NASA Science Mission Directorate Response to the Consensus Study Report:

Roman Space Telescope Observing Time Allocation Principles: Report Series—Committee on Astronomy and Astrophysics

Roman Core Community Survey Definition

Roman will perform three Core Community Surveys (CCS): a High Latitude Wide Area survey, a High Latitude Time Domain survey, and a Galactic Bulge Time Domain survey. The definition of these surveys will be via an open process, maximizing the overall science return while meeting the Astrophysics, cosmology and exoplanet science requirements.

The Roman Project has considered and incorporated the findings of the CAA Roman Observations working group report. The path the Roman Project will take for defining the Core Community Surveys and the process for selecting General Astrophysics Surveys is built upon the principles outlined in the CAA report.

The Core Community Surveys will be defined over the next two years, culminating in a release in Q2 2025. In Spring 2023, white papers will be solicited form the science community wherein they will describe the science drivers, observation strategies, and figures of merit for science objectives that can be met with the Core Community Surveys.

For each Core Community Survey, the Roman Mission (i.e. both science centers and project) will recruit a definition committee, who will be responsible for generating a community defined baseline survey, along with options for an overguide and an underguide survey. These committees will use the white papers and solicit additional input as they deem necessary. Additionally, a series of open community workshops will occur, starting in late 2023, that will serve as forums for the discussion of the survey definition.

The survey definitions will be competitively evaluated by an independent, balanced committee with members with expertise in science related to the Core Community Surveys (across Astrophysics, Cosmology and Exoplanets) and members with expertise in science that can only be conducted with potential General Astrophysics Surveys. This committee is called the ROTAC (Roman Observations Time Allocation Committee). They will generate a report that recommends the time that should be allocated to each Core Community Survey, along with the time that should be assigned to General Astrophysics Surveys.

In parallel with the Core Community Survey definition, the Roman Project is considering an Early Definition General Astrophysics Survey. Following recommendations from the Roman Science Interest Group and the Roman Space Telescope Advisory committee, in November 2021 the Roman project solicited white papers describing the case for defining a general astrophysics survey prior to the first call for General Investigator proposals (i.e. early). An assessment committee has been formed, and will recommend whether to move forward and, if so, the science theme that this survey should be based upon. If they recommend proceeding, this survey will be defined via a community process, similar to that of the core community surveys, and evaluated by the ROTAC.

In summary, the Roman Project has responded to the findings and conclusions of the CAA ROWG report and laid out a plan for defining the surveys and their allocations.

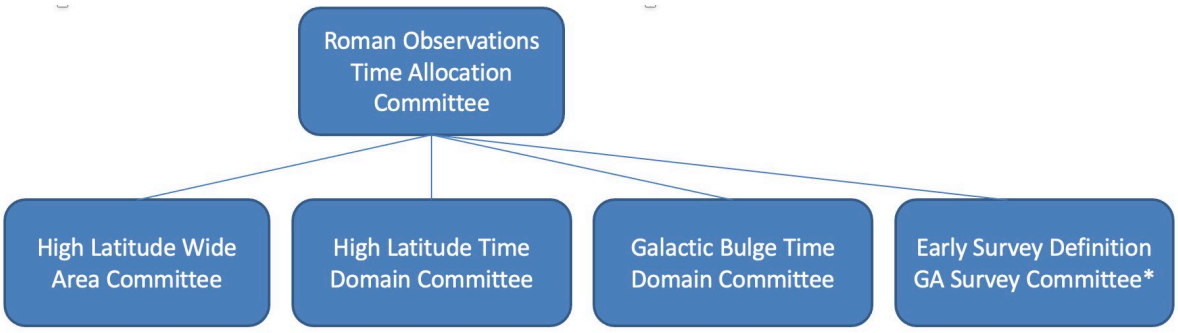

Figure 1 Shows the committee structure for defining the core community surveys and an additional early definition GA survey, if recommended. Each individual survey committee has responsibility to evaluate white papers, solicit additional community input, evaluate survey options against science metrics, and produce recommendations for each survey with options for underguide/overguides. The suite of survey options will be provided to the ROTAC, who will provide recommendations on balance among the core community surveys, and the time allocation for general astrophysics survey above 25%

Findings in CAA Roman Observations Working Group Report

In what follows, we list each of the findings and conclusions in the CAA ROWG report (in bold), followed by the project response (in italics).

Finding: The scientific objectives to be achieved by Roman's CCS remain scientifically valid and will have a significant impact on the fields of cosmology and exoplanets.
Agree

Finding: The GA science return of Roman is compelling and may lead to unexpected discoveries.
Conclusion: Maximizing the GA science return of Roman, while still achieving the science objectives envisioned by Astro2010 and endorsed by Astro2020, would enhance the scientific reach of the mission.
Agree

Finding: If Roman performs as designed and no new systematic uncertainties are identified, then the three CCS will meet their requirements with appreciable margins.
Agree

Finding: The current DRM reference surveys were developed without competition against each other or against other GA surveys.
The purpose of the Roman DRM (Design Reference Mission) was to demonstrate that the mission can meet its mission objectives and to provide realistic sample observations to support the development of the ground system. Similar to DRM for other missions such as JWST, the observations in the DRM were not optimized and never intended to define the actual observing plan.

