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EXPANDING THE FRONTIERS OF SPACE ASTRONOMY

Maintenance and Refurbishment of ST

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2019-05-30



The Large Space Telescope was radical in goals and design, esp. including being able to be serviced

- Matched to Shuttle in size and orbit
 - Large as possible to fit in bay
 - Highest possible orbit (320 nm, 600 km)
- Needed the shuttle to survive via maintenance and replacement
 - Solar arrays
 - Batteries (originally Ni-Cad)
 - Infrastructure (NSSC, recorders, gyros, ...)
- Refurbishment could update and augment capabilities



1983 Weiler white paper

Ed Weiler wrote a brief white paper in 1983 that outlined a way to make the concept of M&R into a more concrete plan:

- Solicit designs for new instruments
- Always have a back-up camera
- Inventory and maintain spare parts

Riccardo wanted insight into this, and so in January 1984...

- I get hired as Advanced Instrument Studies Scientist
- M&R Working Group, MSFC-based
- Space Station Users Working Group
 - ST was about the only clearly identified potential customer for servicing



How M&R became real

AO for second-generation instruments

- Selection in 1987: STIS, NICMOS, HIMS
- Long delays

Engineering tasks

- Assessment of available parts, quality, longevity
- Estimates of failure rates (the "winner": FGEs)

False starts

- Servicing ST from Space Station
- Orbital Transfer Vehicle

M&R comes to GSFC: the Ceppy era



ST's three great crises

Challenger

NASA owned the telescope; would it ever fly?

The flawed mirror

- Astronomers and STScI owned the telescope and came up with a plan
- SM1: above expectations

SM4: Would we watch HST just die?

- The world owned HST
- May, 2009: Far above ever greater expectations



Assessing servicing

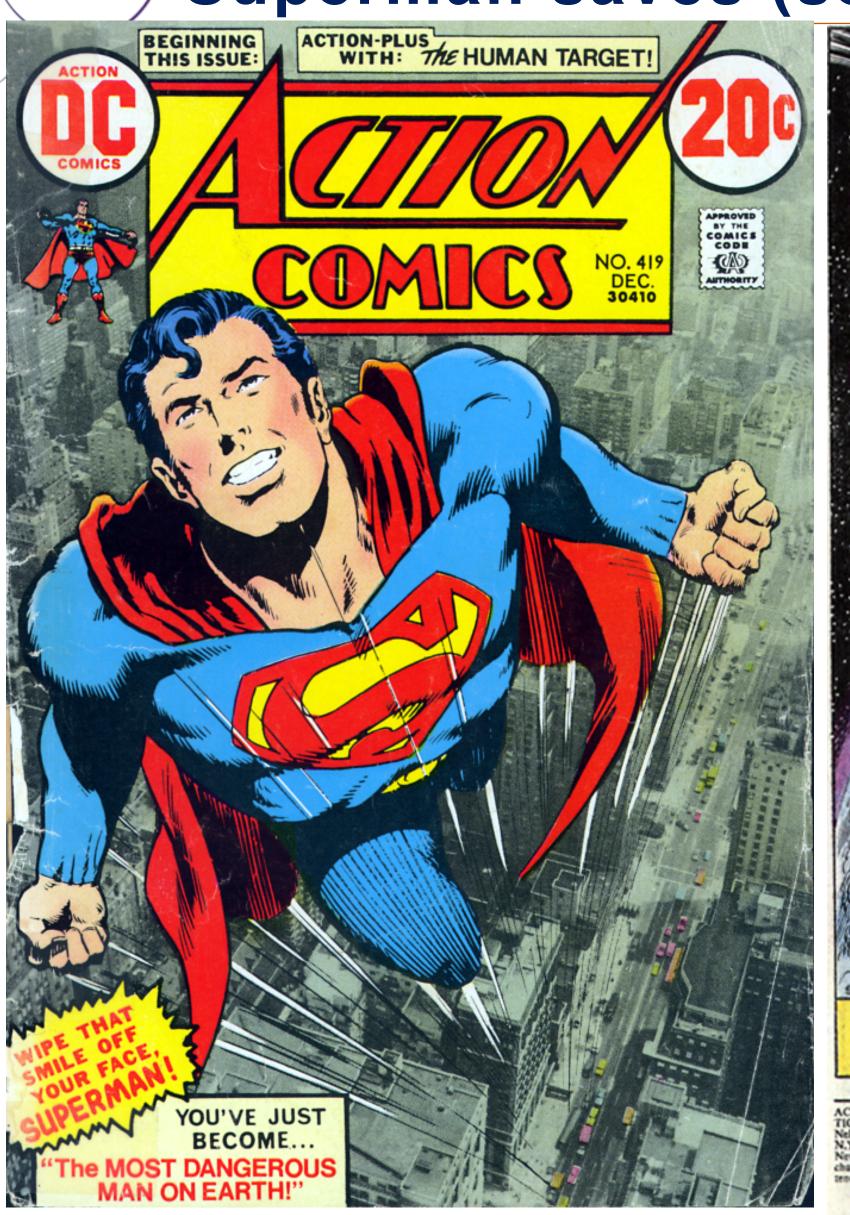
HST was designed for servicing and a central part of its success:

- Public visibility
- Continued enhanced science capabilities
- HST today shows how space technology has advanced in reliability

But why no others built to be serviced?

- Weiler: "Too expensive"
- Really?

Superman saves (sells) the Large Space Telescope ("SM zero")

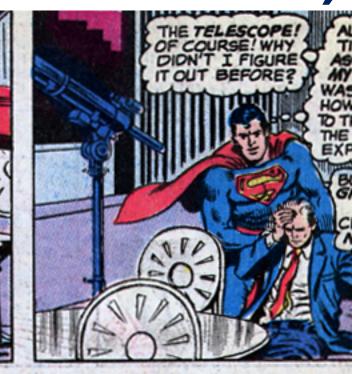




THE METROPOLIS AREA
WITH A STRANGE ENERGY...
BUT MY INVULNERABILITY
MADE ME IMMUNE! THE GROUND -- IT SET OFF AN EXPLOSIVE CHAIN-REACTION! EASY DOES IT, OR I'LL MELT THE LENS! A GENTLE DOSE OF HEAT VISION WILL VAPORIZE THE TROUBLE-MAKING DUST AND RESTORE NORMAL! GOES UP IN SMOKE --!

STREAKING SPACEWARD, SUPERMAN SCANS THE ATMOSPHERE WITH INFRA-RED VISION TO REVEAL...

OHHH...







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PROBLEMS



