
National Aeronautics and
Space Administration
NASA
EXPLORE SCIENCE
R&A Update
APAC Fall Meeting | October 29, 2019
Stefan Immler, Dan Evans, and Eric Smith
Astrophysics Division
Science Mission Directorate

Astrophysics Research Programs

Astrophysics Research Elements

ROSES elements

Supporting Research and Technology

- Astrophysics Research & Analysis (APRA)
- Strategic Astrophysics Technology (SAT)
- Astrophysics Theory Program (ATP)
- Theoretical and Computational Astrophysics Networks (TCAN)
- Exoplanet Research Program (XRP)
- Roman Technology Fellowships (RTF)
- FINESST Graduate Student Research Awards

Data Analysis

- Astrophysics Data Analysis (ADAP)
- GO/GI programs in ROSES for:
  - Fermi
  - Swift
  - NuSTAR
  - TESS
  - NICER

Mission Science and Instrumentation

- Sounding rocket, balloon, cubesat, and ISS payloads solicited through APRA
- Astrophysics Science SmallSat Studies
- XRISM PV Phase GS
- WFIRST SWG (recompete)
- LISA Preparatory Science

Separately Solicited

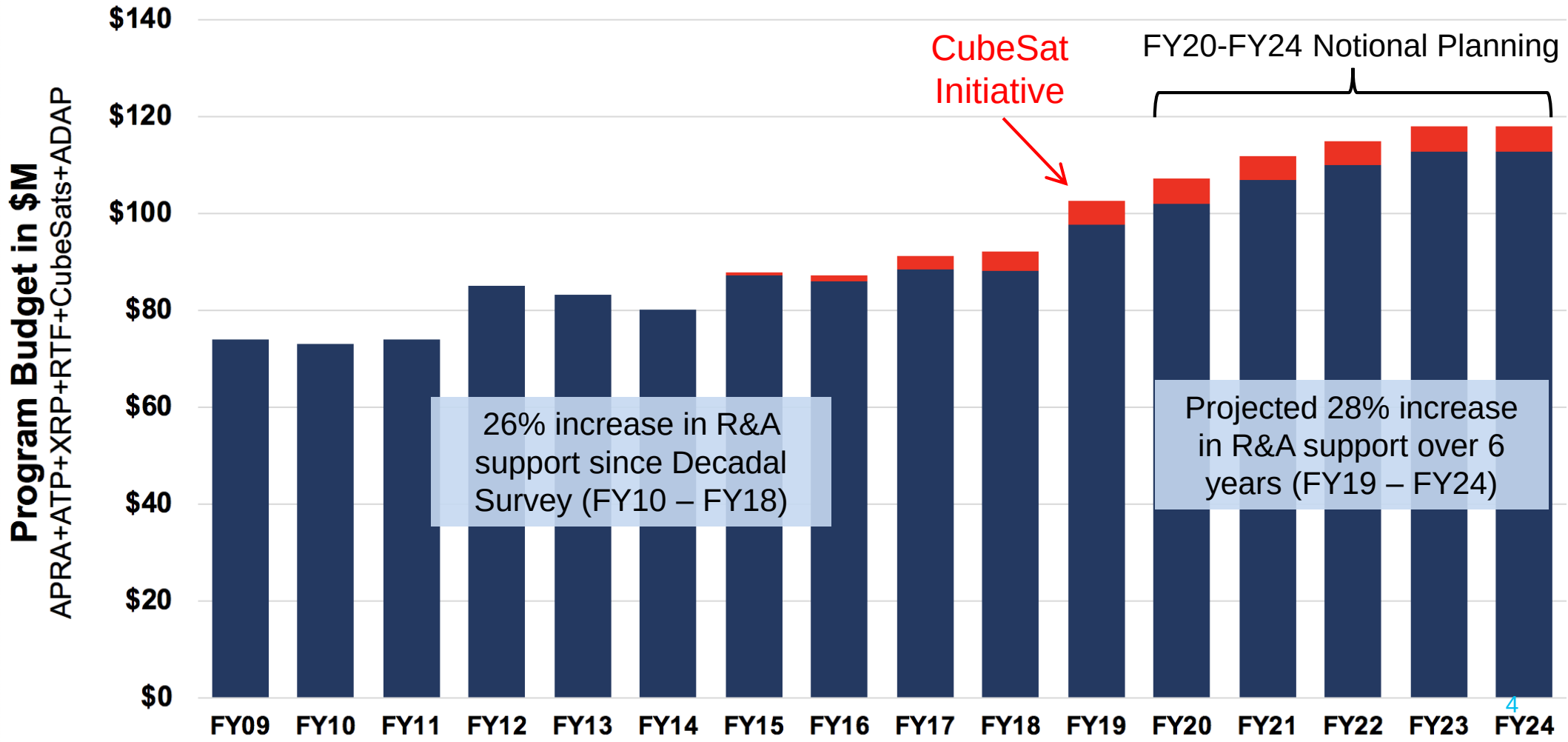
- GO/GI/Archive/Theory programs for:
  - Chandra
  - Hubble
  - SOFIA
  - Webb
- NASA Hubble Fellowship Program
- NASA Postdoctoral Program

New in ROSES-20 (to be released in February 2020):

