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## **Advanced QMS activities for improving outputs of Research, Development and Operation**

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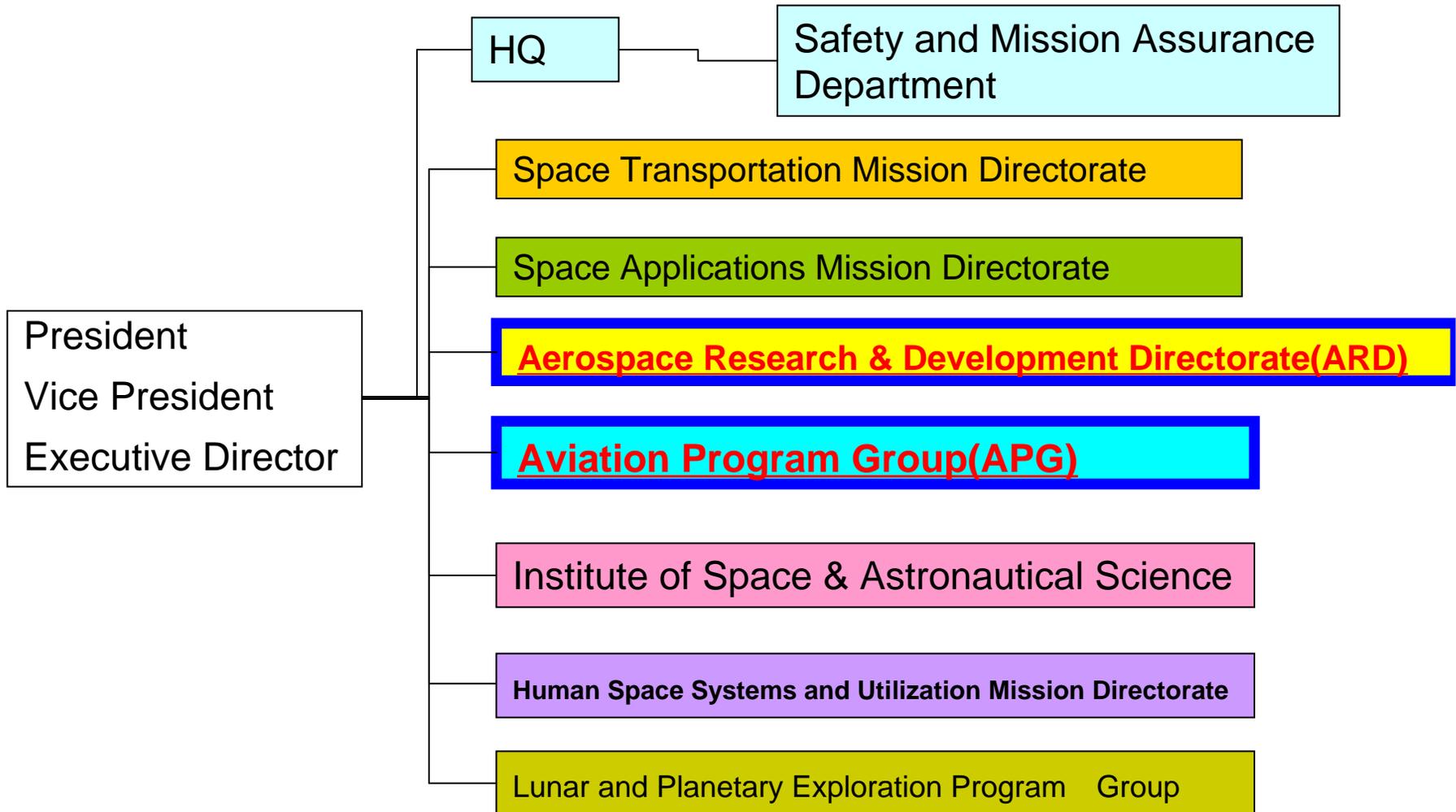
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# 1.1 JAXA Organization

