

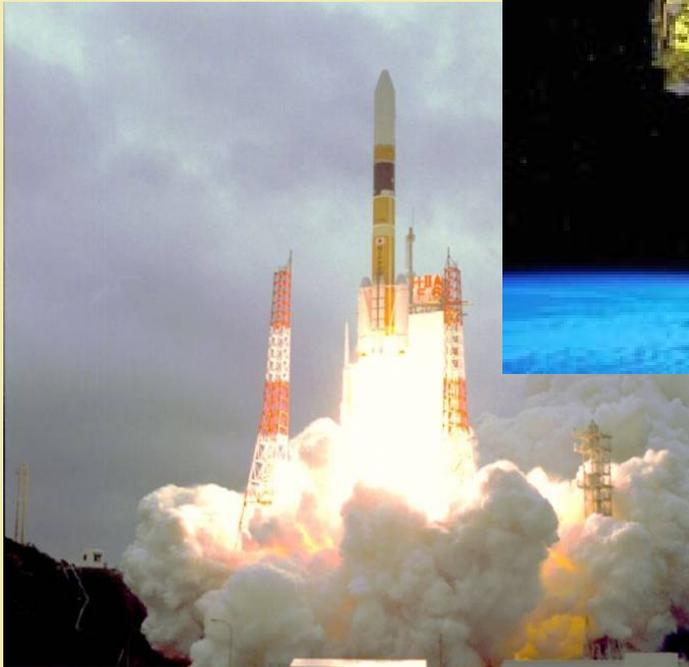
Independent Engineering Review at JAXA

April 2008
Hiroshi Imamura
Masashi Okada
Chief Engineer Office, JAXA

Contents

- Successive failures in 2003
- Actions from the failures
 - Original Independent Review
 - Visualization
- Establishing new frame work of Independent Engineering Review
 - Gray Beard team
- Conclusion

Successive Failures in 2003



H-IIA launch vehicle



ADEOS-II

Planet-B



First Action from the Failures

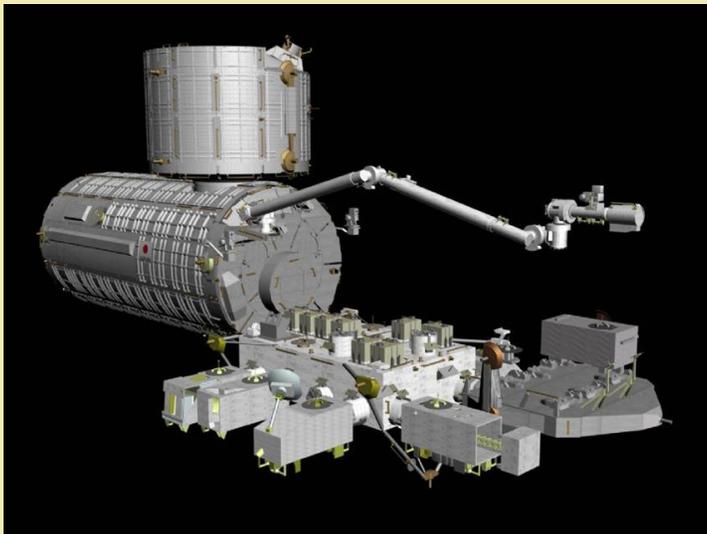
- In order to identify latent failures as much as possible before flight. We tried **Independent Engineering Review** for H-IIA rockets and succeeding Spacecrafts.
- Experienced people (so called specialists) from inside and outside JAXA are member of the independent review teams.

- **Independent review as a corrective action-**

Expand to Independent Engineering Review for Manned Space Systems

- The independent review was expanded to manned space systems such as Japanese Experiment Module (JEM) and H-II Transfer Vehicle (HTV).