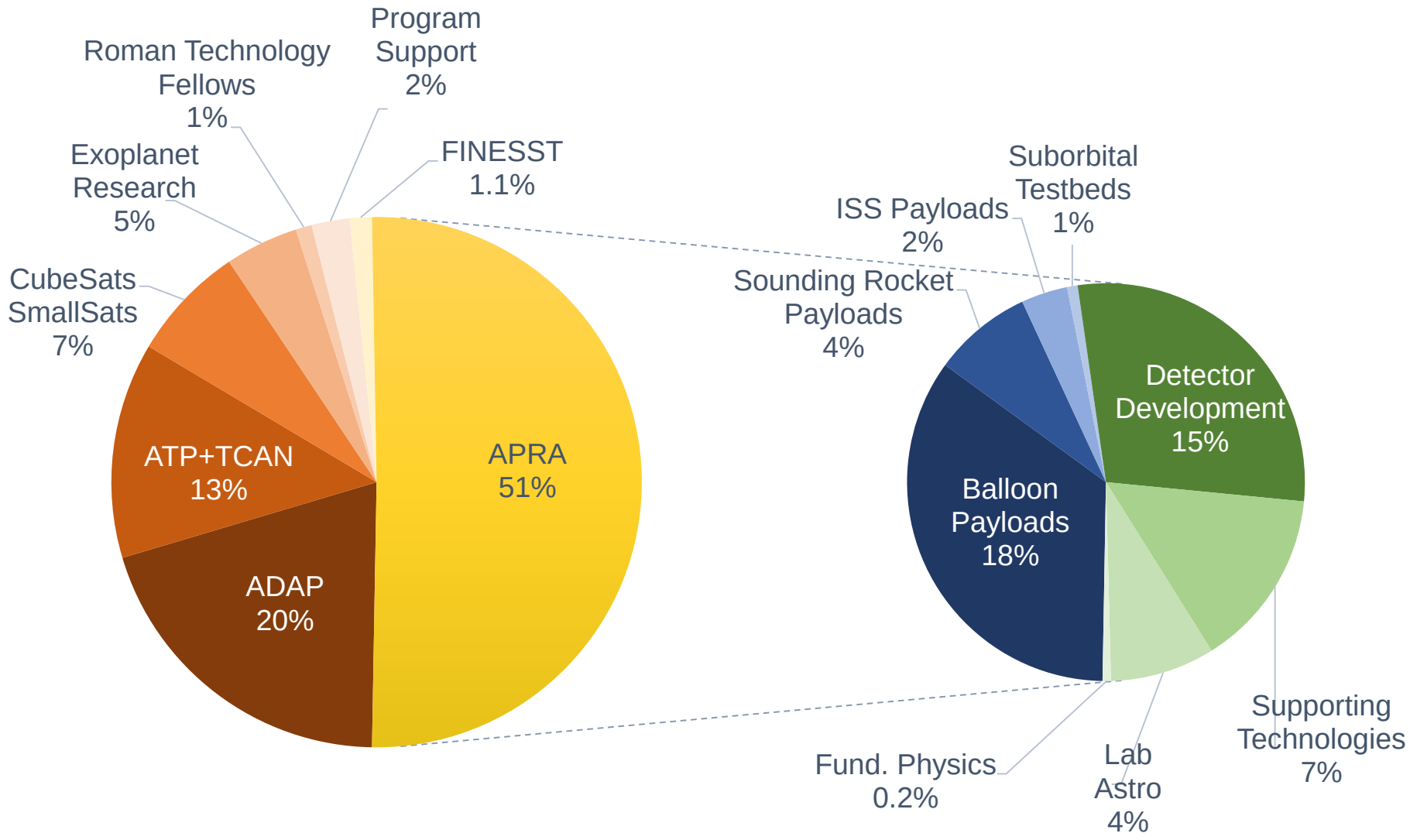
- No ATP (solicited every other year)
- XRISM PV Phase GS
- WFIRST SWG (recompete)
- LISA Preparatory Science
- APD participates in the cross-divisional topical workshops, symposia and conferences
- Exoplanet consolidation (see extra slides)

Growth in R&A Funding ($M)

Program	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24
R&A	$74	$73	$74	$85	$83	$80	$87	$86	$89	$88	$98	$102	$107	$110	$113	$113
CubeSat							$0.9	$1.2	$2.5	$3.9	$5	$5	$5	$5	$5	$5
Total	$74	$73	$74	$85	$83	$80	$88	$87	$91	$92	$103	$107	$112	$115	$118	$118

