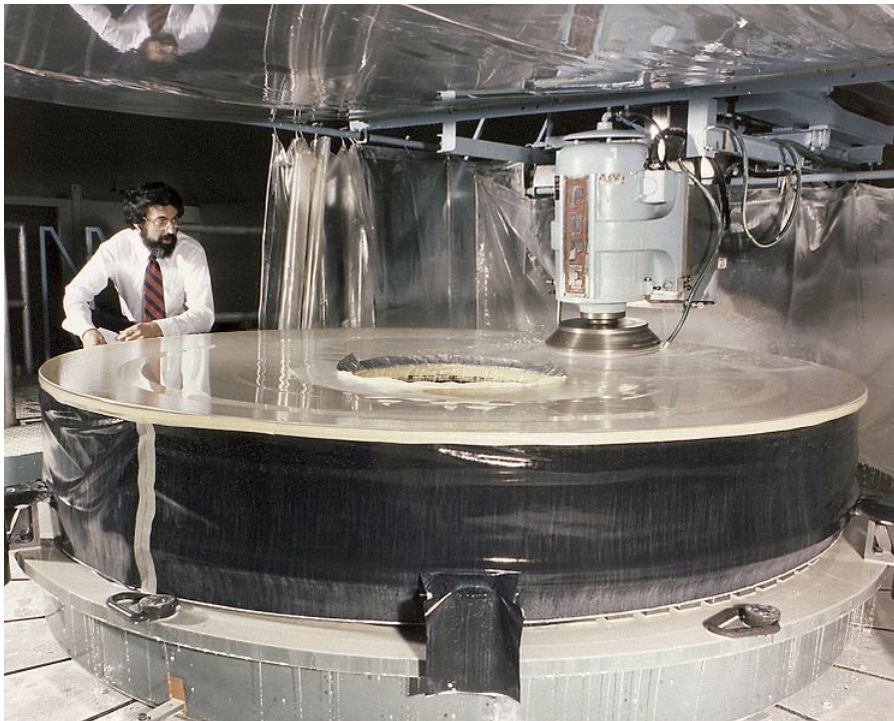


## 9.3: Repairing the HST

### Repairing the HST

One of the HST major design features is the capability of changing out equipment during a Space Shuttle visit. Engineers understood that the technology which supported the HST was changing at a rapid rate. They also understood from previous satellite experience that systems can and do fail. It was fortuitous that HST design engineers had this on orbit servicing mission concept in mind, for it was needed much sooner than thought.

As astronomers checked out their new telescope after launch, it became painfully obvious that something was wrong with the telescope. It was as if the HST was nearsighted; the telescope was not getting a good focus. Stars and galaxies looked fuzzy, something one did not want to see from a multi-billion-dollar telescope. After an investigation, it was found that the HST's primary mirror was shaped to the wrong curve, producing out of focus images.



Hubble's primary mirror during fabrication. [ " Hubble mirror polishing " by NASA, in the [Public Domain](#) ]



Wide Field Planetary Camera 1



Wide Field Planetary Camera 2

Hubble without corrective optics (left) — and with corrective optics. After determining the primary mirror was flawed, a corrective optical system — glasses — was designed, built, and flown aboard the Space Shuttle to the Hubble Space Telescope, where it was installed. [” Hubble Images ” by NASA, in the [Public Domain](#) ]

During five space shuttle servicing missions over the period of about 16 years, not only was a fix initiated for the out-of-focus issues — the HST basically was fitted with glasses — but solar panels were replaced, new and updated computers installed, and instruments replaced by new instruments.





Hubble's first servicing mission was to install the corrective optics package, along with other repairs and upgraded. The HST was captured by the Shuttle's robotic arm and then placed on an HST-specific base in the Shuttle's Cargo Bay. Astronauts could then take a spacewalk to effect repairs. [” Upgrading Hubble during SM1 ” by NASA, in the [Public Domain](#) ]

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