- Independent Review as preventive action -



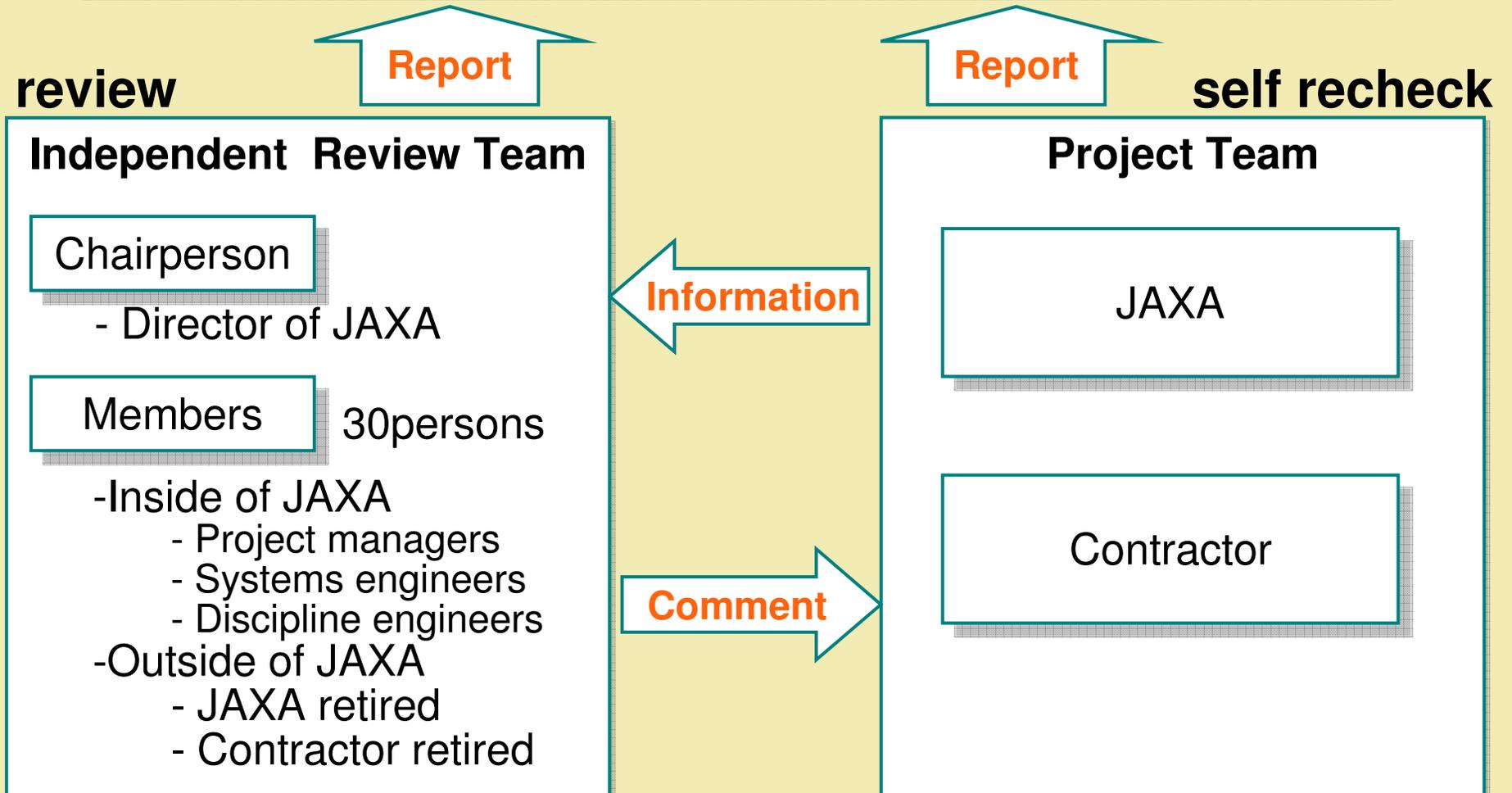
JEM (First element was attached to the ISS on March 14, 2008)



HTV (to be launched in 2009)

Framework of Independent Review

JAXA Reliability Reinforcement Board



Lessons Learned from HTV Independent Engineering Review

Good points

- The **review in the design phase** could reflect the results into development timely.
- Co-locating of all review member enabled the overall discussion **from a several viewpoint**.
- The information of the **significant malfunction** that JAXA experienced in other project could be shared promptly.
- Process of the discussion with the review member promoted the project team member to **re-realize and re-evaluate of the risk**. (awaking)
- The **common issues raised by the review team** could be shared with the project team and the contractor through review.

Lessons Learned from HTV Independent Engineering Review

Bad points

- In order to make review effective, it is necessary to prepare enough information by the project team, but it is a **burden** for them.
- It is **difficult to focus on the issue** to be checked in order to conduct an efficient review.
- But, few indications were effective.