Principles for defining the Core Community Surveys

The report provided ten principles to guide the process of survey design and time allocation. We provide the conclusions from each of these below, along with a response from the Roman project.

Conclusion: Roman's overall science output could be increased by having the design of the CCS be informed by GA science objectives.

Agree, Astrophysics with near-IR surveys is the first listed Roman mission objective and will be met with observations from the Core Community Surveys and with additional General Astrophysics Surveys.

Conclusion: Roman's overall science output could be increased by establishing a combined evaluation of all observing time requirements, including CCS, their GA extensions, and GA-only surveys.
Agree. Roman will establish a committee responsible for recommending the balance of observing time between each of the Core Community Surveys and the allocation for General Astrophysics Surveys. This will include representatives from the science that can be done with the Core Community Surveys (cosmology, exoplanets, astrophysics) and representatives from science areas that require GA Surveys. This committee is the ROTAC and is the top-level committee.

Conclusion: The process of selecting Roman's observing plan would benefit from including both community collaboration and competition.
Agree. Roman's community process is a form of open competition in addition to collaboration. We outline here how the combination of cooperation and collaboration will work.

For each Core Community Survey:

- *In response to calls for information, the community will provide survey needs along with associated scientific rationale and drivers.*
- *Each Core Community Survey will have an associated definition committee.*
- *An open collaborative process managed by each survey committee identifies solutions that address the needs of multiple science topics that can be met with a given survey.*
- *Each survey committee works with the science community to produce survey designs incorporating the most compelling science and submits them to ROTAC.*

The ROTAC will competitively assess the multiple survey options from each survey committee to make a final recommendation of time allocation for each core survey and for the General Astrophysics Surveys.

Starting one year before launch, users can propose to the Roman General Investigator program for General Astrophysics Surveys, and will continue on a regular cadence during the prime mission. These proposals will be competitively reviewed by a Roman TAC.

Conclusion: Roman's science output would benefit from an observing plan selected by an independent STAC.
Agree. The ROTAC will be an independent, balanced committee with members representing science interests related to the Core Community Surveys (across Astrophysics, Cosmology and Exoplanets) and members representing science interests related to General Astrophysics Surveys.

Conclusion: To make optimal use of Roman observing time, proposing teams would provide the STAC with quantitative sensitivity analyses relating observing time options with science deliverables. Smaller exploratory projects might be exempt.
Agree. Each survey committee will need to have quantified sensitivity analyses to support their recommended survey point designs. As part of this, it will also be important for each individual survey committee to have figures of merit, where possible, to quantify the impact of survey choices on a broad range of science cases. The scientific community has been solicited to provide these science cases, and associated figures of merit/metric as part of a white paper call due in Summer 2023.

Conclusion: Among the options each CCS proposes, it will be beneficial to include one with the minimum time required for achieving the science objectives laid out by Astro2010.

Agree. Each CCS committee will be charged with providing point survey designs for baseline, underguide, and overguide observing time allocation guidelines. These survey designs will be submitted to the ROTAC and be competitively evaluated.

Conclusion: An independent STAC would optimize Roman's scientific return without constraints of pre-set observing time allocations.
Agree. The guidelines for the planned community process will maintain the current requirement for at least 25% of the observing time to be allocated to General Astrophysics Surveys. However, should a very compelling case be made, the ROTAC will have flexibility to recommend an observing plan that does not follow this requirement.

Conclusion: For a survey instrument, it is beneficial to establish a process of consolidating observational programs. However, it is conceivable that some programs cannot be consolidated, and the CAA encourages a selection process that allows a broad range of program sizes.
Agree. The Roman mission will continue to work with the Roman community advisory and science interest committees to develop infrastructure to enable the community to consolidate/coordinate observational programs. The science centers supporting Roman have experience designing calls that support programs of a range of sizes.

Conclusion: Roman's science output may benefit from increasing the number of GA competed programs above 30. The final number of programs may be best determined by the STAC, or subsequent regular TAC reviews, so as to maximize the scientific return consistent with programmatic constraints at the time of the review.
Agree. The current design of the Roman ground system (including the planning and scheduling system) supports more than 30 competed General Astrophysics Surveys. The only thing that changes is the number of PIs that will need user support. The Roman mission will continue to explore ways to increase the number of PIs in a cost neutral way.

Conclusion: It would be beneficial to plan for post-launch flexibility should updates to the observing plan be warranted.
Agreed, the Roman mission plans to re-evaluate survey choices before launch (to incorporate possible new science information from other observatories), after launch (to incorporate as-measured flight observatory performance), and shortly after the start and periodically during the course of each major survey (to verify that the survey is proceeding as planned).