Portfolio Mix of NASA Science Missions

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Introduction

- NASA benefits from having a variety of different acquisition approaches and types of missions
  - *Acquisition approach: Directed vs. Competed vs. Contributed Inst.*
  - *Category of Missions: CAT1, CAT2, CAT3*

- Other Agencies use a multiple tiered “force structure” to maximize capability within a fixed budget
  - *USAF utilizes multiple aircraft (i.e. B-2, F-22, F-35, etc.) to support their objectives*
  - *Cities use multiple transportation alternatives (i.e. light rail, subway, busses, taxis, bicycles, etc.) to maximize passenger throughput*

- Question
  - *What has been NASA’s allocation of missions over the last 20 years?*

Portfolio Mix – Directed vs. Competed Missions

- NASA missions are acquired by being:
  - *Directed to NASA Centers or*
  - *Competed through the Announcement of Opportunity*

- Additionally, NASA often develops Contributed instruments to be flown by other organizations (ESA, JAXA, DoD, etc.)

- Directed missions are typically more expensive missions based on high science value targets (e.g. Decadal Survey, etc.)

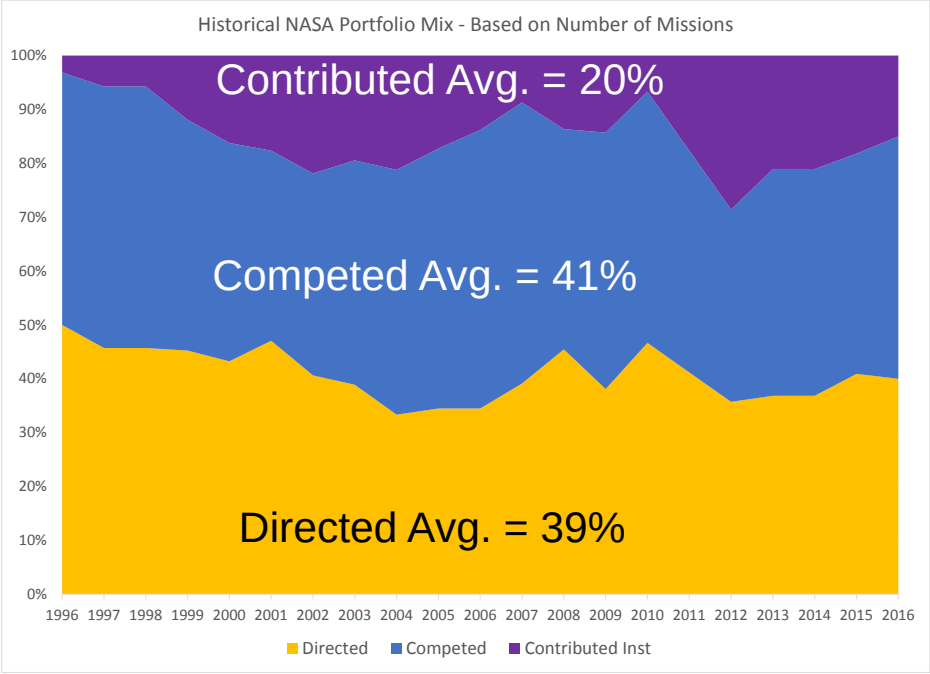
- Competed missions are selected based on science value with a fixed cost cap

- Contributed instruments rely on other organizations to ensure that science is implemented