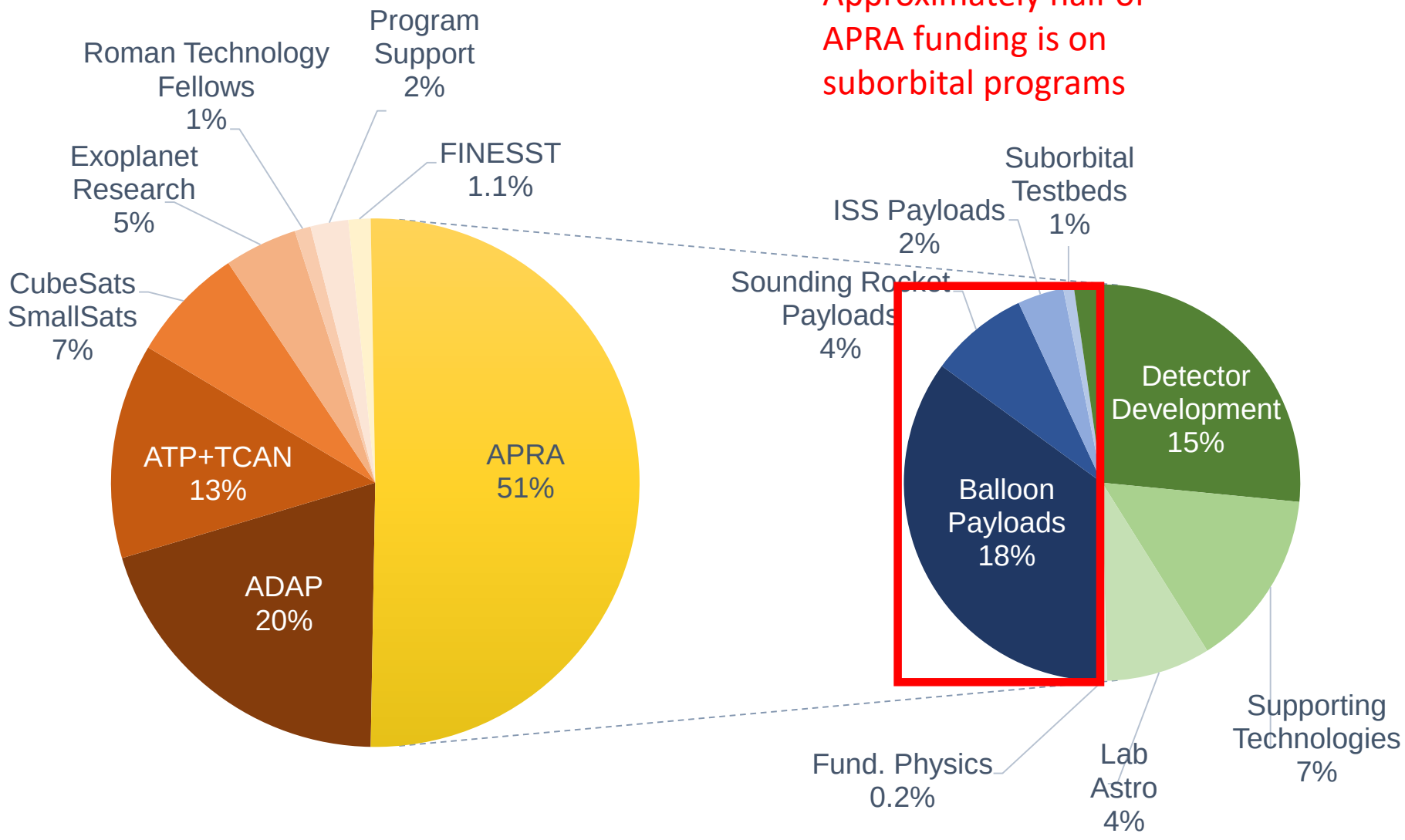


FY19 R&A Elements
(excludes GO Programs and SAT)



FY19 R&A Elements
(excludes GO Programs and SAT)

