



NASA Planetary Science Division's Instrument Development Programs, PICASSO and MatISSE

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NASA Planetary Science



Strategic Goal: Advance scientific knowledge of the origin and history of the solar system, the potential for life elsewhere, and the hazards and resources present as humans explore space.

It seeks to answer five fundamental questions:

- How did the Sun's family of planets and minor bodies originate?
- How did the solar system evolve to its current diverse state?
- What are the characteristics of the solar system that led to the origin of life?
- How did life begin and evolve on Earth and has it evolved elsewhere in the solar system?
- What are the hazards and resources in the solar system environment that will affect the extension of human presence in space?



Instrument Development Strategy



Planetary Instrument Concepts Advancing Solar System Observations (PICASSO)



- **PICASSO** supports the development of spacecraft-based instrument systems that show promise for use in future planetary missions
- **Program goal** to develop low TRL technology to feed MatISSE, etc.
 - science instrument feasibility studies
 - concept formation
 - proof of concept instruments
 - advanced component technology
- **Program objectives** to develop new technologies that significantly improve instrument measurement capabilities for planetary science missions
- **Proposals** are typically sought every year.
- **The budget** is ~\$3.5 M per year.
 - Average award ~ \$250 - \$300K/year
 - Typically ~ 12 awards



Maturation of Instruments for Solar System Exploration (MatISSE)



MatISSE supports the maturation of spacecraft-based instrument systems that show promise for use in future planetary missions



Program goal to develop instrument to point where they can be proposed to flight programs

- Must address specific science objectives
- Retire major technological risk



Program requires higher level of oversight

- Quarterly reviews
- Site visits
- External reviewers



Proposals are typically sought on even numbered years

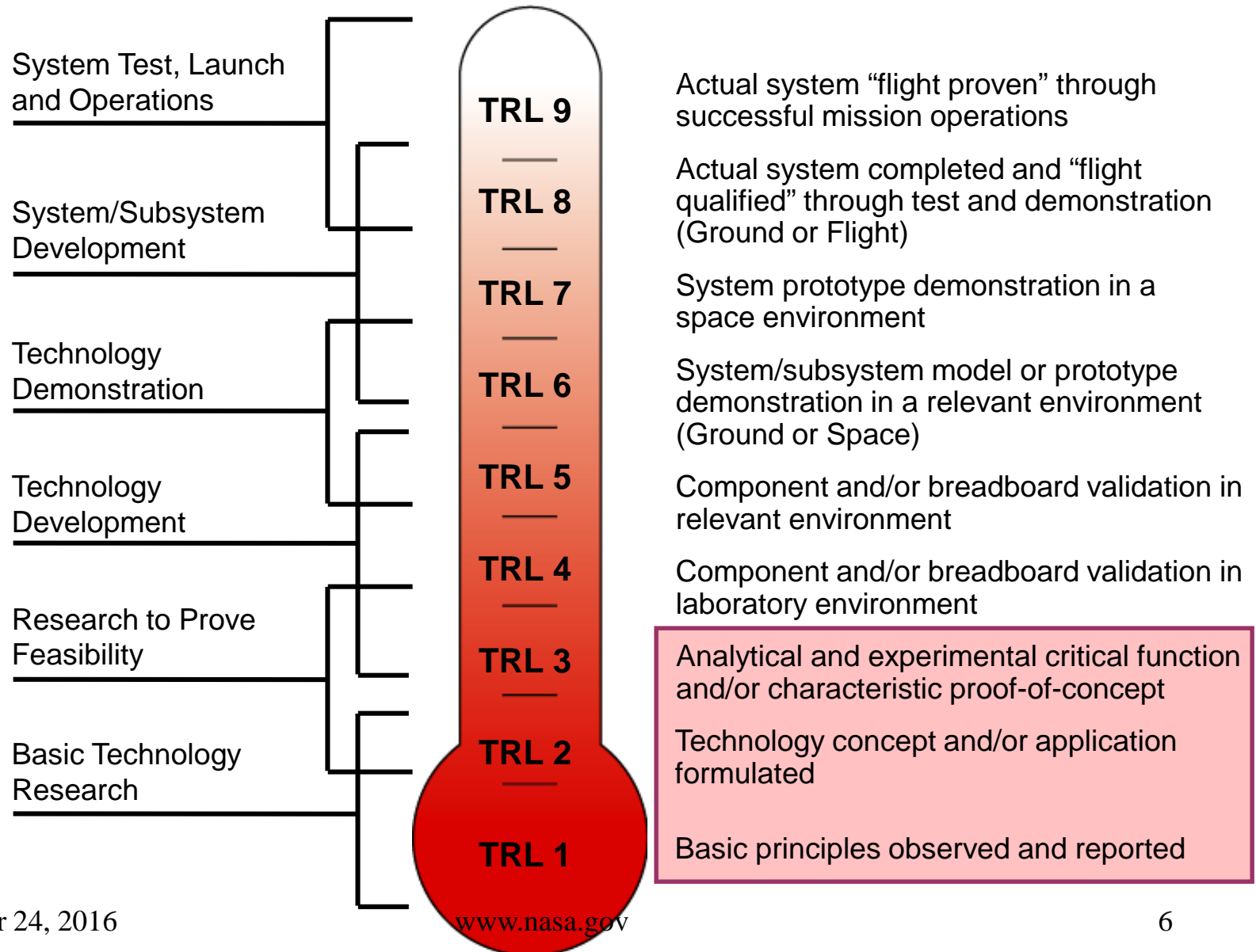


The budget is ~\$6 M per year.

