



Great Observatories Maturation Program Stage 1 Technology Activities

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ExoPAG

- **Longer “Pre-Phase A” period (Stages Model)**
 - Enables technologies to be further matured, more time to consider alternatives, more studies and trades before decision to start
 - Defers detailed mission cost estimate closer to Phase A gate review
- **Significant multi-institutional participation, more voices, more inclusion**
- **Utilizing lessons learned from JWST and the SMD Large Mission Study**

Stage 1:

- **Precursor science and technology investments**
- Identify studies, trades, and long lead time technologies
- Identify precursor science investigations

Stage 2:

- **Commence Great Observatory Maturation Program**
- Conduct science / technology / architecture studies and trades

Stage 3:

- **Pre-formulation and decision to start the next Great Observatory**
- Transition to a pre-project in pre-Phase A

Phase A

Stages 1 - 3

- The current Stage 1 precursor technology effort mainly consists of an updated gap list, a ROSES program (SAT and APRA), SBIR, Center IR&Ds, few directed programs, internal NASA scientist funding, and a Segmented Mirror Technology Program.
- However, these Stage 1 programs by themselves don't sufficiently prepare NASA to execute the elevated Stage 2 investments. They don't tell us:
 - **how to close the technology gaps**
 - **which are the tall tent poles, the long duration items, estimated cost and schedule to bring to TRL 5 and 6**
 - **which studies to conduct first, which trades to open early**
 - **how to best fund gap-closure efforts (competed, directed)**
 - **where to involve industry, gov't labs, academia, and international collaboration**
- Therefore, we are adding strategic technology planning activities to the existing Stage 1 activities.
- ... which must receive and iterate with science input.