Approximately half of APRA funding is on suborbital programs



FY19 R&A Elements
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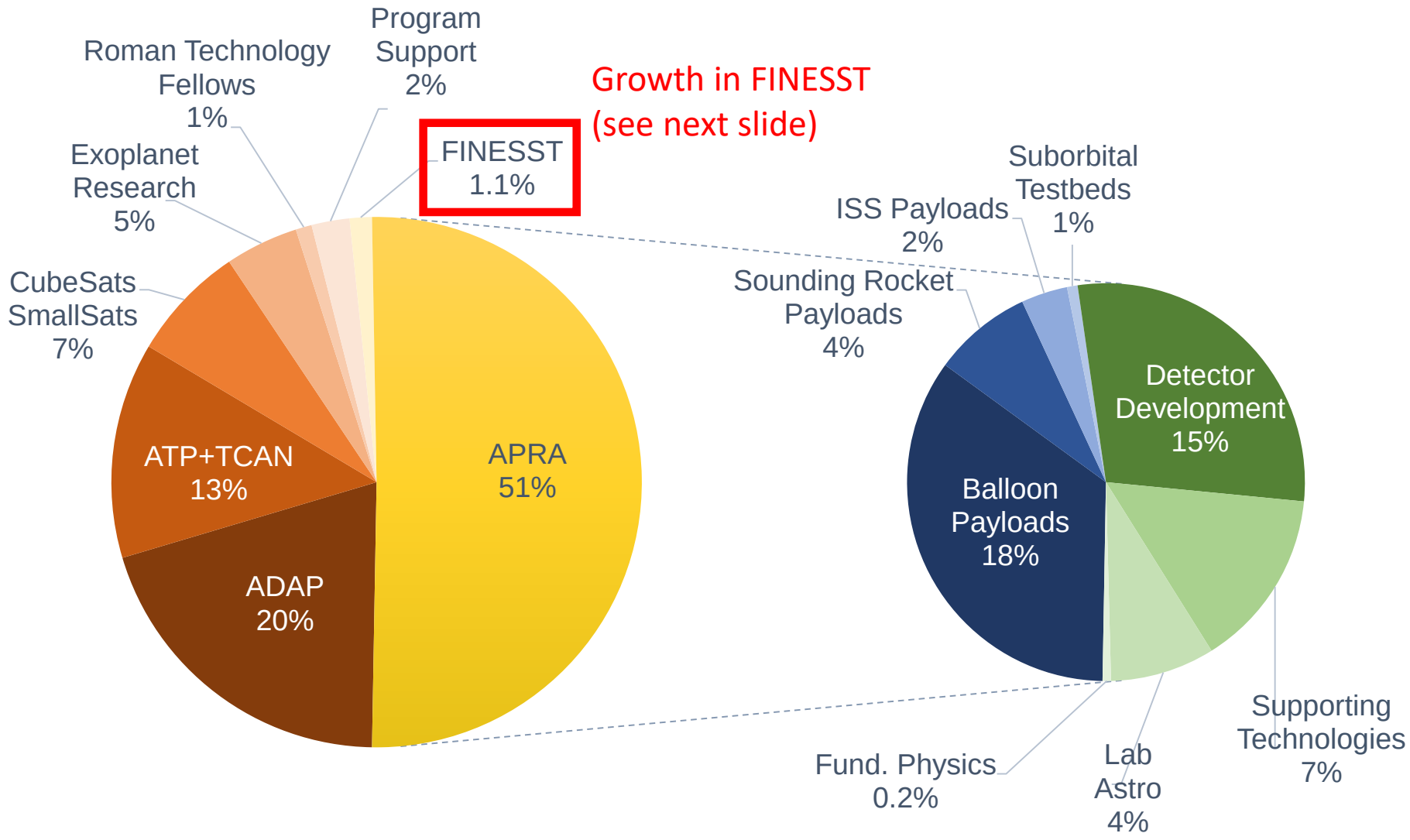
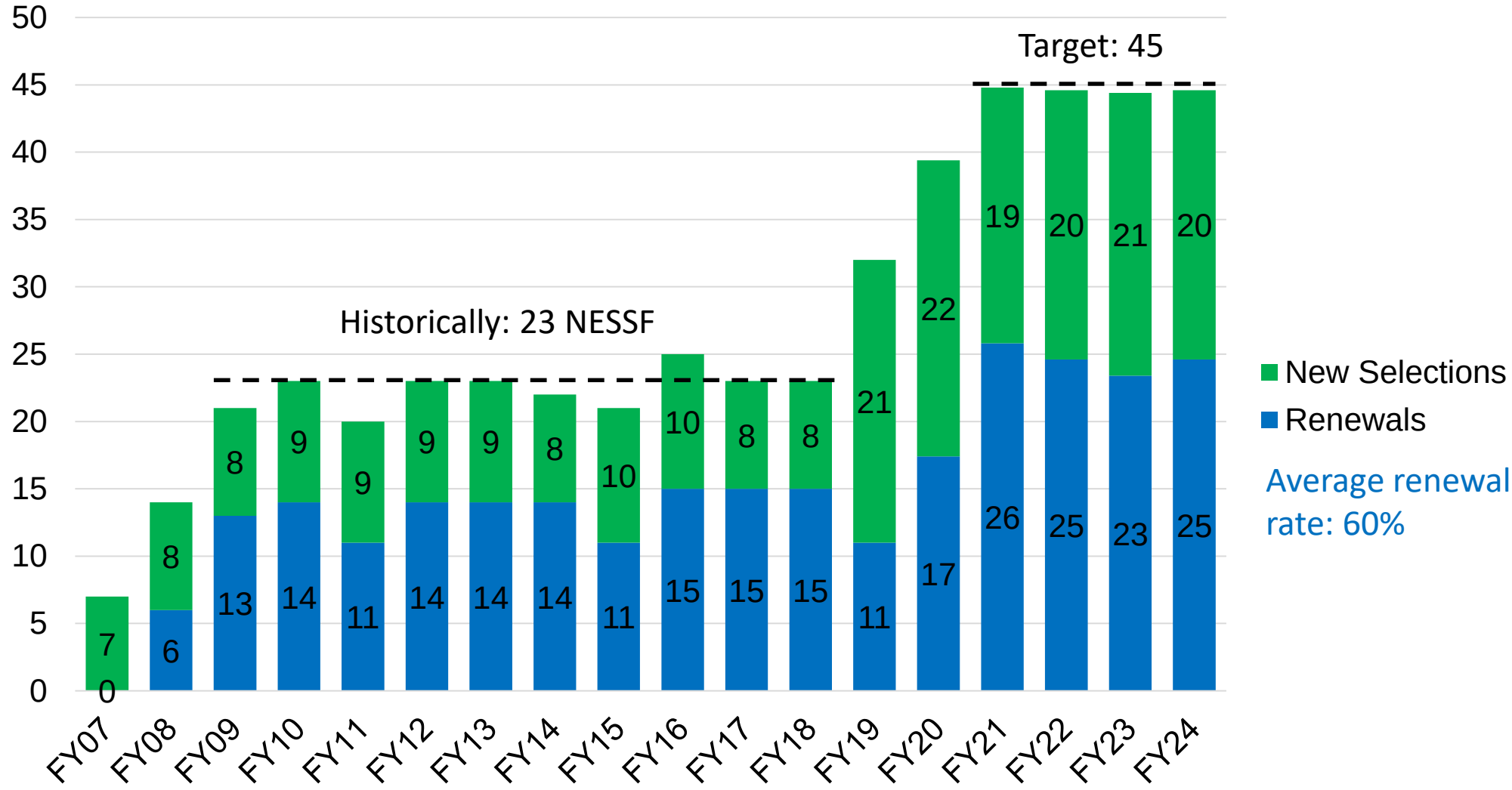


Growth in FINESST Funding & Selection



Theory Programs

R&A:

$12M

ATP+TCAN+XRP
FY19

Missions:

$750k

CHANDRA THEORY
(APPROX. PER YEAR)