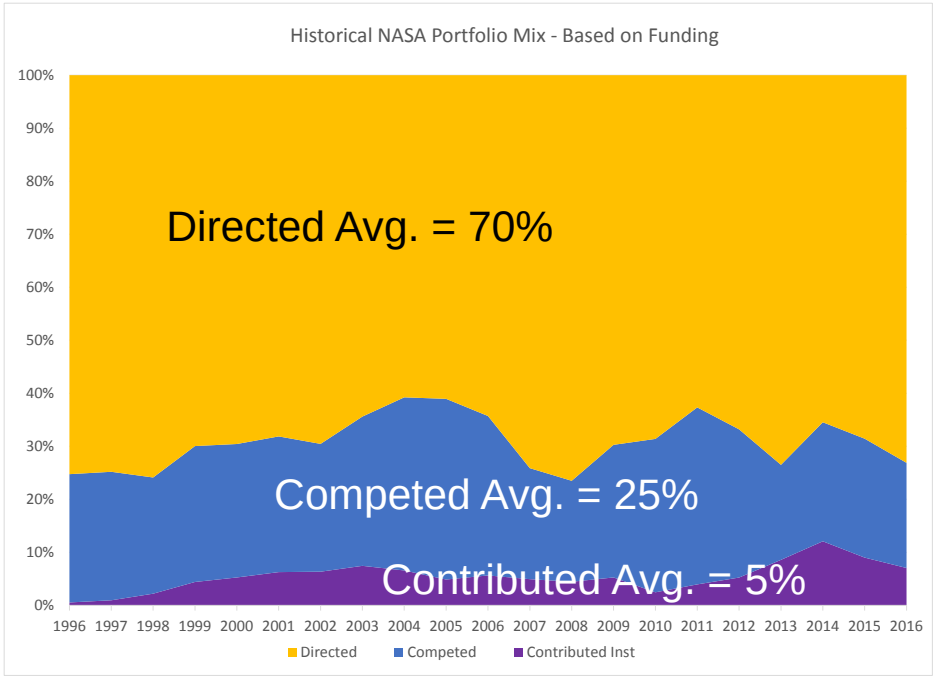
Portfolio Mix Can be Defined in Different Ways

- Following data shows the mix between Directed & Competed Missions and Contributed Instruments over a 20-year period relative to the number of missions and the funding allocation