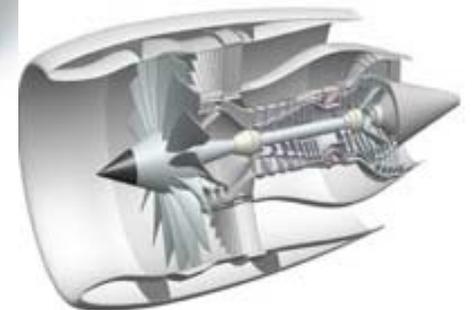




## 1.1 JAXA Organization

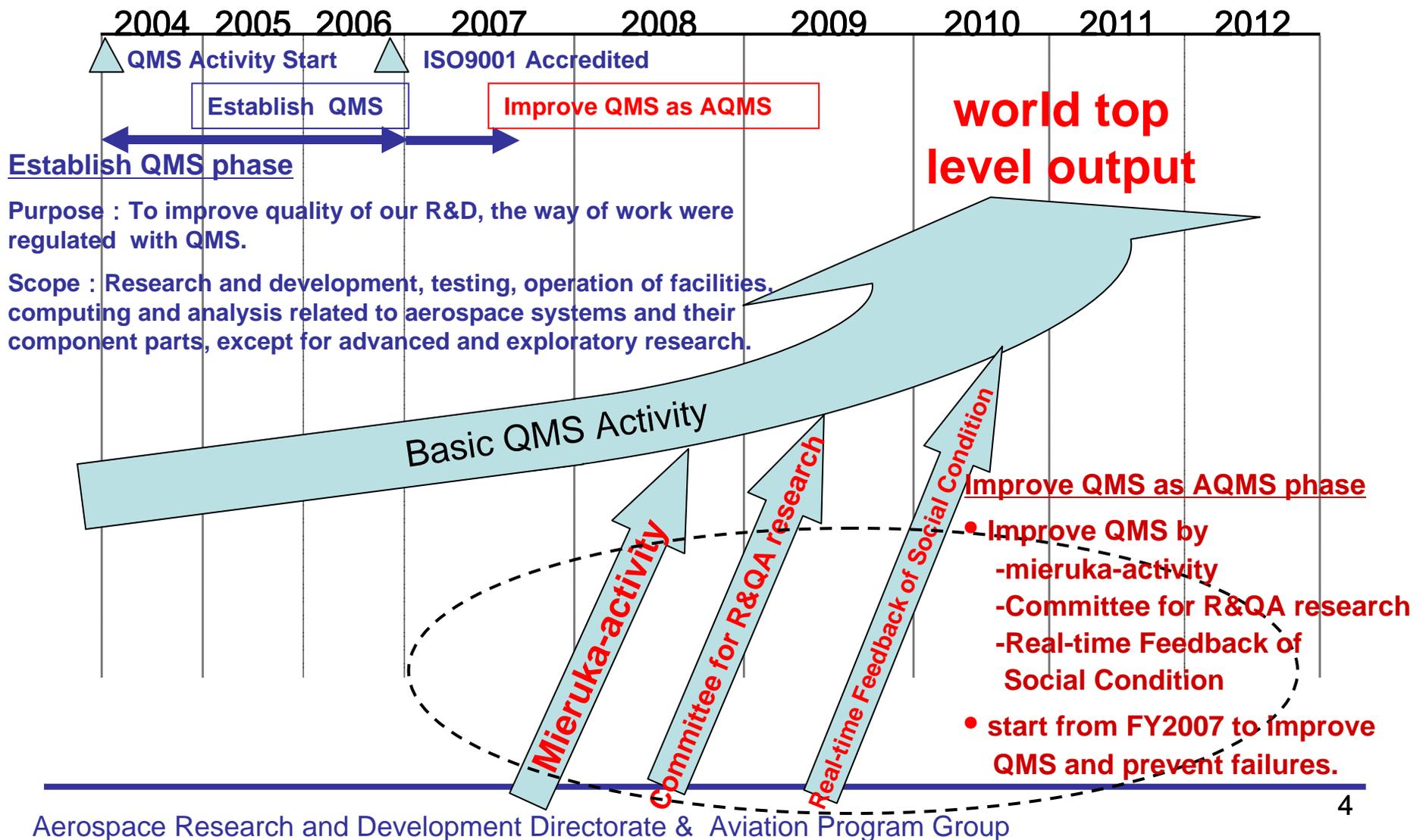
# Aerospace Research & Development Directorate

- Promotion of **fundamental research**
- Maintaining and up-grading of **basic technology**