Stage 1

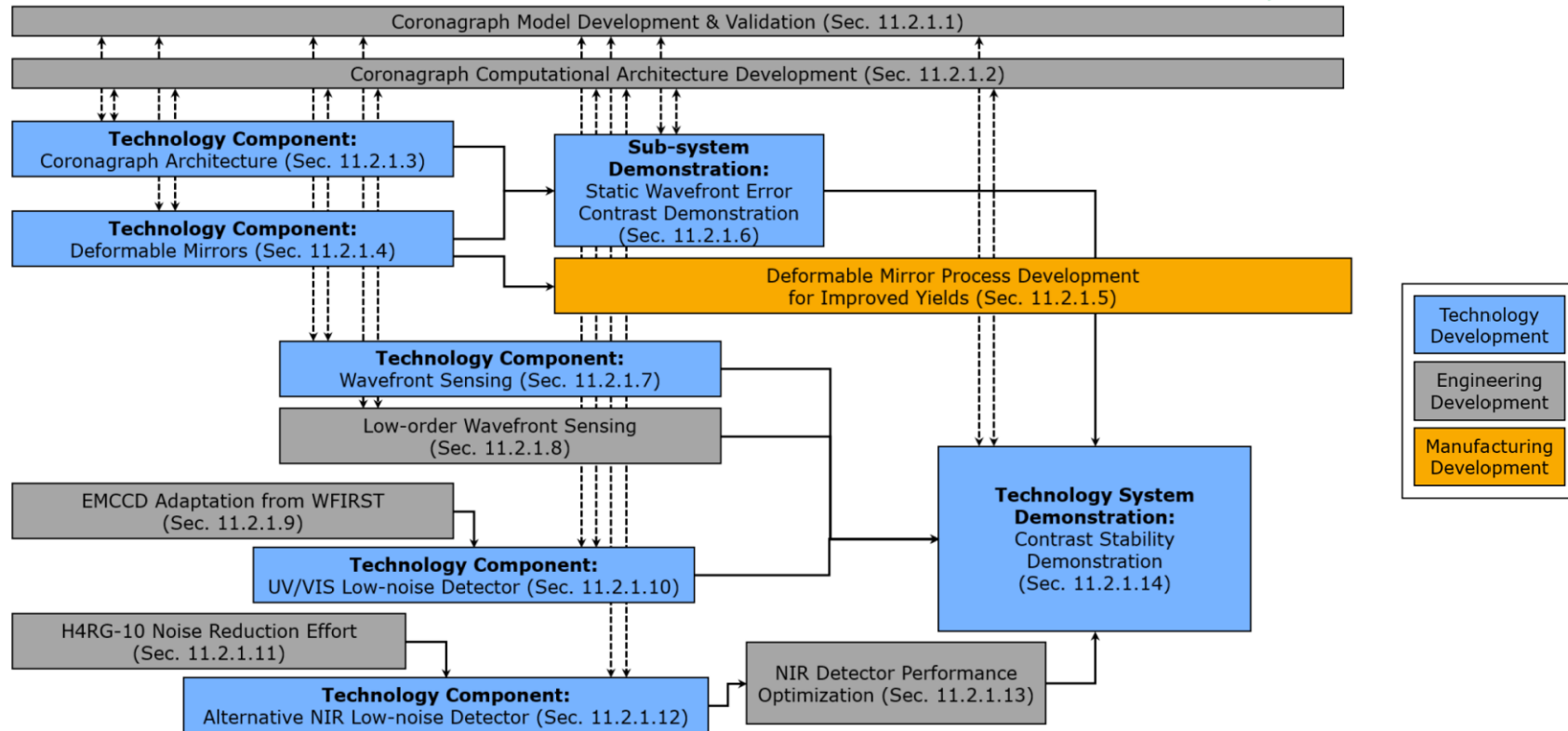
Strategic Technology Activities

- 1. Identify the architecture space of the great observatories and derive their technology gaps**
 - Segmented or monolithic primary mirror, coronagraph or starshade? etc
 - With help from science community, adopt figures of merit
 - Including ~ 6 meter, ~ \$11B, ~ 25 HZ terrestrial planets, end of decade start, LRD ~ 20 years (as captured in the Decadal report on p7-17)
 - Selected architecture is going to have to balance these and more
- 2. Develop high-level tech development plans to close each gap**
 - Not starting from scratch; informed by HabEx and LUVOIR STDT reports



3. Develop detailed technology development plans at lower levels.

Example of high level plan: Coronagraph Technology Development



- Each sub-box requires a detailed plan describing path to TRL 5/6 and estimating costs, durations, suggested funding platforms, risks, and alternatives

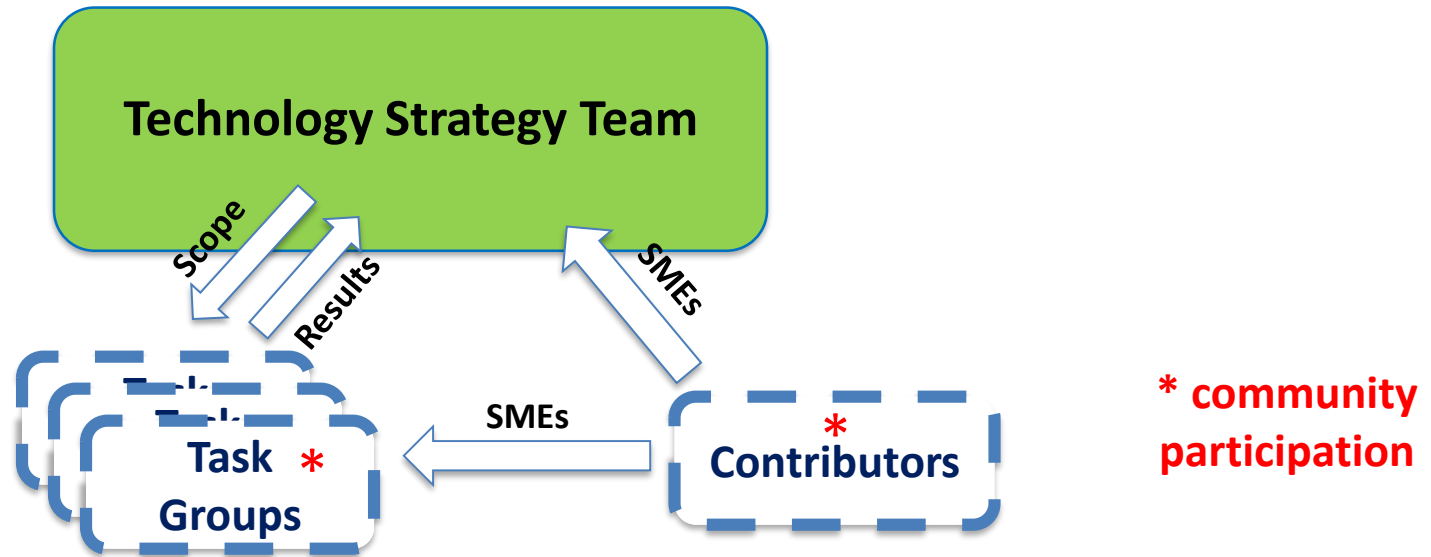
4. Identify technology **studies** to conduct and **trades** to open in order to inform future down-selects

Examples:

- a) Should the primary mirror be monolithic or segmented?
 - Can a monolith survive launch loads?
- b) Should a starshade be in the option space?
- c) How important is UV exoplanet science? Is it a must have?
 - If needed, what is the impact to the telescope and starlight suppression techniques?
- d) What degrees of in-space refueling and servicing should be considered?
- e) Will micro-meteroid impacts on the primary mirror risk exoplanet science goals?

5. Identify long-lead technologies needing prioritized investments to close the gaps

A Technology Strategy Team (TST) can lead these planning activities for Stage 2



- **Technology Strategy Team:** Multi-disciplinary, NASA-only technology leadership team with scientist participation and SME contributions
- **Task Groups:** Specialized teams taken from the community tasked to define detailed tech plans, work studies and trades
- **Contributors:** SMEs from NASA Centers and the broad community brought in as needed

Final Thoughts...