Mix Based on Number of Missions



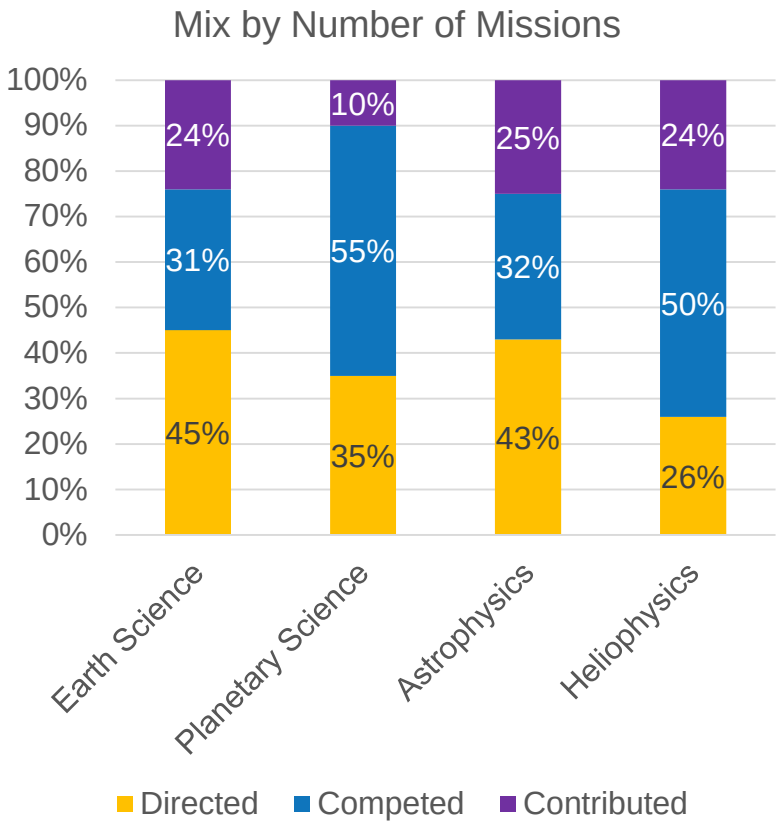
Mix Based on Funding

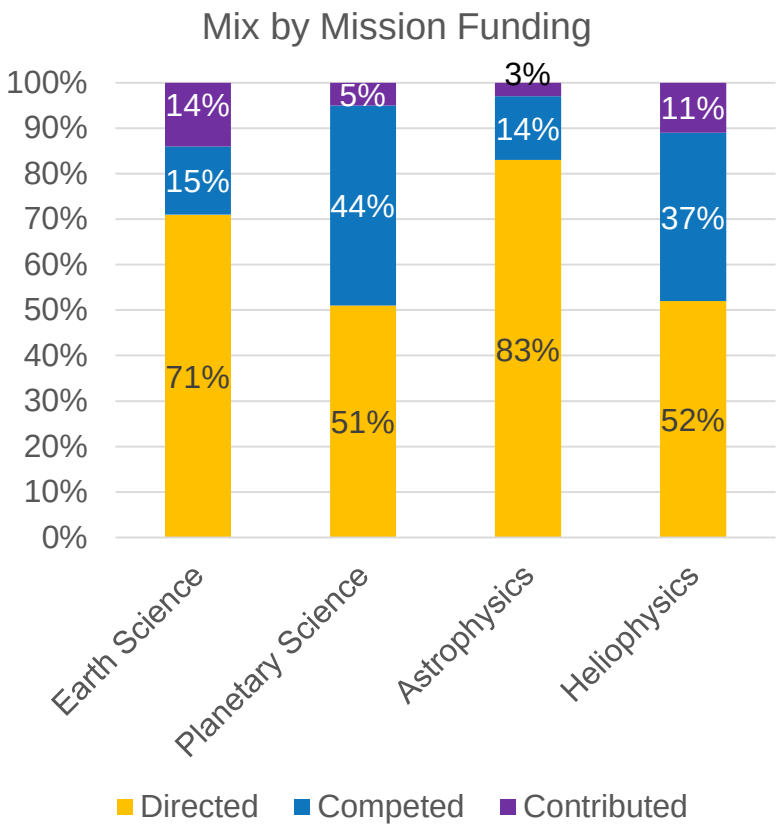


Portfolio Mix for Directed vs. Competed missions is relatively stable over last 20 years

Portfolio Mix by Acquisition Type

20-year Average Percentage





Selection of missions fairly balanced although majority of funding is for Directed missions

Portfolio Mix – CAT1 vs. CAT2 vs. CAT3 Missions

- NASA missions are categorized in the following manner as defined by 7120.5E:

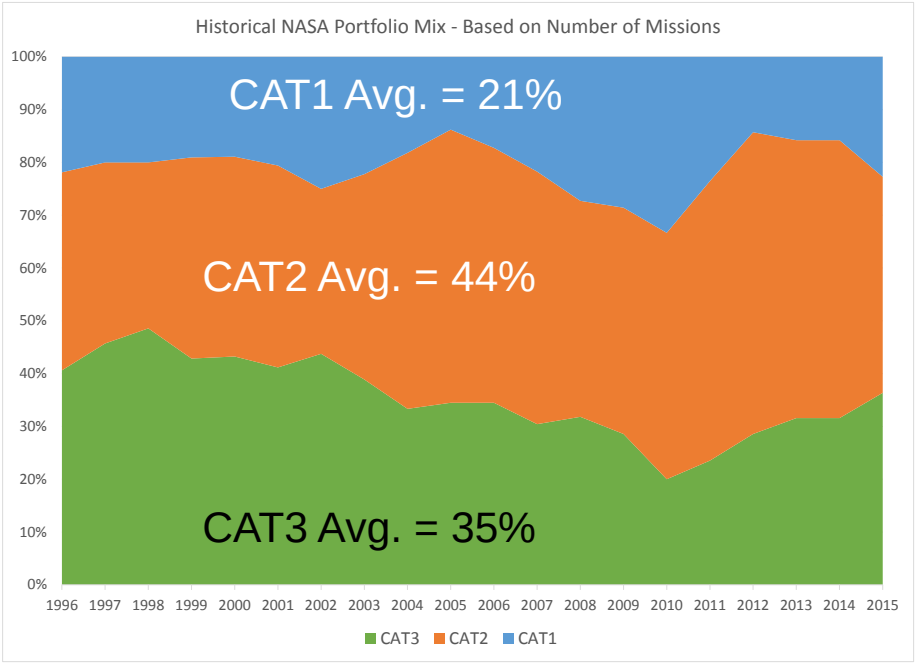
Priority Level	LCC < $250M	$250M = LCC = $1B	LCC > $1B
High	**CAT 2**	**CAT 2**	**CAT 1**
Medium	**CAT 3**	**CAT 2**	**CAT 1**
Low	**CAT 3**	**CAT 2**	**CAT 1**

