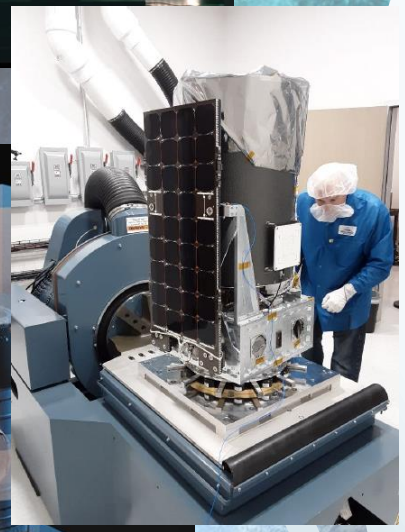
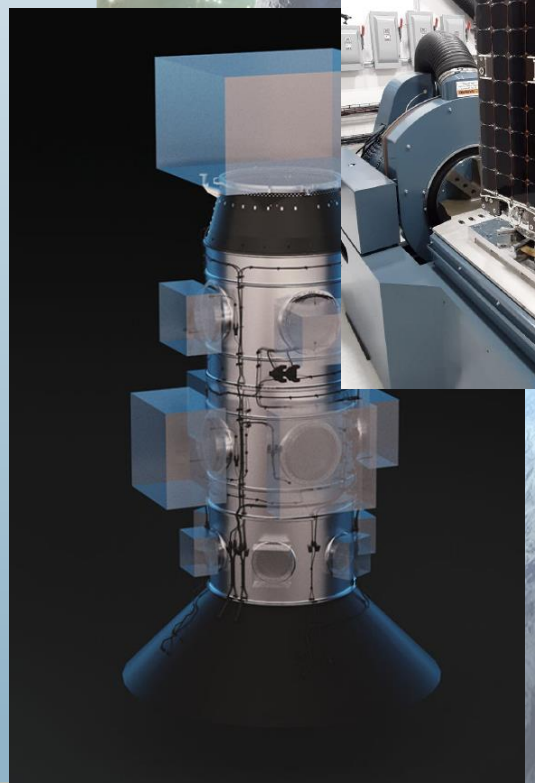
Michael Garcia
CubeSat/SmallSat Lead, Astrophysics Division
Science Mission Directorate

Astrophysics Pioneers

- The FY21 President's Budget Request contains a new initiative for Astrophysics – A new class of small missions
- Astrophysics Pioneers
  - Fill in the gap between existing ROSES investigations (<$10M for APRA) and existing Explorers MO investigations (<$35M for SmallSats)
  - Managed as Research and Analysis projects with enhanced oversight
  - Will be solicited through ROSES; relieves burden of writing full Explorers MO proposal
  - Will include SmallSats, Large CubeSats, CubeSat constellations (all as rideshare/secondary payloads), major balloon missions, and ISS attached payloads





Why is Pioneers a good idea?