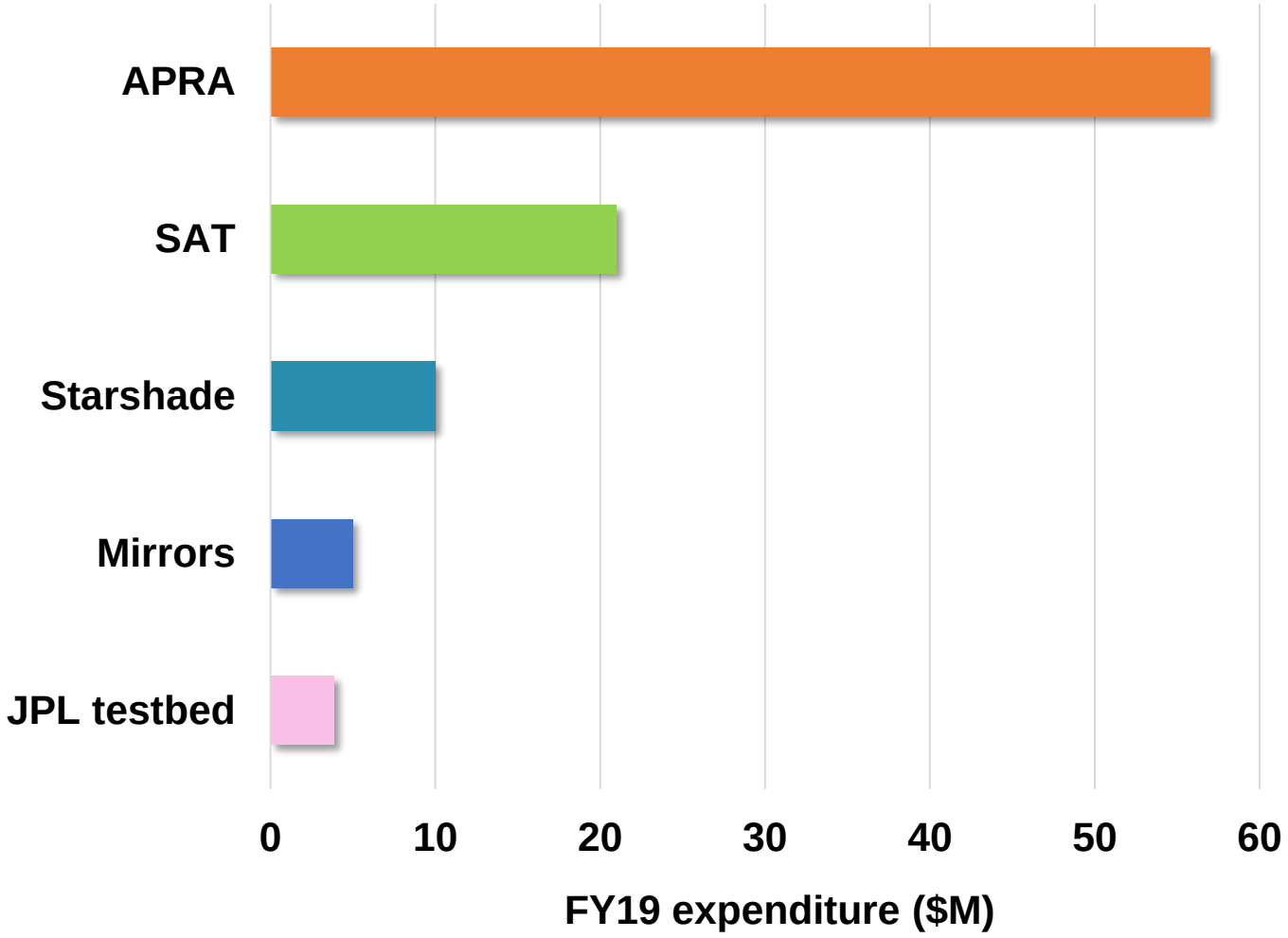
$500k

FERMI THEORY
(APPROX. PER YEAR)

$1M

HUBBLE THEORY
(APPROX. PER YEAR)

Low-TLR Technology Development: $97M in FY19



APRA — $57M, covers TRL 1-9.

SAT — $21M, competed and directed. COR = 9M; PCOS = $7M; ExEP = $5M. Covers TRL 3-6.

STAR SHADE — $10M, NASA-directed investment.

MIRRORS — $5M, segmented mirror ROSES solicitation.

JPL TESTBED — $4M, JPL high-contrast imaging testbed.

Note: NASA also invests $35M in technology development for Athena and LISA.

Astrophysics Suborbital Programs

NASA's Astrophysics Balloon Program

Balloons provide low-cost, quick response, near space access for:

- Conducting cutting-edge research
- Developing technologies to enable future spacecraft science missions
- Advancing lighter-than-air platform technologies
- Enabling hands-on training of the next generation of scientists and engineers
- Now offering super-pressure balloons as a new capability

COSI launch from Wanaka, NZ on a Super-Pressure Balloon on May 17, 2016.

Most recently successfully launched all 8 large payloads during the Ft. Sumner, NM Campaign.

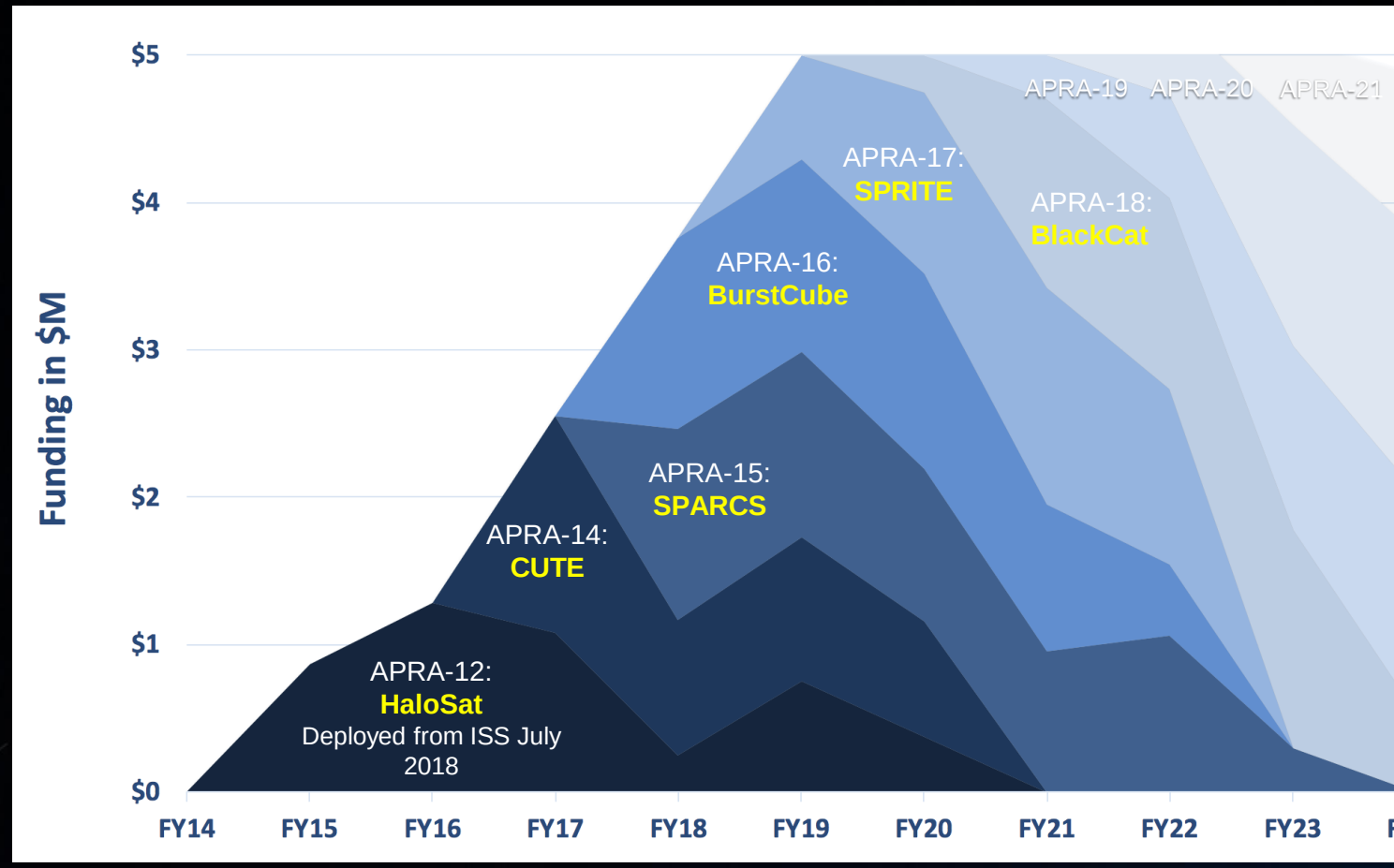
Super-Pressure Balloon Flights from Wanaka, NZ enable multi-day (night) astrophysics observation in the Southern Hemisphere.