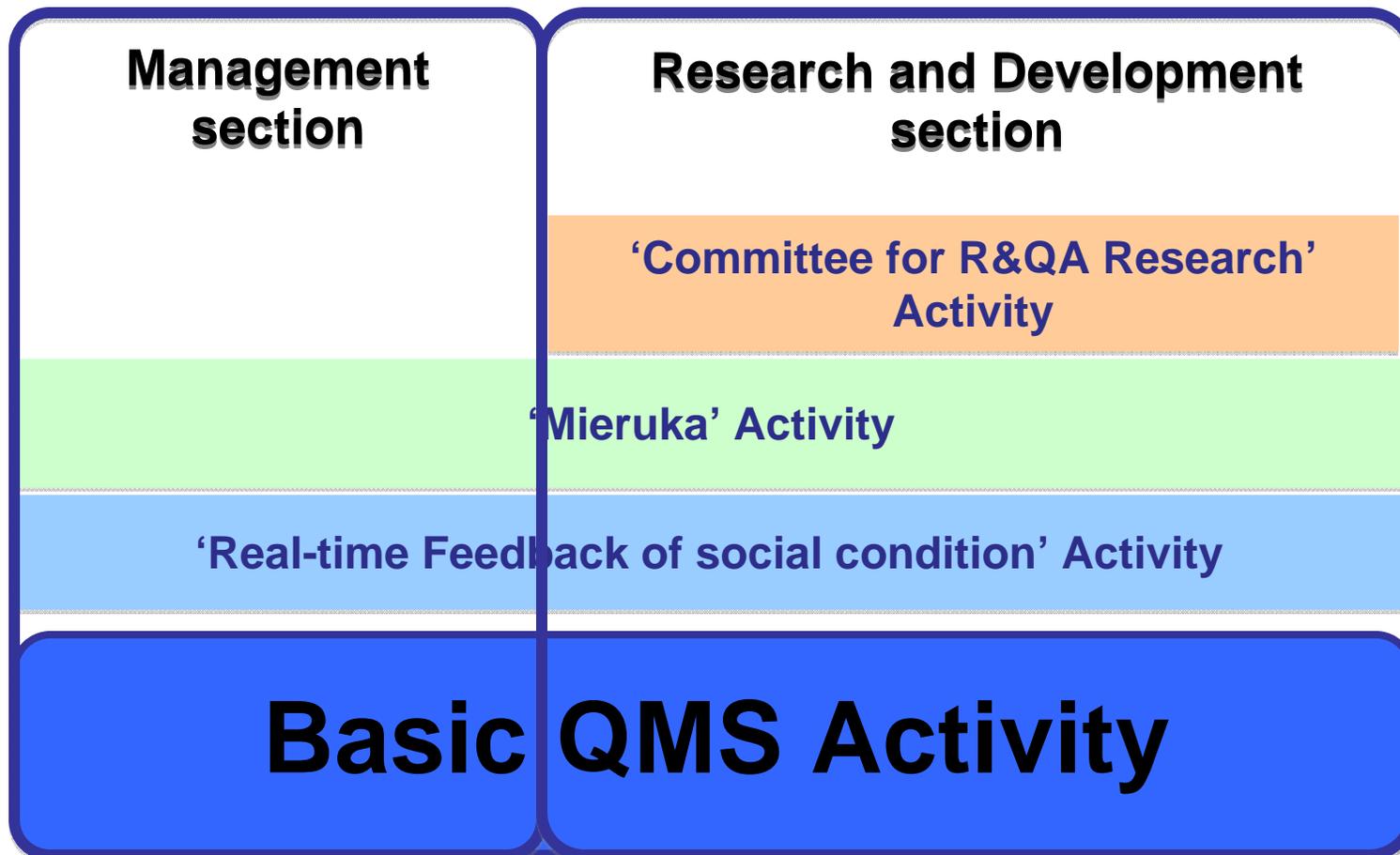
- Promotion of aviation programs to demonstrate **key system technologies of airplanes**

## 1.2 What is AQMS(Advanced QMS) in ARD & APG



## 1.2 What is AQMS(Advanced QMS) in ARD & APG

### Who participate in AQMS?



## 2. Mieruka-activity

## 2. Mieruka-activity

- **Purpose:** Promote the improvement of our research and it's efficiency by Mieruka(eq. visualizing)-activity.
- **Participant:** All employees in ARD/APG.
- **Schedule:**



### Trial Phase

- **Make Mieruka-Activity Known to everyone by seminar and workshop**
- **Mieruka Trial in each department**