Lessons Learned from HTV Independent Engineering Review

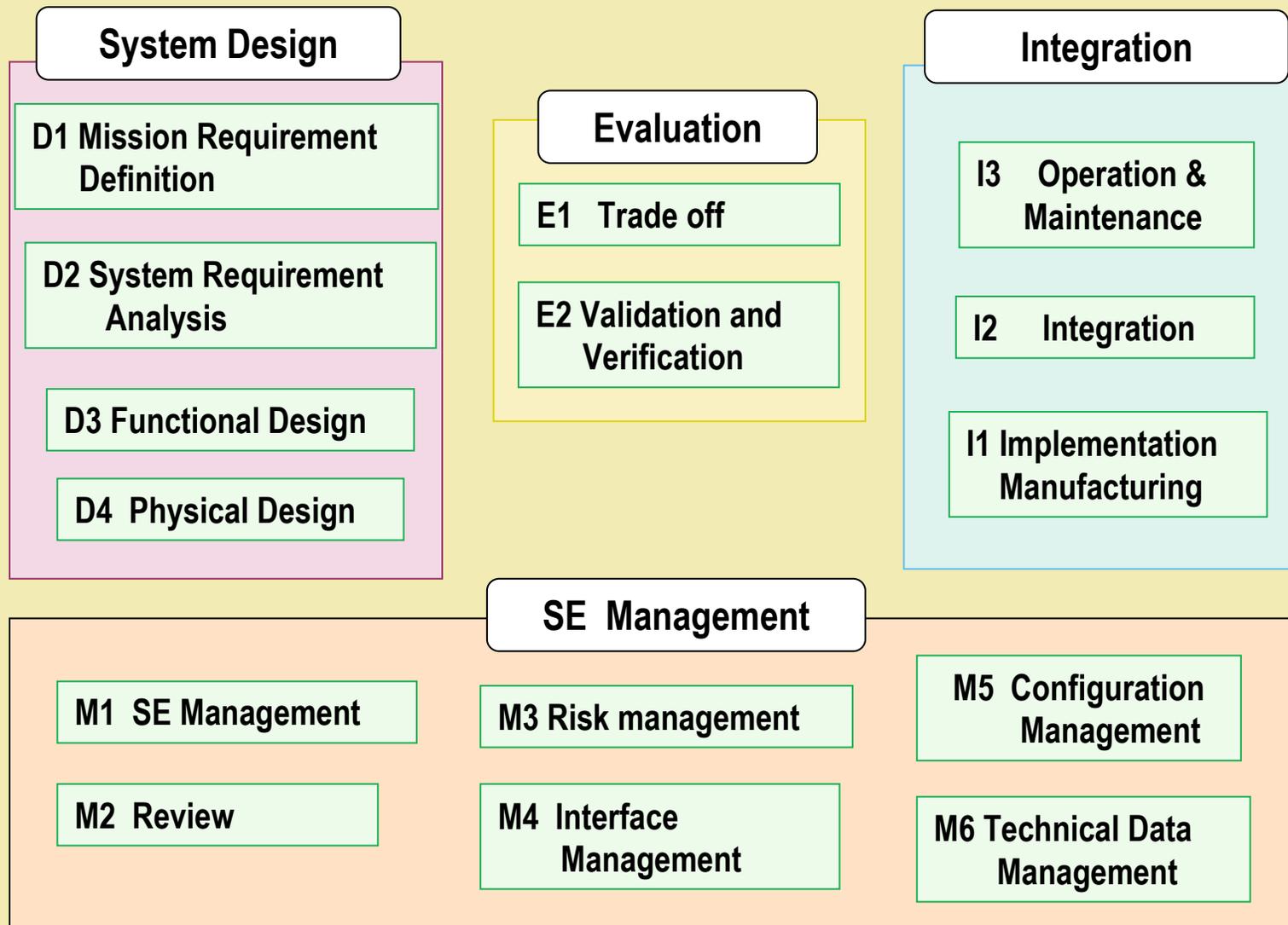
In a word

- Good results were found in Independent Review. It seems effective for other projects as well.
- On the other hand, the numerous times reviews impose an excessive burden on the project team.

