



AURA Proposal

GSMT Design and Technology Development
A Community Based Proposal



GSMT SWG Conclusions

“In order to reap the enormous potential synergy between the James Webb Space Telescope (JWST) and a 20-m to 30-m telescope, it is essential to initiate major design and technology development efforts now to ensure that facility operations coincide with the early JWST era.”

“Federal investment now in a major technology development program targeted at key areas can advance multiple design programs, and will ensure a strong public voice at all stages in the development of next-generation telescopes.”

What is Needed

- Significant advances in AO
- Thorough understanding of site characteristics
- Risk reduction in mirror fabrication
- Advances in detector technology
- Advances in instrument components (gratings, filters and coatings, image slicers)
- Planned and costed project at PDR in 2008

Optimum approach based on a combination of **parallel** and **joint** technology development efforts



Proposal Approach

- Goal:
 - Advance the design of TMT and at least one other US ELT program so that performance, cost, schedule and risk of differing approaches can be assessed prior to any commitment to construction
- Provide \$17.5M for TMT partnership effort (matches private and Canadian funding)
- Provide comparable funds for non-TMT referenced investment including:
 - Startup funds for another ELT design & development effort (~\$14M)
 - Funding for joint, common technology development (~\$2M)
 - Funding for two instrument conceptual design studies (~1.5M)



Investment in TMT

- Responds to AASC recommendations
- The community will receive observing time in proportion to the public investment
- Technology developments will be transparent
 - Reported to other groups
 - Published openly
- Effort will be made to openly compete technology developments so as to engage the broader community
- AURA participation will ensure that NSF and community will be represented at all levels in the project



Investment in Other ELT Program

- Responds to SWG by supporting technology development and design efforts needed to advance another major ELT concept.
- AURA will request letters of intent outlining a coherent plan for advancing an ELT concept
- Letters would need to outline
 - Current and future private/state matching funds
 - Total cost of the proposed Design and Development effort
 - Proposed mechanisms for making technology developments transparent
 - Proposed mechanisms for incorporating community input into decision making
 - Proposed mechanisms for engaging the broader community in technology developments

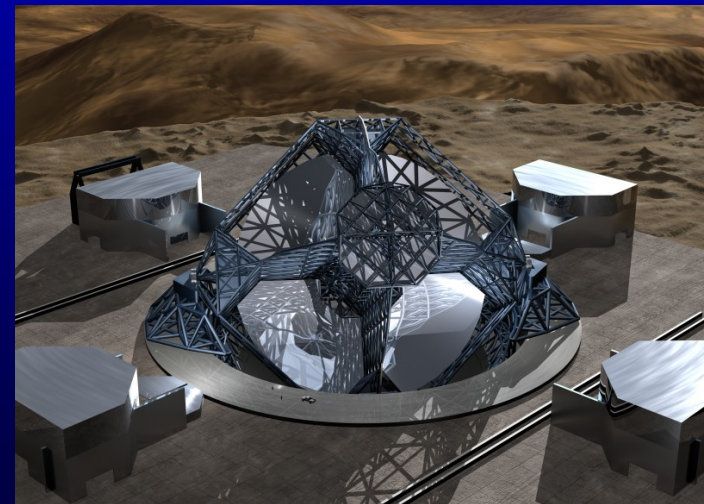


Current TMT status

- Design and Development Phase partners are Caltech, UC, AURA, ACURA
 - Project Manager Gary Sanders
 - Project Scientist Jerry Nelson
- Central design office Pasadena
- WBS complete
- Site testing part of general GSMT effort
 - Atacama, Las Campanas, Mauna Kea, San Pedro Martir
- \$44M/\$70M DDP funds identified