### Progress Phase

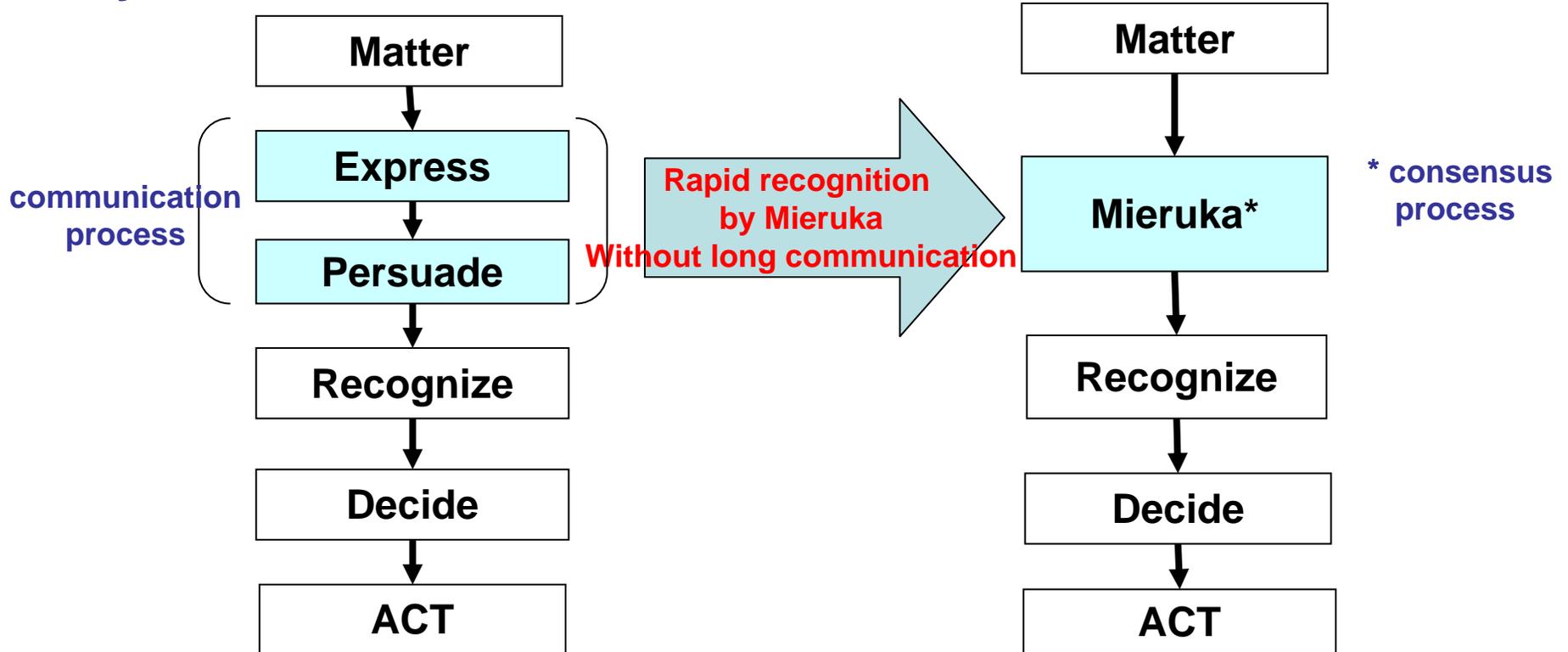
- **Progress Mieruka in main business (ex. Utilization of the Risk Control Sheet, etc.)**