8-12	>3	>300	>40
LAUNCHES PER YEAR	CAMPAIGNS PER YEAR	STUDENTS PER YEAR	INSTITUTIONS PER YEAR

NASA’s Astrophysics CubeSat Initiative

NASA’s Astrophysics Division is investing approximately $5M annually in a new CubeSat initiative.

HaloSat, our first CubeSat, is in orbit and is producing excellent data.



Launch:

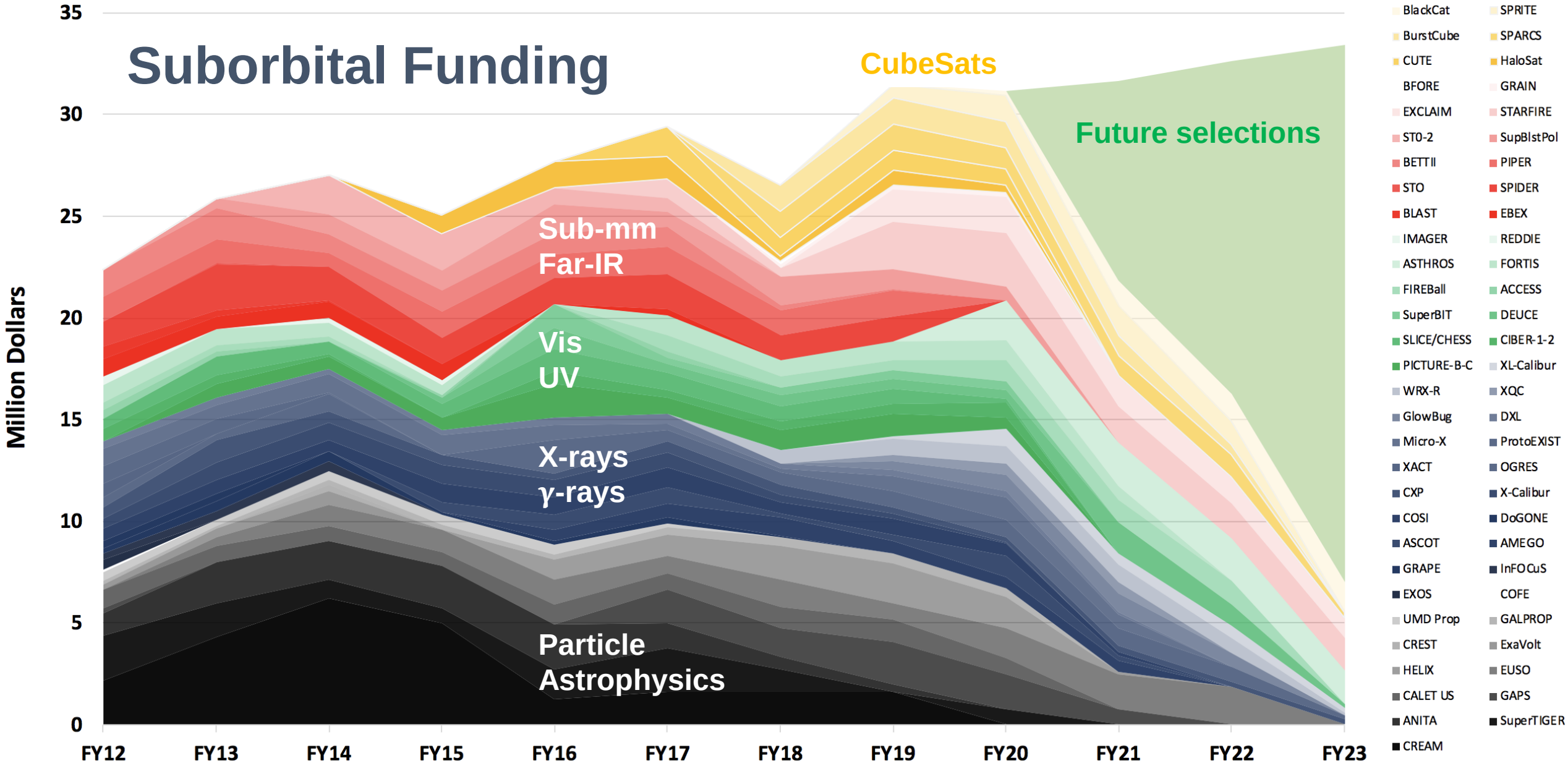
NASA’s Astrophysics Sounding Rocket Program

Objective:
Enable discovery through frequent sub-orbital flight opportunities (sounding rockets and balloons) for NASA scientific, technology development, and educational investigation.