Visualization of process

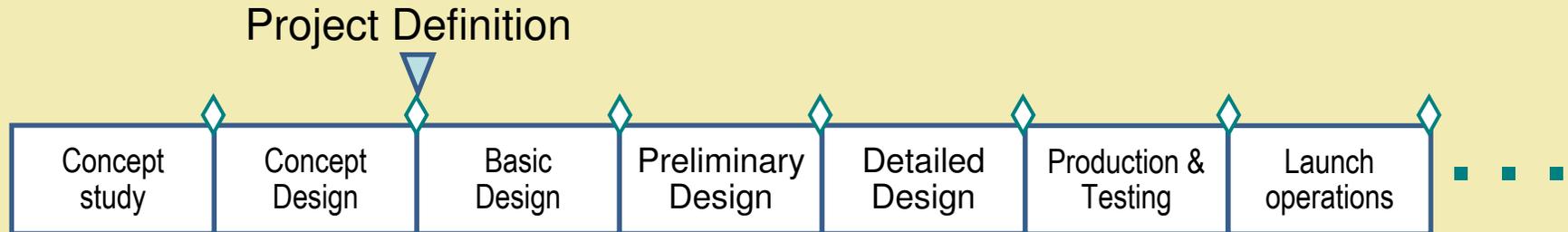
- Another Improvement after failures is;
Re-establishment and Visualization of
Processes ;
 - Systems Engineering
 - Project Management

Systems Engineering Process



Restructuring of Project Management Process

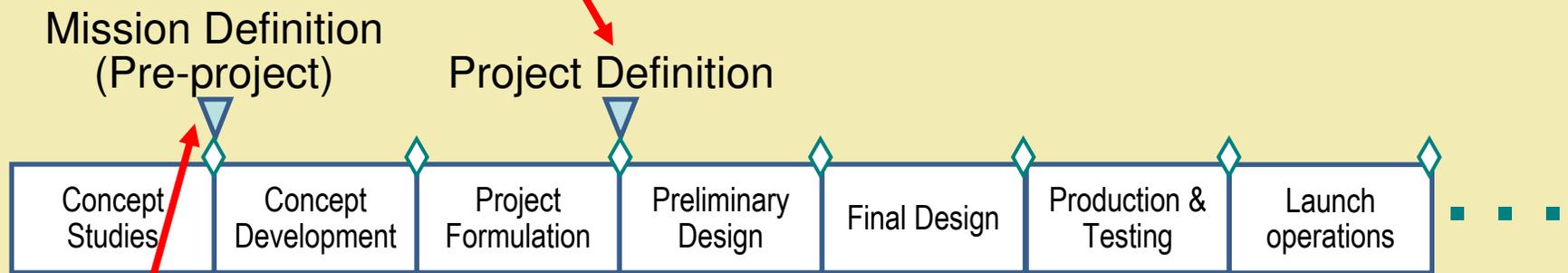
- Previous Process



Contractor Selection

Shifted

- Current Process



Newly Established

Contractor Selection

Pre-project activity

◇ : Phase-up Review

Phase-up Review in JAXA

1. Outline of Existing Review

◆ Phase-up Review

- Management Review (Chair person: Executive Director for Strategic Planning and Management)
- Program department Review (Chairperson: Program Director)

◆ Engineering Pier Review

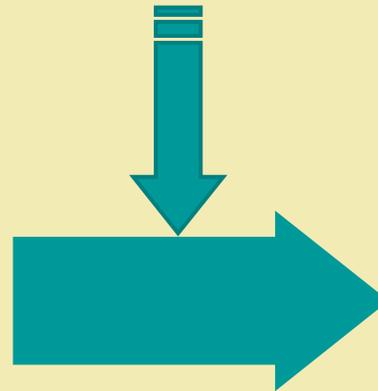
2. Essence of Review

- ◆ The review should base on self-check of the project team, and base on expert of each associated field.
- ◆ The reviewer should judge effectiveness and validity from many viewpoints.
- ◆ The issue and solution should be shared by concerned party.
- ◆ The reviewer should show resolution or direction of work from strict and well-grounded viewpoint.