### Established Phase

- **Early Detection of Issues and Quick Resolution by Mieruka**

## 2. Mieruka-activity

### Why Mieruka?



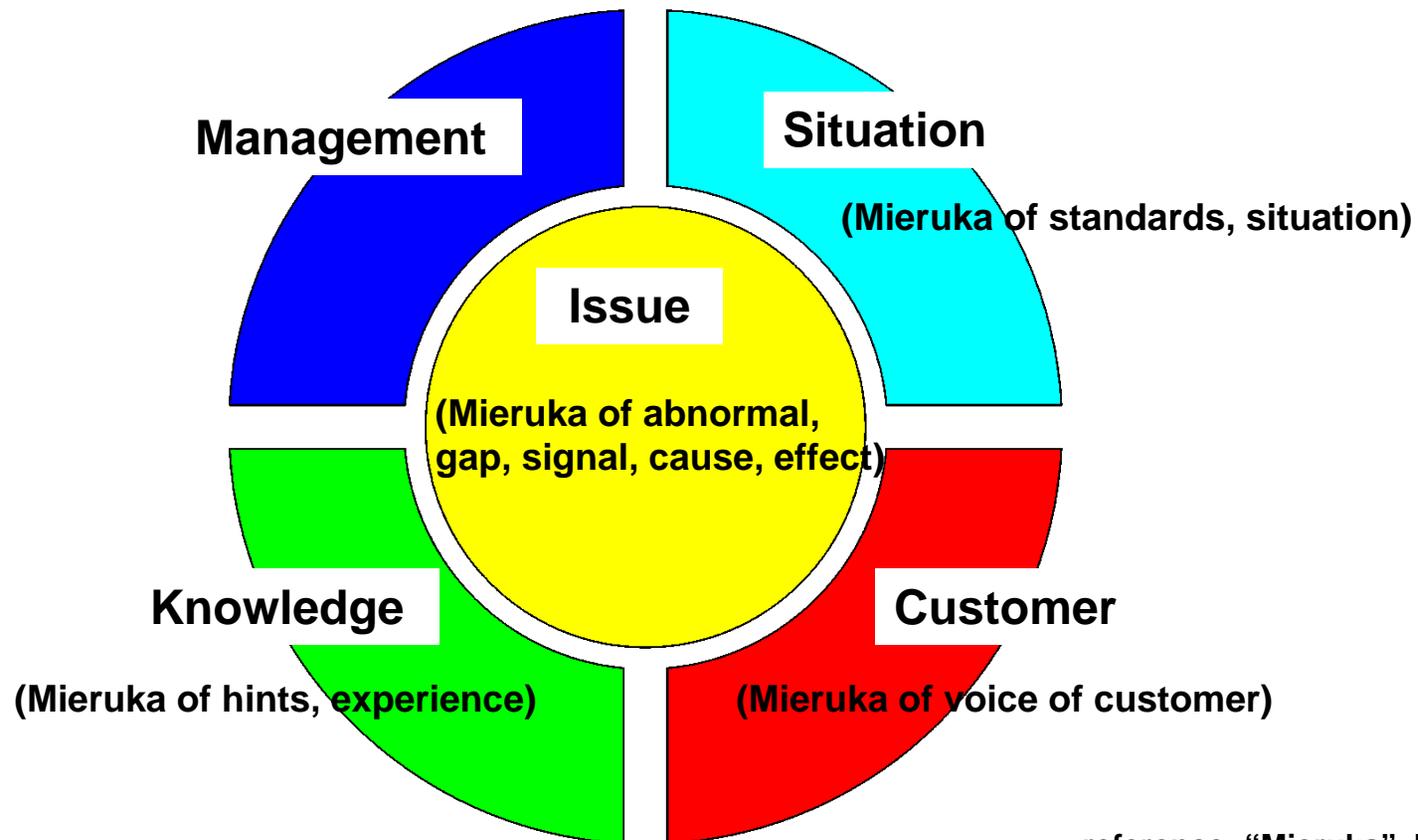
ACT with communication

ACT by Mieruka

Steps until "ACT"

reference: "Mieruka" by Endo Isao

## 2. Mieruka-activity



reference: "Mieruka" by Endo Isao

## 5 Categories of Mieruka

## 2. Mieruka-activity

- Results in FY2007:Mieruka based on 5 categories is started and shows some effects on common understanding of business's information and situation between concerned person.

### Mieruka-activity in ARD/APG

Category	Visualizing item	Number
Situation	Schedule & Follow-up of Development, Manufacturing, Test	9
	Progress of the works	2
	Status of Document Standardization	1
Issue	Results of Interval Check of the Facilities	2
	Action Item List & Follow-up	2
Knowledge	Technical Report	1
	One Page Data of failure: <b>Preventive Data of Critical Parts Failures</b>	1
	Operation Manual	1
Customer	Answers of Customer Questionnaire	2
Management	Development Target	1

➡ See Next Page



## 2. Mieruka-activity

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### Risk Control Sheet is used

