000, or \$38/second of observing time (c.f. with Keck \$1/s)

Let's Ignore The Astronomy

- For the purposes of assessing the environmental impact of SOFIA, we ignore the telescope and focus on the airplane
- We assume that the impact of casting a 2.5 meter telescope, constructing the special mount and instruments, and the overhead of pulling it all together is negligible compared to the burning of 30,000 gallons of jet fuel per night
- What would be the impact simply of flying a 747SP for 1080 hours per year for 20 years?

2,278,260,000
pounds of extra CO₂
in our atmosphere

Source: US DoE Energy Information Administration,
1 gallon jet fuel burned produces 21.095 pounds CO₂

In Context

- To operate SOFIA as planned will require the emission of $1.14 * 10^6$ tons of additional CO₂
- To put this into context, in 2004 humans emitted $3.0 * 10^{10}$ tons of CO₂[†]
- SOFIA contributes < 0.0002% of annual CO₂ emissions during lifespan
- The atmosphere contains $3.3 * 10^{12}$ tons of CO₂^Ω

[†]Source: United Nations Carbon Dioxide Information Analysis Center via Wikipedia, http://en.wikipedia.org/wiki/List_of_countries_by_carbon_dioxide_emissions

^ΩSource: Journal of Geophysical Research, Vol. 93, NoD9, Pages 10,925 (1988) via Wikipedia, http://en.wikipedia.org/wiki/Carbon_dioxide

More Context

- If we assume there are 20,000 commercial airliners each emitting CO₂ at the same rate as SOFIA, but operating at 360 flights/year, then this assumed global airline industry will account for 0.08% of global CO₂ emissions (2004 levels).[†]
- In 1999 the United States emitted $2.2 * 10^9$ tons of CO₂ to generate electricity. This is 0.08% of annual global CO₂ emissions (2004 levels).^Ω

[†]Source: my Ti-86

^ΩSource: US DoE Energy Information Administration via Wikipedia,
http://en.wikipedia.org/wiki/Carbon_dioxide and my Ti-86

Is SOFIA Worth It?

- Environmentally, it's a drop in the bucket
- Monetarily, it costs about as much as JWST
- The only advantage SOFIA claims over JWST is interchangeable and upgradable instruments
- For my money, I'd rather have two JWSTs



NASA/JPL-Caltech/Z. Wang

Antennae Galaxies
IRAC @ 8 microns (red; 160s, 4" x 4")
complement with same resolution with
FORCAST @ 24 microns