- Although CAT1 mission provide more science value per mission than CAT2 and CAT3 missions, potentially more science value can be collectively attributed to CAT2 and CAT3 missions due to the greater number that can be afforded

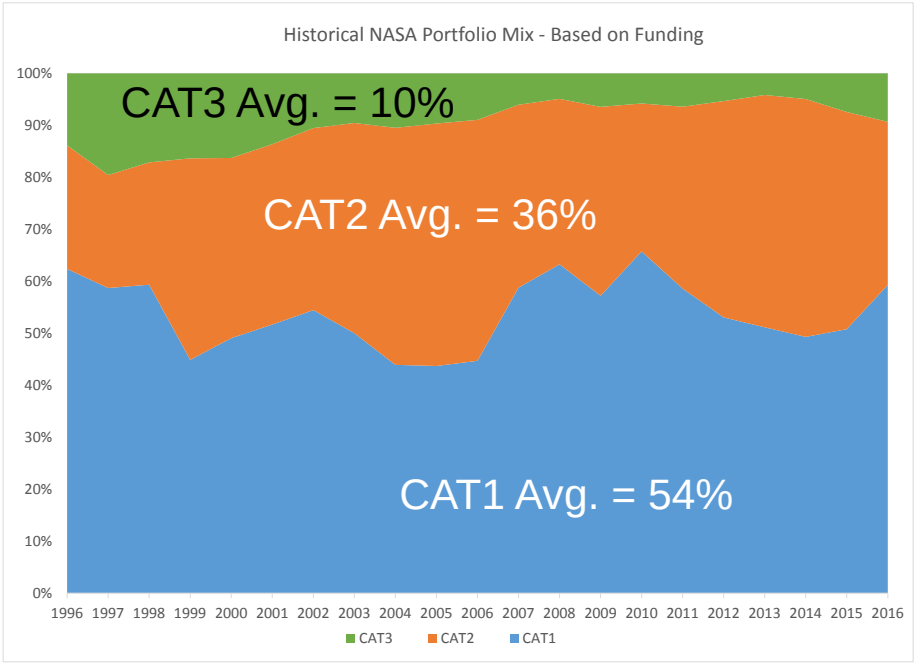
Portfolio Mix for CAT1, CAT2 and CAT3

- Following data shows the mix between CAT1, CAT2 and CAT3 over a 20-year period relative to the number of missions and the funding allocation