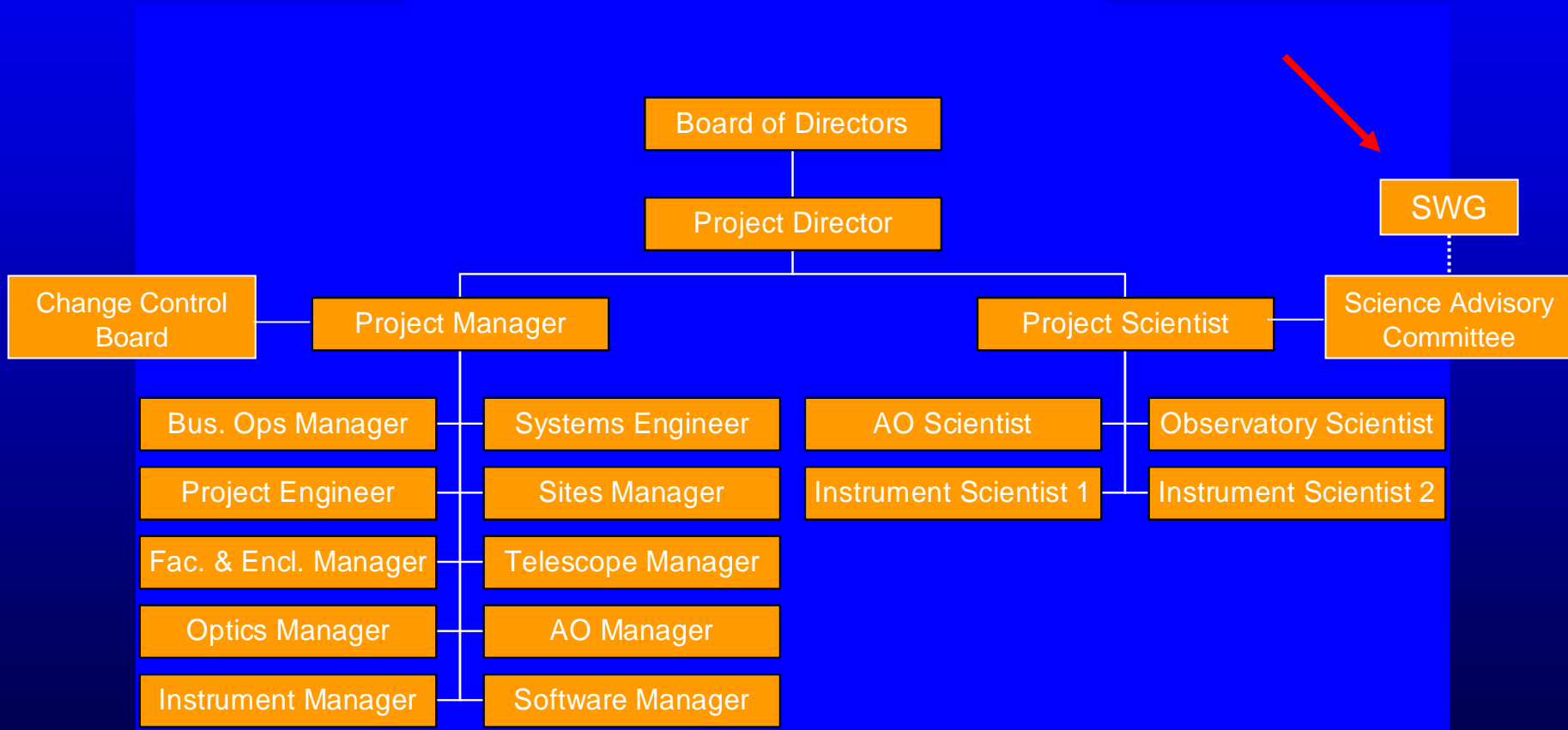
Joint WGs with ESO (AURA MOU)

- Segment fabrication
 - prototype figured segments
- Adaptive Optics
- Detectors and Instrument Components
- Site testing
 - ensure a consistent calibration
- Joint meeting of SWGs
 - first in Berlin





Design & Development Phase (DDP) Project Organization





High-order macro DM conceptual design study

- Develop the conceptual design for a 3 kilo-actuator deformable mirror with
 - 5 mm interactuator spacing and
 - other parameters matching the requirements for the minimum MCAO system on TMT.
- Issues to be considered include
 - actuator stroke (4 μm , with a goal of 15 μm),
 - mirror figure quality,
 - electronics design,
 - actuator reliability, and
 - scalability to somewhat larger mirrors.

Fabricate 1m-prototype SiC segment

- Purchase four prototype 1-m segments (full-scale for TMT, half-scale for OWL) from the German company ECM.

Polish 1m-prototype SiC segment

- Contract for polishing prototype OWL segments. Four segments manufactured by Boostec, a French company, will be polished in FY05.

Fiber optic laser beam relay systems

- Purchase and test hollow core photonic crystal fibers for use in laser beam relay systems on TMT and other current-and next-generation telescopes.
- Issues to be considered include
 - average and peak laser power levels, and
 - power attenuation per meter.
- These fibers would be tested at ESO Garching

Pulse Raman Fiber Laser conceptual design study

- Develop the conceptual design for a pulsed Raman fiber laser with
 - a power level,
 - pulse format, and
 - other parametersmatching the requirements for the minimum MCAO system on TMT.
- Develop a plan for a laboratory demonstration as the next step.



Polish & test eight 30-cm SiC samples

- Place two contracts for polishing and testing the 30-cm diameter lightweight SiC mirror blanks purchased in FY2004.
- Each contract would be to polish four blanks, one each from four US SiC vendors.
- At least one of the polishing contracts would require testing at more than one ambient temperature, to quantify any warping of the mirrors due to thermal expansion.