

***Cosmic Background Explorer,***

***COBE***

***Goddard in the 1980's***

**Dennis McCarthy**

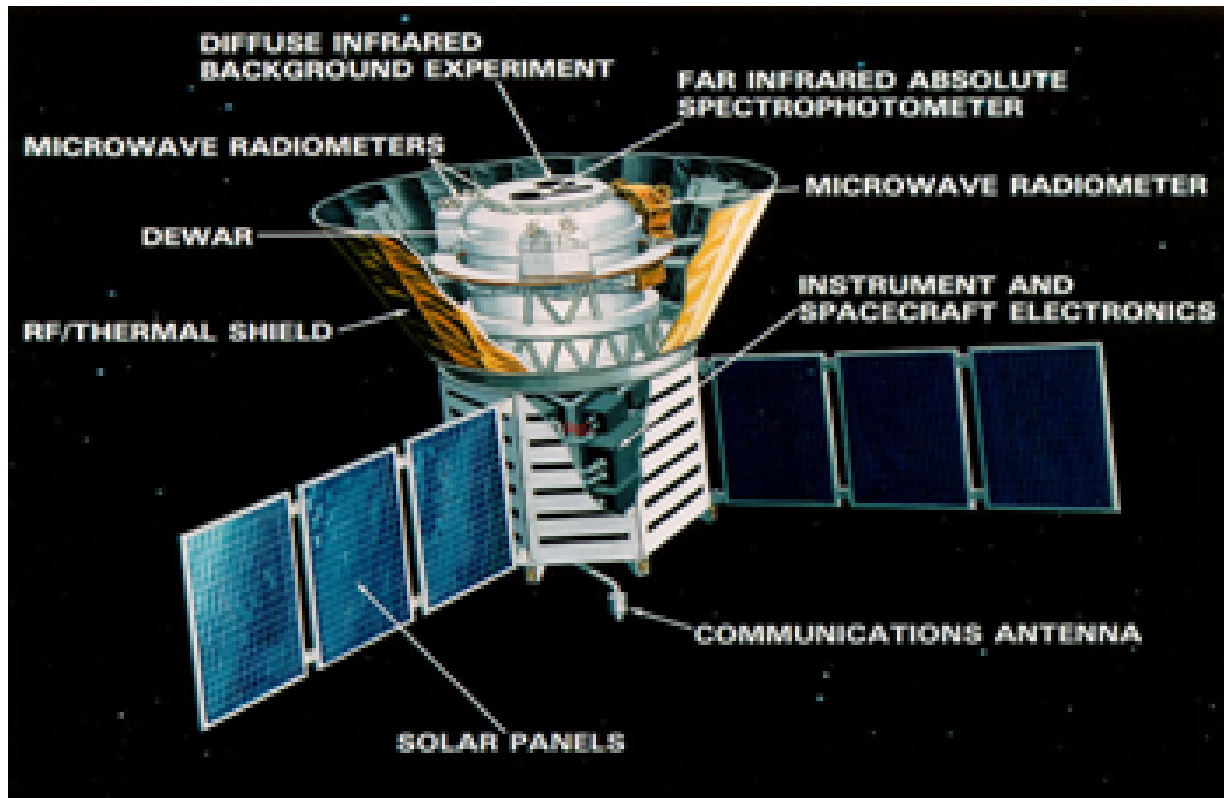
**COBE Deputy Project Manager**

# COBE

- COBE was “Nobel science.” Nothing like the instruments had ever been built before.
- The COBE Project was the most demanding from an engineering aspect because it had to be so precise. To achieve its goal of measuring the diffuse infrared and microwave radiation from the early universe, it had to be essentially perfect.
- COBE had cryogenic instruments at liquid helium. There was a 100% failure rate, when the instruments were placed in test dewars to test materials properties and electronics.
- COBE was designed to launch from Vandenberg Air Force Base on the Shuttle, where it would be inserted into a polar orbit at 12,000 pounds.
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- Moving from a Shuttle launch to a Delta rocket because of the *Challenger* accident forced engineering to completely rethink every aspect of the spacecraft’s design with a total weight of 5,000 pounds.

# COBE

## COBE Satellite



## COBE Development

- **COBE was developed in house at GSFC for two reasons:**
  - **It was a training Program for future Managers. The NASA Chief Engineer, the GSFC Head of Engineering and a Division Chief worked on COBE**
  - **These instruments could not have been developed out of house.**
- **COBE required ~ 9 years and 2,000 many years of effort, i.e. 4 million hours of engineering, scientist, and technician support because it was so difficult.**
- **COBE success can be attributed to the thorough test program. Single string designs were acceptable if they are thoroughly tested to remove infant mortality of components**

# COBE Re-Design

**Trades:** Decision Making  
Skunk Works, Co-Located All Personnel  
War Room (responsible name on each schedule)  
Peer Review (hand selected personnel) of re-Design

**Experts:** Hinshelwood, Webb, Martin

**Q/A** Empowered  
Read every GIDEP alert personally

**Testing:** Deferred tests, but never eliminated tests; ran for 2 weeks at the end  
Don't make a decision before you have to  
Keep your options open  
COBE was allowed to just run for 2 weeks after the qualification Program so that the scientists could learn all of the characteristics, idiosyncrasies, behavior, etc of the spacecraft and instruments

**Communication:** Encouraged anyone to talk with me anytime

**How did I know how to do this?**  
Observed other project Managers  
"B.P." Prudent, Practical, Patient, Perseverance,  
Protective (hardware and personnel)

**Financial pressures**  
Project maintained budget, not Directorates  
Fix the ground system and spacecraft; develop  
the instruments  
Sold COBE Shuttle hydrazine propulsion  
system to DOD