- Astrophysics has 3-5 sounding rocket launches per year.
- The next southern hemisphere campaign from Australia is currently scheduled for July of 2020.

MISSION	PI	PROJECT	RANGE	DATE (ET)	DISCIPLINE
36.323 UG	FRANCE	CHESS	WSMR	2017-06-27 00:10:00	UV/OPTICAL
36.311 UG	GREEN	DEUCE	WSMR	2017-10-30 05:00:00	UV/OPTICAL
36.329 UH	GALEAZZI	DXL	PFRR	2018-01-19 07:17:00	HIGH ENERGY
36.330 UH	MCENTAFFER	WRX-R	KWAJ	2018-04-04 06:40:00	HIGH ENERGY
36.333 UG	FRANCE	CHESS	KWAJ	2018-04-16 10:16:47	UV/OPTICAL
36.245 UH	FIGUEROA	MICRO-X	WSMR	2018-07-22 02:00:00	HIGH ENERGY
36.331 UG	GREEN	DEUCE	WSMR	2018-12-18 02:46:00	UV/OPTICAL
36.346 UG	FRANCE	SISTINE	WSMR	2019-08-11 02:07:00	UV/OPTICAL
36.343 GG	NUTH	DUST	WSMR	2019-10-07 11:00:00	LAB ASTRO
36.352 UG	MCCANDLISS	FORTIS	WSMR	2019-10-27	UV/OPTICAL
36.245 UH	FIGUEROA	MICRO-X	WSMR	2020-03 TBC	HIGH ENERGY
36.281 UG	ZEMCOV	CIBER-2	WSMR	2020-02-02	UV/OPTICAL
36.339 UG	FRANCE	SISTINE	AUS	~2020-07-01	UV/OPTICAL
36.347 UH	MCCAMMON	XQC	AUS	~2020-07-01	HIGH ENERGY
36.350 UG	GREEN	DEUCE	AUS	~2020-07-01	UV/OPTICAL

Suborbital Funding



R&A Proposal Status Update

R&A Proposal Status Update

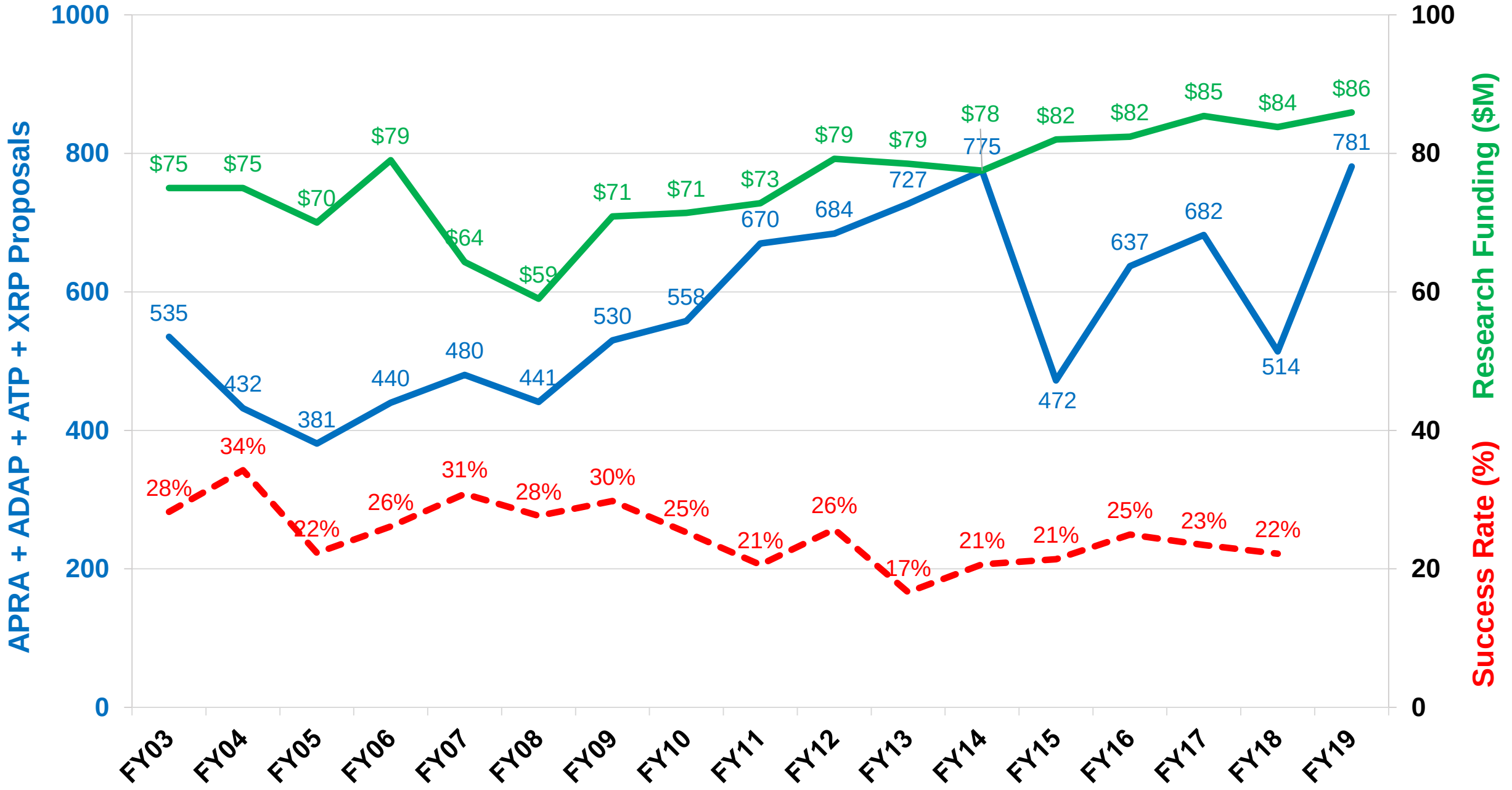
Average: 111 days (59 – 155 days)
80% PIs notified: 89 days