Finding Solution

Visualization of process

Lessons Learned from
HTV Independent Review



SOLUTION

Key Factors

- To maintain experienced engineers
- To store knowledge and make it easily accessible
- Effective participation of the Independent Review Team in on-going project activity

One SOLUTION

- Expert's participation to existing periodic **phase-up review**
 - Independent review before design phase is more effective
- Utilization of **peer review** system
- Securing of enough number of specialists and expert
 - **Grey Beard Registration System**

Three Purpose of Gray Beard registration system

1. Progression of Review Quality

- Enhancement of reviewer resource
- Increase advice based on sharp-edged discipline knowledge
- Increase advice based on wealth of SE & PM experience

2. Succeeding of knowledge

- Sharing knowledge thorough discussion within the review team
- Promoting project member's self awakening through discussion with expert
- Visualizing of knowledge by cooperating with Knowledge sharing system

3. Support of development/operation

- Direct participation to development or operation

Concept of Gray Beard Registration System

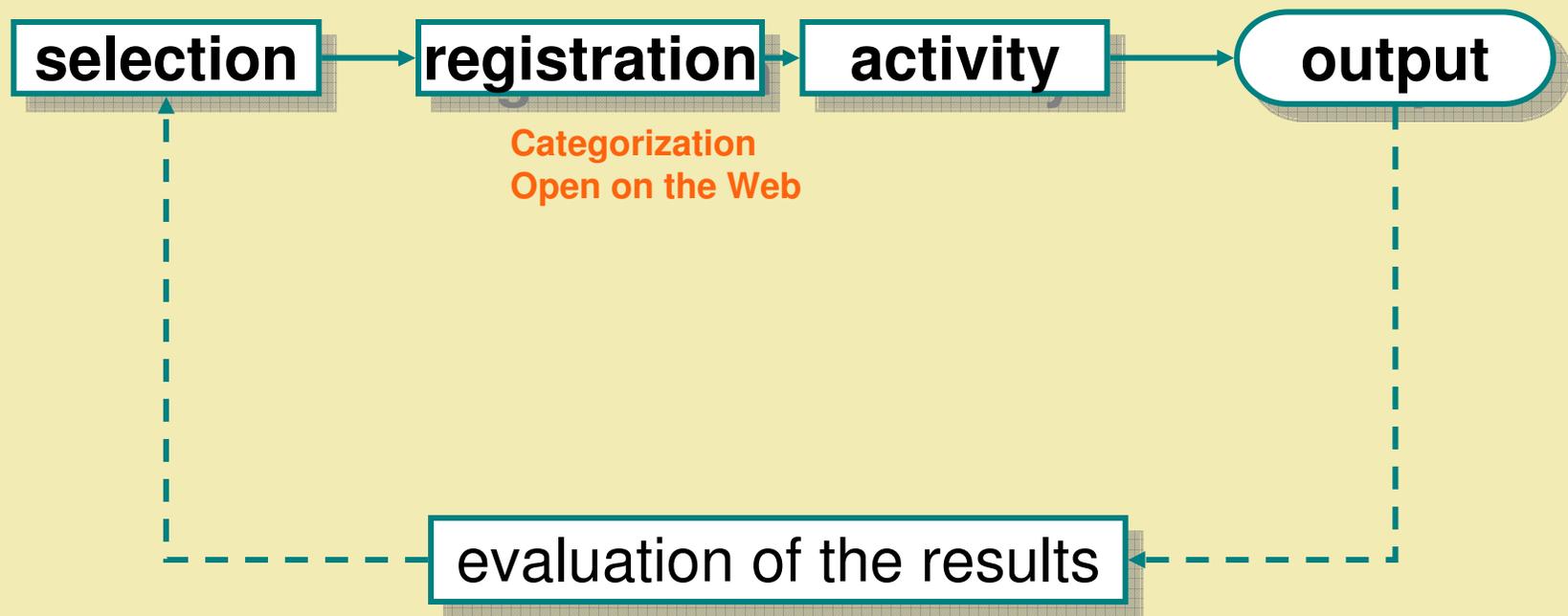
- Administrative organization
 - ◆ Chief Engineer Office

- Candidate of Gray Beard
 - ◆ Outside JAXA
 - JAXA retired
 - Contractor retired
 - Academia
 - Researcher from other organization
 - ◆ Inside JAXA

- Target number of persons
 - ◆ Outside JAXA: 50 ~ 100 persons
 - ◆ Inside JAXA: 30 ~ 50 persons