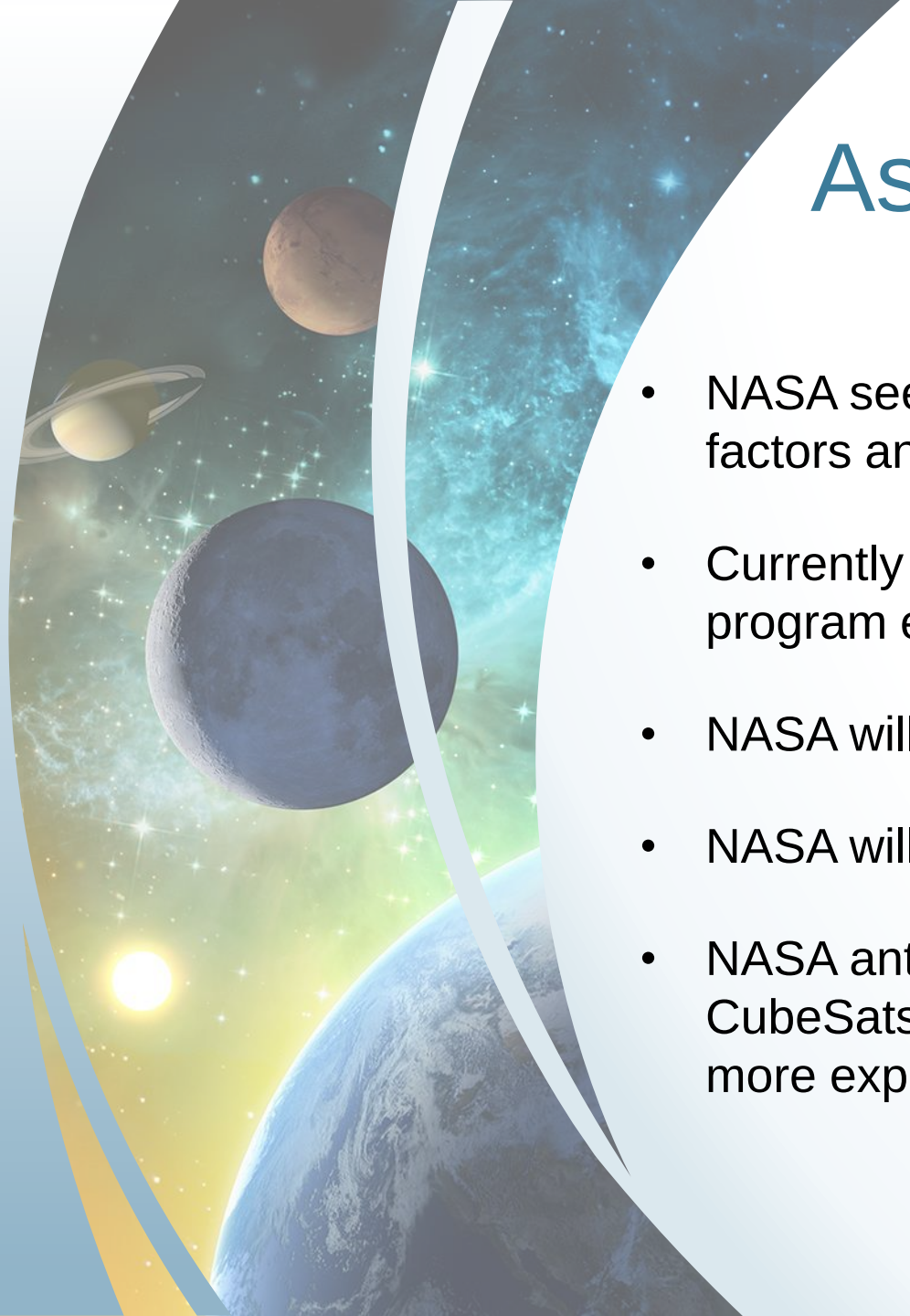
- Numerous opportunities for low cost rideshare and s/c bus.
- Superpressure balloon capability just now coming on line
- Incorporate lessons learned from ISS-CREAM, GUSTO, and recent large suborbital payloads

Strengthens our partnership with commercial providers

SpaceX's SmallSat rideshare Program
- Monthly rideshare missions starting 3/2020
- ESPA class payloads, 200 kg for "as low as $1M", to LEO including SSO
- CSLI $0.9M for 12U CubeSat in last APRA

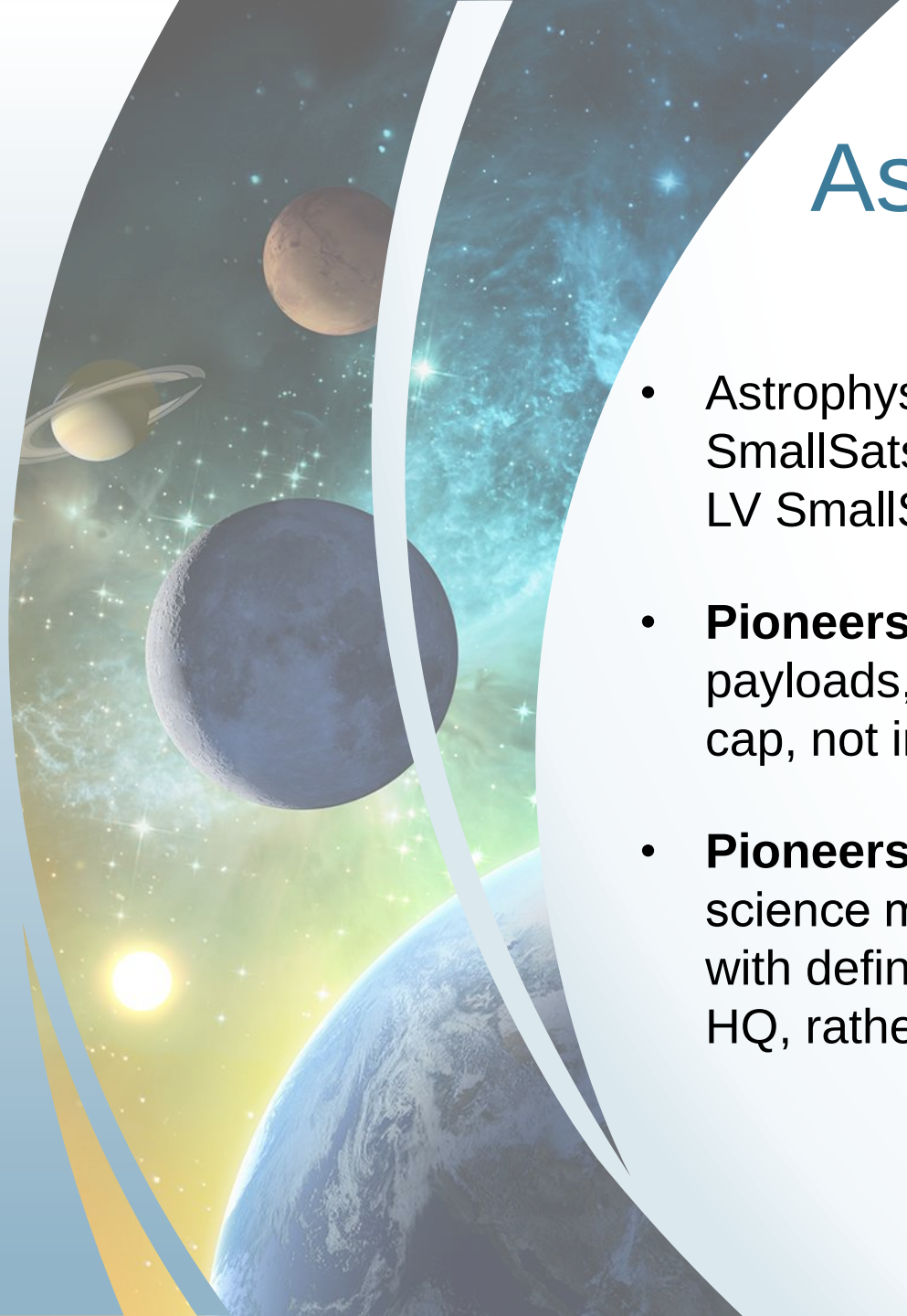
York Space Systems S-class bus
- 3-axis stabilized (10", 1.5°/s)
- 85kg payload, in operation
- $1.2M, comparable to CubeSats

