

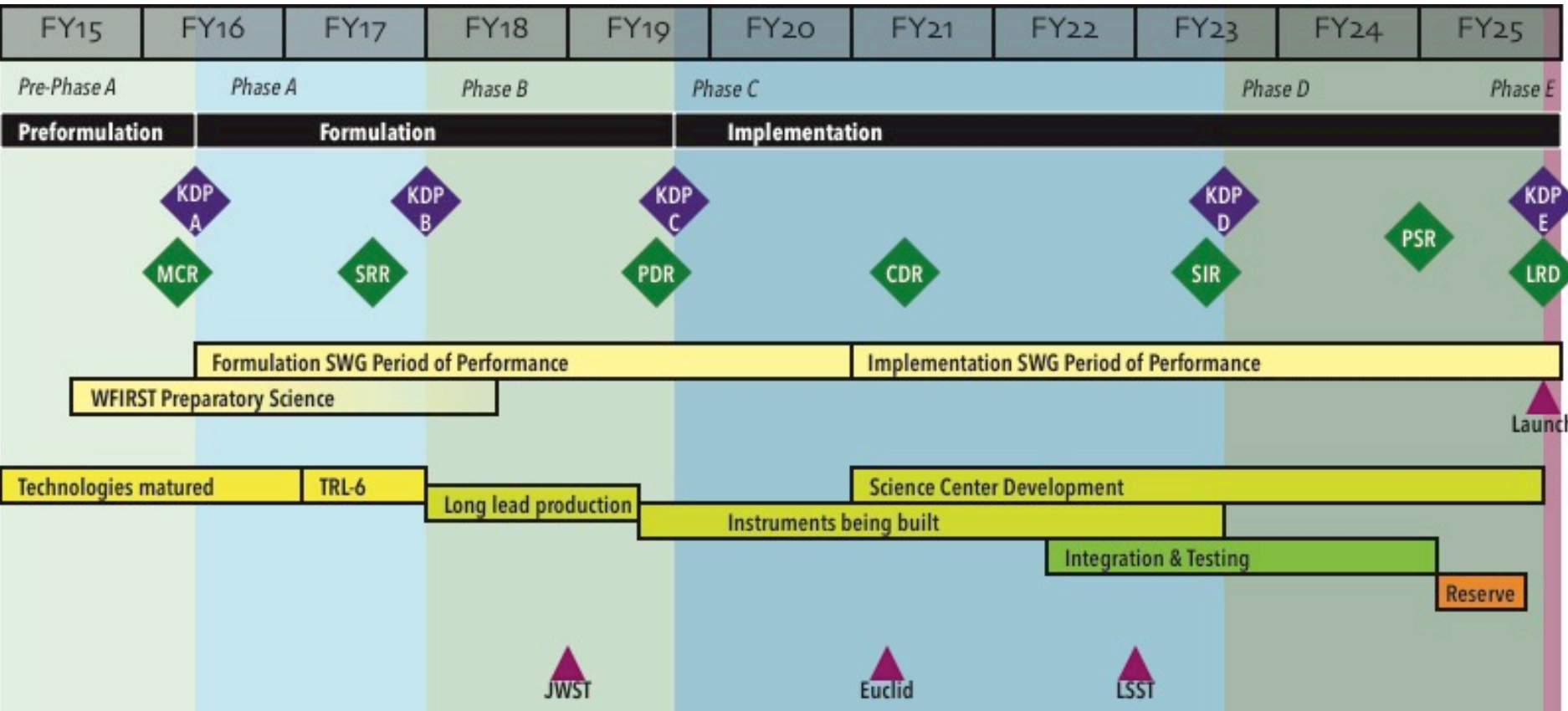
WFIRST



WFIRST Programmatic Overview
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What does Phase A Mean?

- On February 17, WFIRST entered Phase A
- Leading up to that point, a dozen different versions of WFIRST (+related) were studied
 - Laundry: SNAP, Destiny, Adept, JDEM-IDECS, -Probe, - Ω , NIRSS, GEST, MPF, and WFIRST: iDRM, DRM1, DRM2, AFTA (6x)
 - Each is a mission design with hardware, operational approach, science outcome, cost estimate
- Harrison committee: “...*significantly enhance the scientific power of the mission, primarily for cosmology and general survey science, and will also positively impact the exoplanet microlensing survey.*”
- Now WFIRST is a Project. Architecture is fixed.
- Phase A means:
 - Define the requirements precisely
 - Adjust the design to meet those requirements
 - Make grassroots estimates for all activities, schedules, costs
 - Decide who does what



- Awarding widefield study contracts in March.
- Finalize Acquisition Strategy - Acquisition Strategy Meeting (ASM) to occur in Summer 2016.
- Complete open design trades → update the WFIRST design concept → complete integrated modelling/subsystem analyses.
- Complete requirements development and flowdown from Science Objectives to Level 1, 2, 3 and driving Level 4 requirements
- Complete IR detector and coronagraph technology development.
- Develop grassroots implementation plans and schedules during Formulation
- Develop KDP-B documentation (control plans, descope plan, design reference, etc.)