- Average award ~ \$1.0M/year
- Typically ~ 6 awards

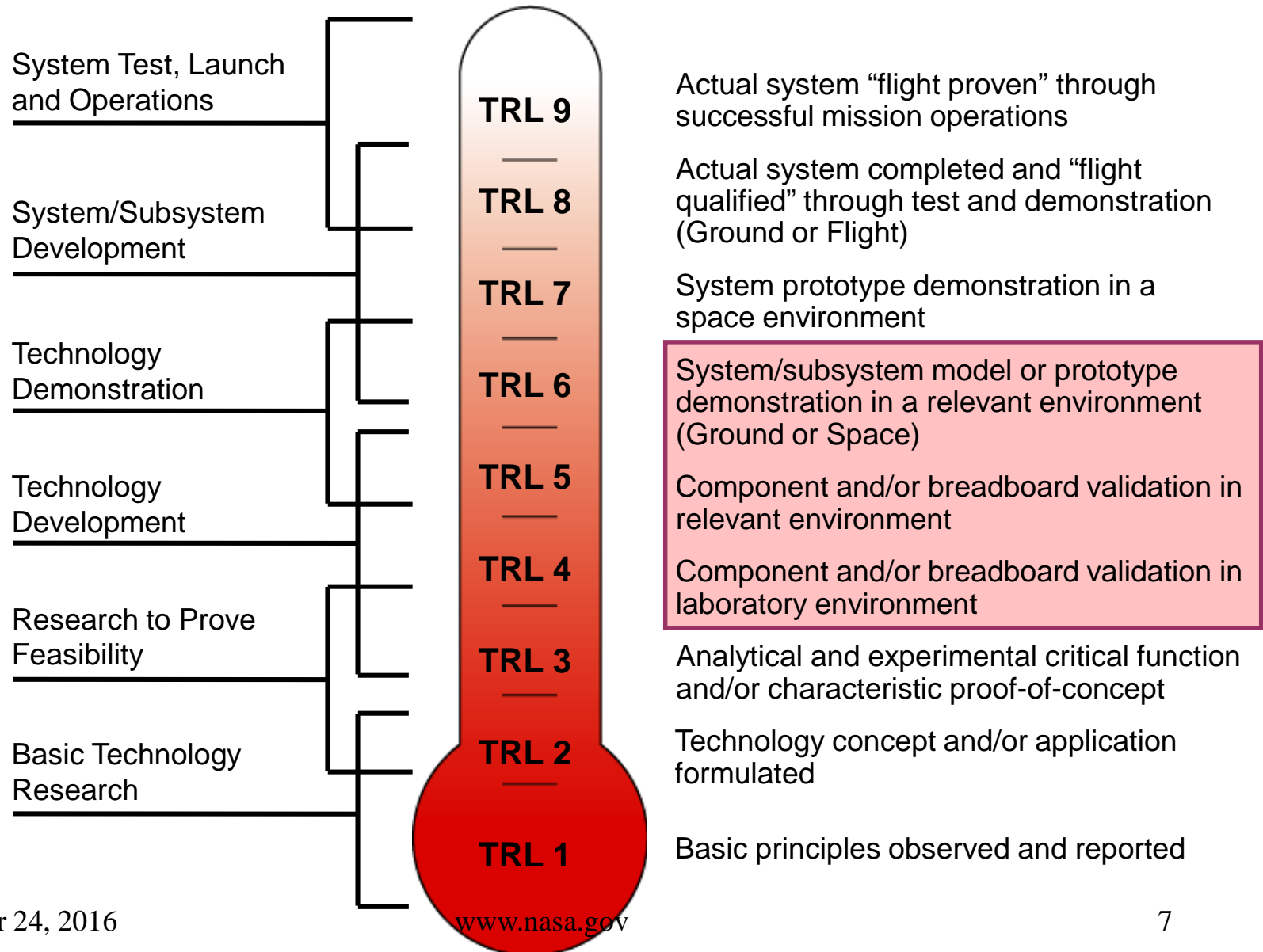


PICASSO Entry TRL's 1-3





MatISSE TRL's 4-6





TRL Summary

TRL's are quantized

TRL 2-3 does not exist

If the technology is between 2 & 3, it is 2

PICASSO

Entry TRL must be 1, 2, or 3

Advance the TRL at least 1 level.