BCT 'S5' Bus
- $2.7M, in Operation
- AFRL ~0.5m telescope



Astrophysics Pioneers

- NASA seeks to do compelling astrophysics science in smaller form factors and at lower costs than traditional Explorers.
- Currently the largest suborbital programs within the ROSES/APRA program element have a maximum cost of ~$5-10M
- NASA will no longer solicit ISS attached payloads within APRA
- NASA will no longer solicit balloon payloads within Explorers MO
- NASA anticipates that major extended duration balloon payloads, CubeSats larger than 6U, and CREAM-class ISS payloads will be more expensive than $10M



Astrophysics Pioneers

- Astrophysics **Explorers** MOs currently include (i) Rideshare SmallSats with a $35M cost cap and (ii) ISS payloads and Venture LV SmallSats with a $70M cost cap.
- **Pioneers** will include SmallSats, CubeSats >6U, major balloon payloads, and modest ISS attached payloads with a $20M cost cap, not including launch.
- **Pioneers** will use the lessons learned to carry out up to $20M science missions using ‘enhanced’ research project processes with defined gates and light touch management from WFF and HQ, rather than flight project processes appropriate for a SMEX.

Pioneers Solicitation and Review

- Pioneers will be solicited through a ROSES-2020 Amendment
- Pioneers are science investigations; Pioneers can include new technology, but science is the principal merit criterion; training the next generation is also a review criterion.
- Pioneers cost cap ~$20M, anything ~$10M or less is ROSES/APRA, anything more than $20M is Explorers MO.
- Maximum 5 year projects.
- Proposal must include plans for trades to be considered during Phase A and are invited to work with NASA design labs.
- NASA will provide a second, uniform design lab run for all concepts as part of Phase A.
- Proposal must include costs and schedule for Phase A-E.
- NASA provided launches, via CSLI, rideshare, ISS commercial cargo, Balloons, etc., outside the cost cap.
- Single ROSES peer review, no separate TMC panel.

Pioneers Concept Study Report

- Six to nine month Phase A Study, to include costing at NASA design center
  - Deliverable from Phase A will be a Concept Study Report
  - Review of Phase A Concept Study Report will be for Technical, Management, Cost, and Schedule realism.
  - No purchase of long-lead items – this is a study phase
  - Will require draft Project Plan with Phase A Study
  - Plan to select 2 or 3 for Phase A study.
  - Continue any that pass – continuing more than one could change solicitation cadence (budget averages one project per year)

Pioneers Management

- Small Satellite and Special Projects Office at WFF will provide light touch management for HQ, based on experience with existing sub-orbital class projects (balloons, sounding rockets, CubeSats, ISS payloads)
- Awards will be contracts or cooperative agreements with defined deliverables
- Delivery of the data to a NASA archive will be required
- Special Programs Office at WFF responsible for gateway reviews, as well as monthly and quarterly reporting

Pioneers Timeline

Early Feb	FY21 President's Budget Request
Feb 20	Community announcement
Mar 5-6	APAC meeting
Early Spring	Release draft ROSES-2020 amendment
June	Final ROSES-2020 amendment
Sep	Proposals due
Early 2021	Selections announced before AAS meeting

Funding starts with FY21

Concept Study Review in 2021/2022

Notional Launch(s) NLT 2026.