- To clarify action items and it's status when corrective means are complex and some person are concerned.**
- To have common recognition between JAXA and contractor to resolve the issue.**
- For both of JAXA and contractor to confirm all actions are closed with the checkout of action status.**
- As the preventive action or corrective action.**
- In the case of omission of end-to-end test, or application of new and sophisticated special process.**

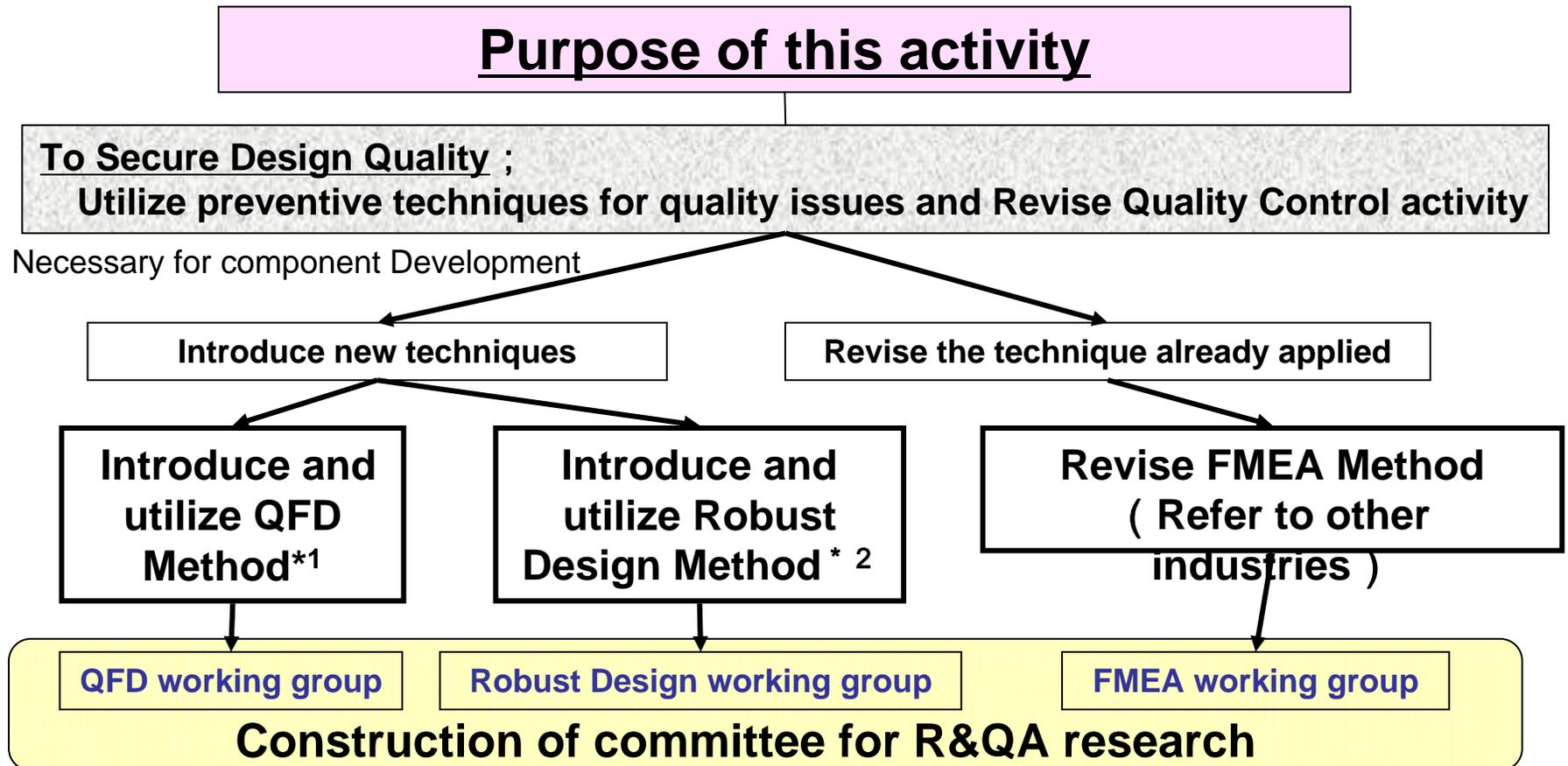
## 3. Committee for R&QA research

3.1 QFD working group

3.2 Robust Design working group

3.3 FMEA working group

### 3. Committee for R&QA research



\* 1 : Method to transform user demands into design quality, to deploy the functions forming quality, and to deploy methods for achieving the design quality into subsystems and component parts, and ultimately to specific elements of the manufacturing process