R&A Selection Rate = 20%
GO Selection Rate = 26%

Status: October 31, 2019

Solicitation	Proposal Due Date	Notify Date	Days since received	Number received	Number selected	% selected	New PIs
SmallSat Studies (AS^3)	July 13, 2018	Sep 10, 2018	59	38	9	24%	N/A
ADAP (Data Analysis)	May 17, 2018	Sep 17, 2018	123	242	53	22%	36 (68%)
XRP (Exoplanet Research)	May 30, 2018	Oct 19, 2018	142	67	8	12%	7 (88%)
LISA Preparatory Science	June 14, 2018	Nov 16, 2018	155	30	9	30%	N/A
SOFIA Next Gen Instruments	Aug 1, 2018	Oct 23, 2018	84	6	0	0%	N/A
Swift GI – Cycle 15 *	Sep 27, 2018	Feb 12, 2019	153	141	33	23%	4 (12%)
NICER GO – Cycle 1 *	Dec 20, 2018	Mar 4, 2019	75	84	49	58%	N/A
TESS GI – Cycle 2 *	Mar 14, 2019	June 21, 2019	99	134	38	27%	31 (78%)
Fermi GI – Cycle 12 *	Feb 23, 2019	July 1, 2019	128	97	35	36%	5 (14%)
NuSTAR GO – Cycle 5 *	Mar 29, 2019	June 17, 2019	80	198	67	34%	26 (39%)
FINESST-19	Mar 11, 2019	June 27, 2019	108	188	21	11%	N/A
Chandra GO – Cycle 21	Mar 14, 2019	July 24, 2019	132	516	168	32%	27 (17%)
Hubble GO – Cycle 27	Apr 4, 2019	June 28, 2019	86	1019	182	18%	51 (30%)
APRA (Basic Research)	Mar 29, 2019	Aug 21, 2019	145	164	40 (11)	27%	35 (88%)
SAT (Technology)	Mar 29, 2019	Aug 21, 2019	145	30	12	40%	7 (58%)
Roman Technology Fellowships	Mar 29, 2019	(pending)	(217) **	9			
ADAP (Data Analysis)	May 17, 2019	(pending)	(133)	242	38 (8)	16%	27 (71%)
XRP (Exoplanets Research)	May 30, 2019	Oct 4, 2019	128	139	18	13%	16 (89%)
Segmented Telescope Design	June 13, 2019	Aug 20, 2019	68	3	2	67%	N/A
ATP (Theory)	June 27, 2019	(pending)	(92)	236			

* affected by the partial government shutdown. ** RTF fellows are to be notified within 3 months after their APRA award.


APRA + ADAP + ATP + XRP Proposals
Research Funding ($M)
Success Rate (%)
1000
800
600
400
200
0
100
80
60
40
20
0
FY03
FY04
FY05
FY06
FY07
FY08
FY09
FY10
FY11
FY12
FY13
FY14
FY15
FY16
FY17
FY18
FY19
$75
$75
$70
$79
$64
$59
$71
$71
$73
$79
$79
$78
$82
$82
$85
$84
$86
535
432
381
440
480
441
530
558
670
684
727
775
472
637
682
514
781
28%
34%
22%
26%
31%
28%
30%
25%
21%
26%
17%
21%
21%
25%
23%
22%

Exoplanet Consolidation

Exoplanet Consolidation

- In 2XRP-18 = FY20 (most recent selections), the **Exoplanet Research Program** (XRP) was jointly managed for the first time by all four divisions of SMD – Astrophysics Division (APD), Planetary Science Division (PSD), Heliophysics Division (HPD), and Earth Science Division (ESD).
- Purpose: Combine skills and disciplines from across divisional boundaries and scientific cultures to make the most impact upon strategic and solicited exoplanet science.
- Starting in XRP-20 = FY21, the scope of Appendix D will change to exclude exoplanet research elements from ADAP, ATP, and the Lab Astro component of APRA (technology development will not be affected).
- Historical levels of APD exoplanet research funded through ADAP, ATP, and APRA will be maintained, but distributed through XRP.
- HPD and ESD are now financial partners in XRP, increasing the total money available to the program.

XRP-2018 (FY19)

Scope
APD: Ground-based support of space missions
PSD: Theory | Modeling | Lab Astro

Implementation
APD + PSD
Joint operation of peer review, Divisions make unilateral investigation selections

2XRP-2018 (FY20)

Scope
APD+PSD+HPD+ESD: Ground-based support of space missions | Theory | Modeling | Lab Astro

Implementation
APD + PSD + HPD + ESD
Joint operation of peer review, and joint investigation selections

XRP-2020 (FY21)

Scope
Same as before + archival investigations. Exoplanets will be excluded from ADAP-20, ATP-20, and APRA-20 Lab Astro

Implementation
No changes