NASA
EXPLORE
with us

Contents of Concept Study Report

Science Section

- Investigation Overview
- Changes from the Proposal
- Investigation Plans
- Level 1 Science Requirements

Science Traceability Matrix

- Baseline Mission
- Threshold Mission
- Science Team
- Management Structure
- Launch requirements
- Data Management
- Publication plan

Management Section

- Budget
- Schedule/Milestones
- Operations
- Project Reviews
- Risk Management
- Descope
- Ready to Proceed
- Baseline Project Plan

Community Announcement

Astrophysics Pioneers Community Announcement, Feb 2020

NASA announces that a new opportunity entitled 'Astrophysics Pioneers' will be added to the Research Opportunities in Space and Earth Sciences 2020 (ROSES-2020) NASA Research Announcement. The Astrophysics Pioneers program element will solicit proposals for astrophysics suborbital and modest orbital science investigations that are (i) greater in cost and scope than what is possible within the Astrophysics Research and Analysis (APRA) program element of ROSES-2020 (APRA-2020) but are (ii) smaller in cost and scope than what is allowed within the Astrophysics Explorers Mission of Opportunity (MO) program. Science investigations are solicited that use the established platforms of CubeSats (including constellations), SmallSats launched as secondary payloads, major balloons missions, and International Space Station (ISS) attached payloads. Technology development within the proposed project is allowed, but the primary review criterion will be the merit of the science investigation. As with existing sub-orbital and small orbital class programs, a secondary review criterion will be the participation of graduate and undergraduate students, postdocs, and other early career team members.

All proposed investigations must be responsive to the science goals of the Astrophysics Division, as described in the 2014 NASA Science Mission Directorate (SMD) Science Plan and the 2018 NASA Strategic Plan. All proposed investigations are expected to be more capable than the suborbital-class CubeSat missions or balloon missions that are solicited within the APRA program.

PI-managed mission cost ranges (from project initiation through shutdown, publication, and archiving) allowed under this program are limited to $20M in real year dollars, not including launch. NASA will cover all launch and launch vehicle integration costs. NASA will provide launch for spaceflight launches via NASA's CubeSat Launch Initiative (CSLI) or SMD's rideshare program. For CubeSats and SmallSats, acceptable sizes range from 1U (~1.3kg) to ESPA and ESPA-grande class over a variety of form factors. NASA will provide launch to the ISS for ISS-attached payloads via NASA's Commercial Resupply Services (CRS) program, and the appropriate balloon launch vehicle for major balloon missions via NASA's Scientific Balloon Program.

These projects will be managed as research projects, not space flight projects, but with additional oversight beyond what is typical of APRA sub-orbital projects. That oversight will include monthly reporting based on a pre-defined one-page template. The NASA Small Satellite and Special Projects Office (S3PO) at NASA Wallops Flight Facility (WFF) will provide oversight for NASA.

Pioneers projects will be selected through a two-step process. Following selection of the ROSES proposal, projects will develop a Concept Study Report (CSR), which will include a Project Plan, comprising an agreement between the PI and NASA on implementation approach, resources, cost, reviews, schedule, and other plans. The project will need to pass a Systems Requirements Review (SRR) upon delivery of the CSR in order to be approved to proceed from the formulation phase to implementation phase. Gate reviews, including the SRR, will be conducted by the S3PO and will include a Preliminary Design Review (PDR) and/or Critical Design Review (CDR), and Flight Readiness Review (FRR) per the draft schedule contained in the CSR.

NASA anticipates releasing a draft Pioneers appendix to ROSES-2020 by late spring 2020 and a final version by June 2020. Proposals are anticipated to be due in September 2020 and selections announced in early 2021. NASA expects to select 2 or 3 projects, assuming the receipt of sufficiently meritorious proposals, and will continue into the implementation phase all that successfully pass the SRR/CSR review, subject to the availability of funding.

Questions about Pioneers should be addressed to Dr. Michael R. Garcia at NASA/HQ, email: Michael.R.Garcia@nasa.gov.

You are receiving this email because you have subscribed, through NSPIRES, to the NASA Science Mission Directorate mailing list.