International Participation

- Canadian Space Agency
 - NASA expressed interest in contributions to the Widefield Instrument
 - CSA conducting Phase Zero study in spring/summer 2016, Government approval process over fall 2016/winter 2017, will result in informal agreement by spring 2017
- European Space Agency
 - NASA expressed interest in contributions to the CGI, spacecraft, and ground system
 - Will coordinate European contributions from ESA or member nations
 - AO open for European membership on FSWG
 - Presentation to SPC in November 2016, then put ESA project team in place
- Japanese Aerospace Exploration Agency
 - JAXA has expressed interest in contributing to CGI and ground based observations
 - Explained well yesterday
- NASA expects that international partners will expect the following from NASA
 - Appoint member(s) of the FSWG and participate in mission formulation
 - Appoint collaborator(s) to existing SITs and participate in mission key projects
 - Participate in the GO program
 - Obtain access to WFIRST data, which will have no period of limited access
- Informal agreements should be well understood by early 2017 (possibly earlier)

- New Worlds, New Horizons:
 - *[The committee] firmly believes [the GI/GO program] should not drive the mission hardware design or implementation cost. NASA should consider creative ways to enable the most flexible possible general investigator program consistent with the current spacecraft and instrument suite.*

- What is GI/GO allowed to request?
 - Hardware changes should not increase cost or schedule nor require tech development. Cost neutral ok (e.g., filter λ).
 - Operations to enable GI/GO should be possible within the implementation envisaged for primary science. (e.g., non-sidereal tracking mode ok; operational change to enable TDA is ok, but not if the ground system architecture is affected). Modest cost ok.
 - Processing/archiving changes are fair game. Additional cost ok.
 - During Phase A, considering balance of cost/capability. More...

➤ Background:

- WFIRST was recommended by NWNH as a mission ready for implementation.
 - With the addition of the coronagraph and larger aperture telescope, there are concerns that WFIRST mission cost and schedule could be driven adversely, potentially impacting APD portfolio balance.
 - Harrison Report and Mid-Decadal feedback.
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- ## ➤ Cost control will be of paramount importance on WFIRST, lest NASA undermine the basis on which WFIRST was endorsed by the NRC.



WFIRST
WIDE-FIELD INFRARED SURVEY TELESCOPE
DARK ENERGY • EXOPLANETS • ASTROPHYSICS



Understanding WFIRST Cost

- Current baseline design differs from SDT design subjected to CATE in February and presented to Decadal Mid Term Review in October
 - Some hardware changes + science teams
 - Incorporated latest LV planning costs
 - Now using 2025 profile (in-guide) for cost estimates, not optimistic 2024 profile (overguide)
- Caveat Emptor: the conversion of funds from FY10\$ (used by the Decadal Survey) to RY\$ is about 1/3rd more!
- Comparing present WFIRST with Decadal WFIRST (removing non-NWNH items)
 - Cost of "baseline" WFIRST is within ~10% over the last 6 years

Cost Transparency

Inflation Reminder:
 \$1.8B in 2010 (NWNH) = \$2.0B in 2015 (1.09x)
 \$2.3B in 2015 = \$2.8B in RY\$ (1.2x)
 \$2.7B in 2015 = \$3.2B in RY\$

Item	FY10 (\$B)	FY15 (\$B)	RY (\$B)	Launch
NWNH WFIRST (2010)				
WFIRST	1.61	1.75	2.1	2020
+ New Worlds Technology	<0.2	<0.2	<.2	
Total	1.6 - 1.8	1.8 - 2.0	2.1-2.3	
SDT Report DRM (2015)				
WFIRST-AFTA w/o CGI+GO	1.4 - 1.7	1.6 - 1.9	1.9 - 2.3	2024
+ Coronagraph	0.32	0.35	0.42	
+ GO Program	0.09	0.1	0.12	
Total	1.8 - 2.1	2.0 - 2.3	2.5 - 2.8	
KDP-A (2016)				
WFIRST w/ CGI+GO	1.8 - 2.1	2.0 - 2.3	2.5 - 2.8	2025
+ Uncertain launch date ('24 vs '25)	0.18	0.0 - 0.2	0.20	
+ Cost Changes (details below)*	0.18	0.20	0.24	
+ WFI hardware changes**	0.045	0.05	0.06	
+ L2-related changes†	0.04	0.045	0.05	
Total	2.1 - 2.4	2.3 - 2.7	2.7 - 3.2‡	

"Monetized launch risk"

Independent Cost and Technical Evaluation within ~10% of project estimate

Uncertainty in launch vehicle ~0.3B RY\$

Uncertainty in launch date ~0.2B RY\$

Independent Cost and Technical Evaluation within ~10% of project estimate

* Launch vehicle price change; augmented science team funding; earlier Phase A; reserves

** auxiliary guider, relative calibration system, IFU detector redundancy, structural mass

† 4 large propellant tanks, associated structure, SSR, TWTA, antenna, thermal hardware

‡ Half of this uncertainty is due to range of launch vehicle costs

- Cost control will be of paramount importance on WFIRST, lest NASA undermine the basis on which WFIRST was endorsed by the NRC.
- There will be a mission cost commitment, to ensure that we remain responsive to the NRC. Will figure out in the coming year, fix late 2018.
- NASA has established an agreement for passing into Phase B: mission cost, currently estimated at \$2.7-3.2B (RY), shall not be exceeded.
 - Capping is consistent with Decadal Survey guidance on WFIRST cost
 - Consistent with range of (predicted) cost from Project
 - Consistent with range of (predicted) cost from independent estimate
- Increase of the Management Agreement during Phase A will be considered only if absolutely necessary to preserve mission success.
 - Trades within mission cost agreement during Phase A will have to balance science, risk, and cost