\* 2 : Design which is capable of coping well with variations (sometimes unpredictable variations) in its operating environment with minimal damage, alteration or loss of functionality

## 3.1 QFD (Quality Function Deployment) WG

4/2007	5/2007	6/2007	7/2007	8/2007	9/2007	10/2007	11/2007	12/2007	1/2008	2/2008	3/2008
	△1	△2	△3	△4		△5					
	Basic QFD Training (Lecture and exercise)						△1	△2			
				Apply QFD to our research							

### Main Activities :

- Education of QFD Technique
  - Basic QFD Training Course (5 times) including lecture and exercise by Prof. AKAO\* and his staff
    - \* AKAO is one of originators of QFD
- Application of QFD to our Researches
  - QFD was Applied to 8 themes ( Mechanical Parts, Silent Supersonic Technology Demonstration Program, etc.)
  - Periodic Coaching (2 times) to our application  
(Lecture only is not enough for real application)

## 3.1 QFD (Quality Function Deployment) WG

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### Results:

- **Increasing QFD Skilled Person**
  - QFD advisor in each section were secured by QFD training course.
- **Prepared the Standard Q F D Training Course**
  - Basic course ( including Lecture & Exercise)
- **Applied QFD technique to our research**
  - 2 finished and others are now ongoing.

**Ex. FMEA was analyzed as an example of job function development, and the results described after were obtained.**

## 3.2 Robust Design WG

10/2007	11/2007	12/2007	1/2008	2/2008	3/2008
	▲ 1	▲ 2	▲ 3	▲ 4	▲ 5
Basic Taguchi method Training (Lecture and exercise)					

### Main Activities:

- Education of Robust Design
  - 5 times basic course of Robust Design including lecture and exercise by skilled teacher
- Selecting Application Candidates of Robust Design to our Research
  - 5 themes ( Pre-Cooled Turbojet Engine test, 1 NT Thruster, etc.)

## 3.2 Robust Design WG

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### Results:

- **Increasing Skilled Person of Robust Design**
  - Robust Design advisor of 14 person were secured by Robust Design training course.  
“to Proceed Robust Design, skilled person are necessary”
- **Prepared the Standard Basic Training Course for Robust Design**
  - Basic course (including Lecture & Exercise)
- **Preliminary coaching for our research to which Robust Design will be applied.**
  - Now preparing the application to 5 our research

## 3.3 FMEA WG

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### **Main Activities:**

- **To list up the issues and measures for effective utilization of FMEA,**
  - **Investigate the issues of FMEA worksheet**
  - **Investigate the FMEA process and effective way in other industries (the car industry)**
  - **Investigate the FMEA handbooks in other project office of JAXA**
  
- **Clarify the main issues must be resolved.**

## 3.3 FMEA WG

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### Results:

- **FMEA Handbook (provisional edition) which reflects the effective measures for FMEA is proposed, and will be published into ARD & APG in FY2008.**
- **Main improved points in FMEA Handbook is as follows, (see attached ‘issue and measure’)**
  - **Clarify criteria for judgment of FMEA need or not**
  - **Clarify the designation flow of FMEA type (Design, Process, Interface)**
  - **Various worksheets for preparing work of FMEA are proposed, such as ‘Failure Mode and Cause List’, etc.**
  - **FMEA worksheet are revised for ensuring the follow-up of the critical failure mode.**

### 3.3 FMEA WG

Issue and measure of FMEA	
Issue	Measure
<p>a)Lack of FMEA data items  b)Unclear designation of FMEA type  c)Misunderstanding of analysis target</p>	<p>a) Creation of plan for FMEA, Clarifying analysis target and FMEA category  b) Creation of sheet for technical analysis and evaluation of component  c) Clarification of FMEA operation flow and system</p>
<p>d)Lack of input data to the FMEA sheet  e)Information of Error mode &amp; Cause for analytic bases depends on one's memory  f)Insufficient listing of anxious items related to the failure mode</p>	<p>d,e) Creation and maintaining new work sheet  - Ex. Error mode and Cause list  f)Review FMEA sheet  -Adding items for reason and revaluation  -Refinement of action items</p>
<p>g)Inaccurate trace control system for implementation details of action items  h)Inappropriate maintenance of FMFA sheet and lack of revaluation column for results in the sheet itself</p>	<p>g) Creation of Risk Management Sheet (including contractors)  h) Strict enforcing of review and maintaining FMEA sheet</p>

## 4. Real-time Feedback of Social Condition

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### Outline of this activity

- Fields data of real-time social conditions and technical trends in newspapers and technical magazines are gathered and analyzed.
- The lessons learned through fields data are developed in all sections of ARD & APG.
- This activity started in FY2006.

