

Q8. In your testimony, you highlighted the importance of obtaining both more realistic cost estimates of missions, including the use of lifecycle costs. You gave some examples, but it would be useful for the Subcommittee to have a tabulated summary of lifecycle mission costs for past and present astrophysics missions on a uniform basis (as much as is practical) in current dollars including full-cost accounting estimates, with any assumptions given as well. Please provide that information to the Subcommittee, working with NASA to ensure that the cost numbers are developed consistently.

Response: The importance of having lifecycle costs for missions has been dramatically demonstrated over the last few years. The use of “construction costs” in community discussions has contributed to “undercosting”. For many programs the bulk of the costs are not in construction (Phase C/D) but actually in Phase B and earlier activities, and in operations. An extreme example is SOFIA which stands at \$3.4B lifecycle (in actual year dollars), but whose Phase C/D costs, while hard to define because of the poor management oversight and structure for this program, is probably around \$0.6B. Even for major missions such as JWST and SIM, the Phase C/D costs are about 30-40% of the total. For planning it is essential to develop reliable cost estimates and to use lifecycle costs (over the lifetime of the mission) in the discussions between NASA and the community. This will ensure that program planning within the astrophysics Decadal Survey, and subsequent agency roadmaps, can be carried out within likely budgets.

The Table below summarizes lifecycle mission costs (LCC) in constant 2007 dollars, with a summary of the caveats/comments appropriate for the derivation of these numbers. These numbers are from the NASA Science Mission Directorate (SMD). Since these numbers were derived by NASA, I would hope they become the baseline numbers for subsequent discussions of mission costs. Obviously taking costs from past missions done under very different accounting structures and converting them to present day structures will be uncertain, but they provide a very useful guideline for planning purposes and for setting the scale for missions under discussion. They are estimated as likely to be accurate to better than 10%, probably about ±5%. I would like to express my deep appreciation to the NASA SMD leadership for providing these numbers and notes for the response to this question.

NASA SMD Lifecycle Costs for Science Missions (in constant 2007 dollars)

Mission (alphabetical)	\$B (constant 2007 dollars)	Comments
Cassini	\$3.9	Launch included
CGRO	\$1.5	Launch included
Chandra	\$4.0	Shuttle cost not incl. (IUS incl.)
Galileo	\$3.2	Shuttle cost not incl. (IUS not incl.*)
HST	\$12.8	Shuttle cost not incl.; Servicing mission costs incl.**
JWST	\$4.4	2013 Launch; 10 yrs operations
SIM	\$2.6	Nominal 2015/16 Launch; 10 yrs ops***
SOFIA	\$2.7	Full science ops 2013; 20 yrs ops
Spitzer	\$1.7	Launch included

All costs are lifecycle (LCC), adjusted for full cost prior to FY04 (full cost accounting used since FY04), and converted to constant 2007 dollars (rounded to nearest \$0.1B).

*Inertial Upper Stage (IUS) number too uncertain for inclusion (maybe \$0.2B?);

**ESMD funding of robotic servicing not included.

***Based on FY07 budget data; currently “indefinitely deferred.”