Mix Based on Number of Missions



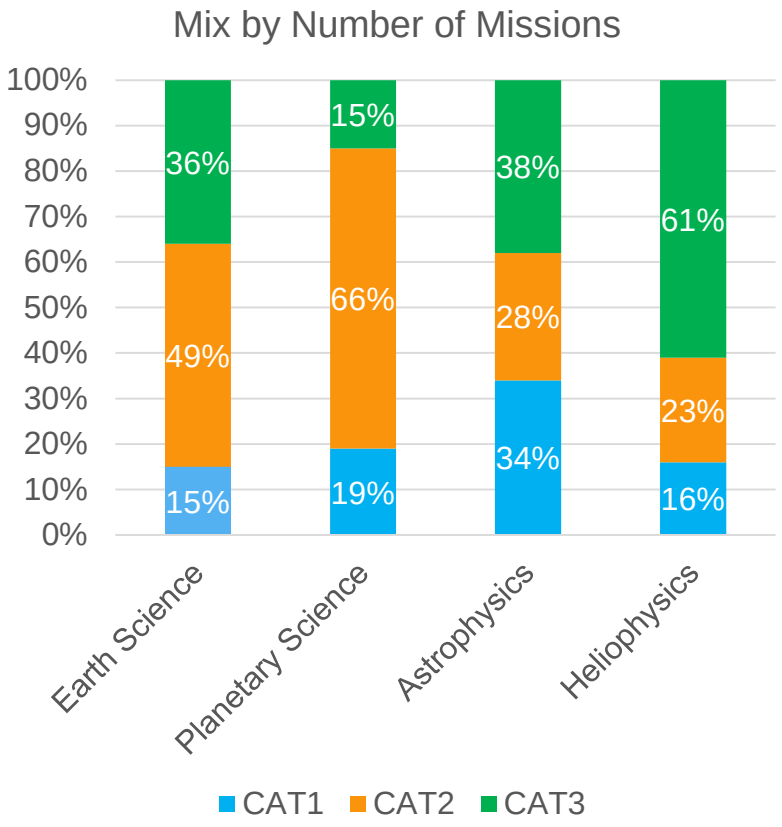
Mix Based on Funding

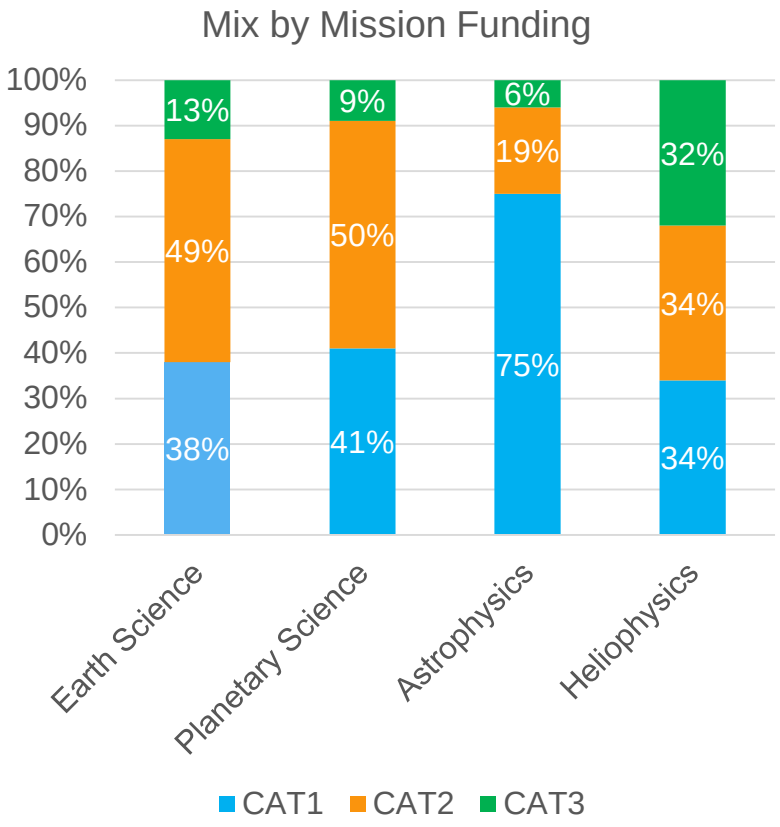


CAT3 mission funding seems to be decreasing over last 20 years

Portfolio Mix by Science Theme

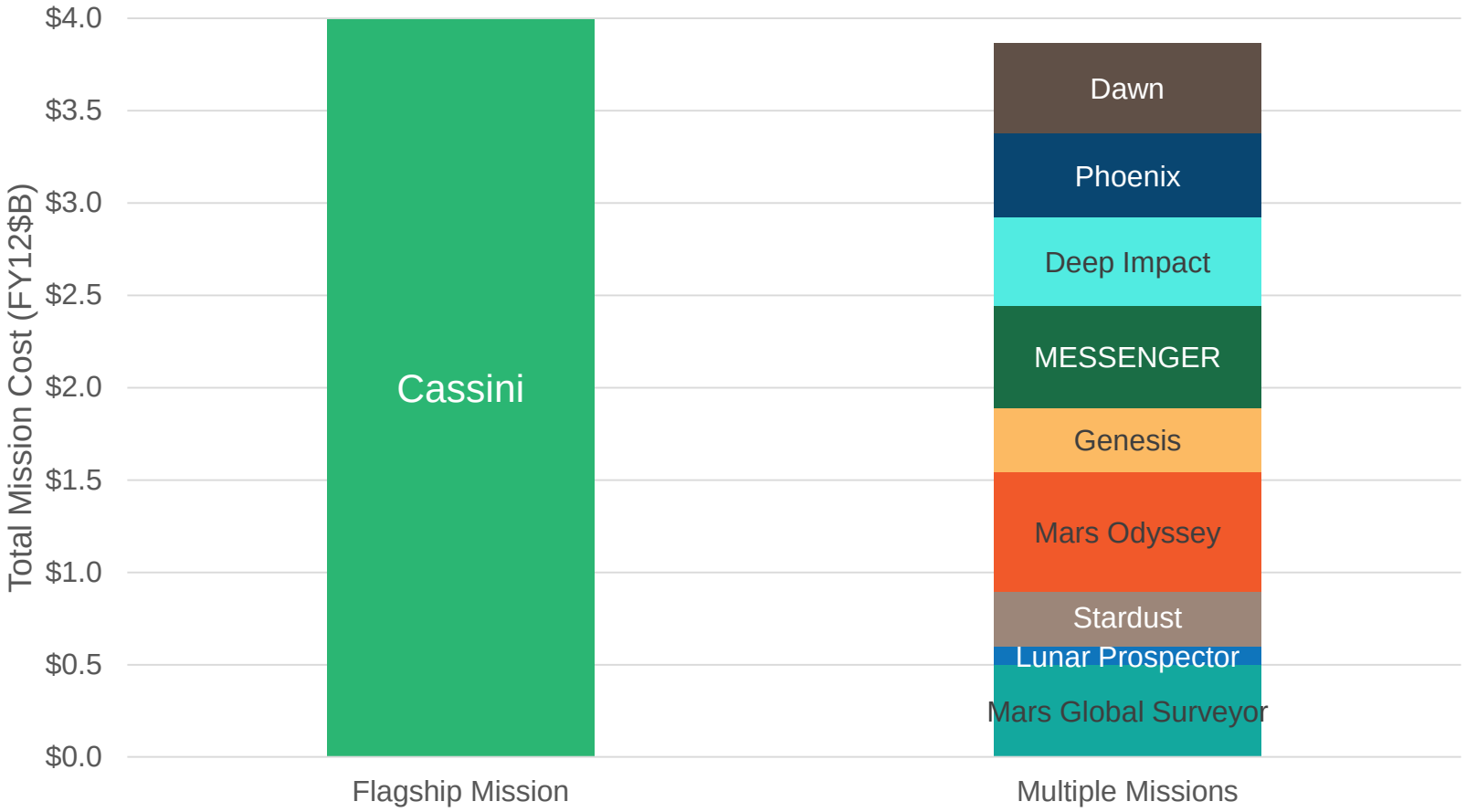
20-year Average Percentage





CAT2 missions make-up majority of funding for Earth and Planetary science while CAT1 missions are majority for Astrophysics

Comparing value of Missions is Difficult Given Benefit of both Depth and Variety of Science



How does science value of Cassini compare to value of all of the other missions listed above?

Summary

- NASA benefits from having a variety of different acquisition approaches and types of missions
  - *Acquisition approach: Directed vs. Competed vs. Contributed Inst.*
  - *Category of Missions: CAT1, CAT2, CAT3*

- The number of Directed vs. Competed missions is fairly balanced although the majority of NASA's funding goes to Directed missions

- CAT1 missions make up one fifth of the number of missions while accounting for over half of the funding while CAT3 missions make up one third of the number of missions but only a tenth of the funding

- Determining the optimal mix of missions to optimize science value is difficult but having different acquisition approaches and categories contributes to both the depth and variety of NASA's science