MatISSE

Entry TRL 3 or higher

Advance the TRL to 6



Evaluations



- ◆ All compliant proposals are discussed (no triage)
- ◆ There is only one PI
- ◆ Proposers receive only the final panel review, not the individual ones
- ◆ No response to previous reviews required
- ◆ Training components are not required
- ◆ An overall score of "Good" is fundable
- ◆ The review panel does not rank proposals
 - Done later by in conjunction with NASA program leads
 - Selection Official does final selection



The prime directive...

- ◆ Reviewers do not guess, infer, interpolate, extrapolate, or read between the lines.
- ◆ They evaluate only what is written in the proposal.

Evaluation Criteria



Intrinsic Merit

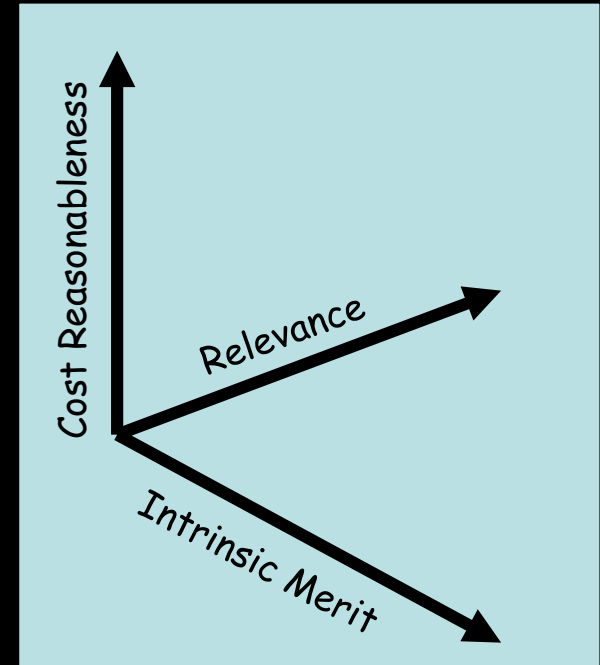
Scientific/technical merit
(including qualifications of
team and TRL assessment)



Relevance to program
(assuming success as proposed)



Cost Reasonableness (for
what they proposed)





Intrinsic Merit

- **Questions to consider:**
 - Can the proposed instrument concept achieve the proposed measurement goal?
 - Can the development achieve the progress proposed?
 - Does the proposal acknowledge potential pitfalls and propose alternatives?
 - Does the team have the necessary expertise?



Relevance

- ♁ Assume that everything works as proposed.
- ♁ Question to consider:
 - How compelling and articulate is the argument presented in the proposal for the relevance of the proposed development to NASA's and PSD's strategic goals?
 - Are specific NASA planning documents cited?
 - Decadal Survey
 - NASA Science Plan
 - Etc.



Cost Reasonableness

● Questions to consider:

- Are the **resources requested** (FTEs, travel and supply costs, etc.) **reasonable** for the scale and type of work proposed?
- Is the budget clearly described and justified
 - All major sub-contracts or sub-awards?
 - Quotes for items > \$5,000?
- Detailed Work Plan
 - Milestones
 - Schedule
 - Budget

● "Cost reasonableness" \neq "bang for buck."



Strengths and Weaknesses

- ◆ Each proposal has strengths and weaknesses
- ◆ Strengths and weaknesses may be major or minor.
 - “Major” and “minor” are fairly broad categories so not all “majors” are equally important.
 - Some major weaknesses, though, are *fatal flaws*.



Strength and Weakness

Major strength distinguishes it and provides a justification for selection

Major weakness is a deficiency that is not correctable in a subsequent negotiation process *A proposal with a fatal flaw in any evaluation category is not selectable.*

◆ Minor Strength and Weakness

- Comments of value to the selecting official or the proposers which are noteworthy.
- Minor weakness is correctable if addressed early during period of performance



Early Career Fellowship (ECF)





- Intended to help make planetary science post-docs more attractive to hiring institutions.
- Application is literally checking a box
 - Additional information supporting ECF request in the CV portion of the proposal
 - Accomplishments to date
 - Current research
 - Ideas for future research directions
 - How future research will support planetary science research goals

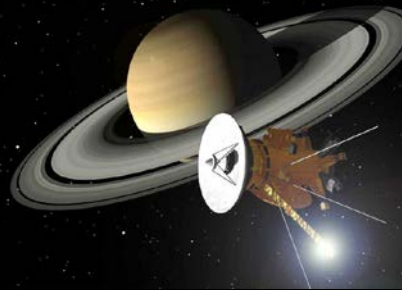


ECF Process

- Proposal must first be selected to be eligible
 - Does not affect proposal selection
 - ECF candidate must be recommended by review panel
- Separate application process
 - When offered tenure-track equivalent positions can apply for up to \$100k in start-up funds over and above proposal award

Historical Success

-  Virtually all US instruments on planetary probes started in PSD instrument development programs
 -  Nearly all instrument PI's were funded by instrument development programs
 -  Instruments rapidly becoming smaller and more capable
-  With your help, PICASSO and MatISSE are on track to continue that success



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