Concept of Gray Beard Registration System

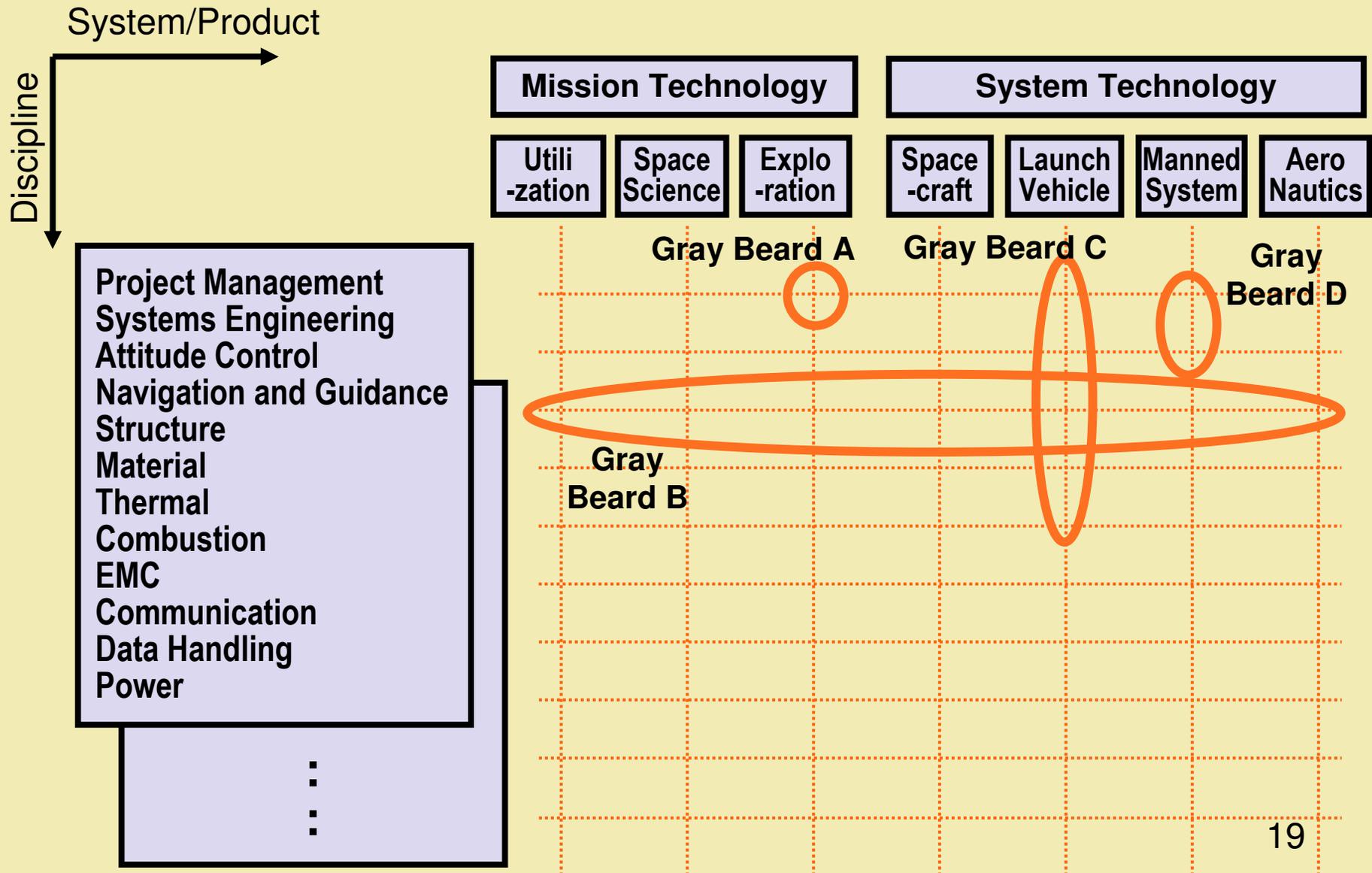
- Operation concept



Five Oaths of Gray beard -policy-

- (一) Think about the mission success at first, and work with sincerity as own things.*
- (二) Look at the fact with open mind of experience and age etc.*
- (三) Carry out well communications.*
- (四) Have mind of developing the younger generation.*
- (五) Secure information and proprietary.*

Categorization of Gray Beard



Conclusion

- This presentation shows new framework of the JAXA's independent engineering review.
- We are just on the first phase of the new framework. Detailed process will be established in the near future according to this policy.