### Purpose of this activity

- Prevention of the same accidents.
- Take actions to improve process performance of QMS.
- Utilization of public R&QA qualification.

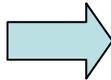
## 4. Real-time Feedback of Social Condition

### Main Results in FY2006 - 2007

- 128 items were gathered. (See following examples)

#### Fields data Safety

Carbon monoxide poisoning



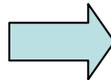
#### Preventive measures in ARD/APG

- Ensure that no equipments are worked with the safety lock unlocked.

Other accident with the safety lock unlocked were reported.

#### Quality

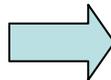
Loss of experimental Data to the report



- Clarify that experimental data are Quality Records in QMS rules.

#### Inspection method/technique

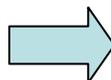
Portable Ultrasonic inspection System



- Introduce the new tools of Non Destructive Inspection, such as the portable ultrasonic inspection system for B-787.

#### Education/Qualification

Certification of Quality Engineer



- Introduce the certifications about S&MA to utilize those in our research.

## 5. Conclusions

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### Mieruka

- Important viewpoints for Mieruka-activity were understood by managers.
- As the next step, Mieruka in main business and Risk management are important.
- In the second middle term plan of JAXA, Mieruka is one of measures to improve QMS.

### FMEA

- Importance of preparation process for FMEA were recognized, so some worksheets were prepared.
- FMEA Handbook (provisional edition) will be published.

### QFD, Robust design

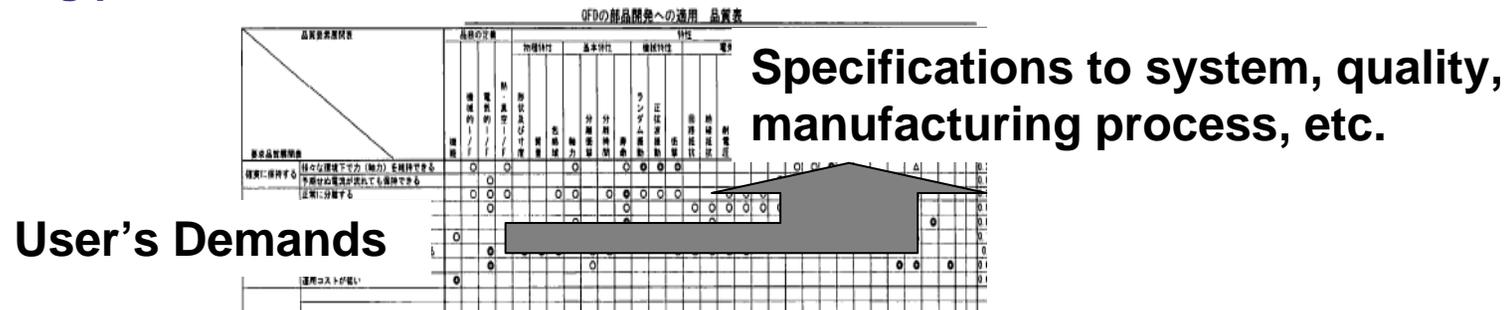
- Basic training course and teaching materials are prepared.
- Coaching system for the case study is prepared.
- Education of QFD and Robust design is still necessary.
- Increasing of case study to our research is necessary.

### Real-time Feedback of Social Condition

- Utilization as the preventive information for improvement of QMS and safety control are started.
  - These information are deployed in all JAXA at the same time.
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## QFD :

Method to transform user demands into design quality, to deploy the functions forming quality, and to deploy methods for achieving the design quality into subsystems and component parts, and ultimately to specific elements of the manufacturing process



## Robust Design (Taguchi Method)

Design which is capable of coping well with variations (sometimes unpredictable variations) in its operating environment with minimal damage, alteration or loss of functionality

