



Risk Management on EarthCARE/CPR

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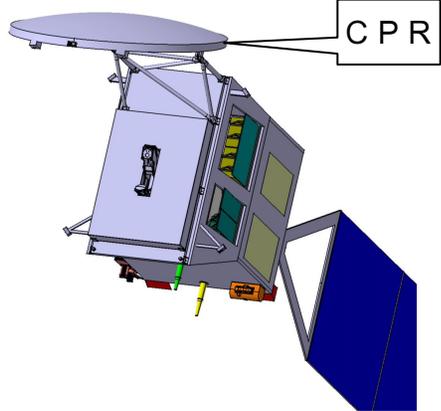
14 - 16 April 2008 at ESA/ESTEC

Outline

1. Overview of EarthCARE and CPR
2. Organizational structure of Project
3. Risk Management approach on CPR Project
4. First Iteration Result
5. Summary

Overview of EarthCARE and CPR

ESA 6th EarthExplorer Mission



EarthCARE Satellite (ESA)
Orbit : Sun-synchronous Polar
Instruments

- **Cloud Profiling RADAR (JAXA/NICT)**
- **Atmospheric LIDAR (ESA)**
- **Multi-spectral Imager (ESA)**
- **Broadband Radiometer(ESA)**

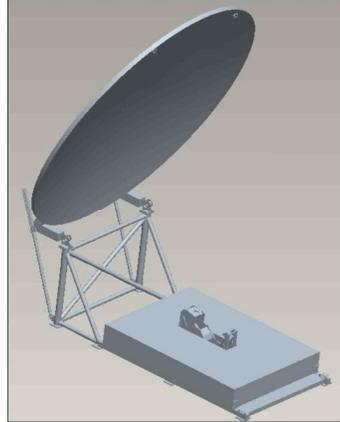
Launcher

- **TBD**

Satellite Operation (ESA)

NICT(JAPAN); National Institute of Information and Communications Technology

Joint Development of JAXA/NICT



Cloud Profiling RADAR(CPR)

- Specification
 - 94GHz Doppler RADAR
 - Measurement Height -0.5 ~ 20km
 - Vertical Resolution 500m[sample100m](V)
 - Dynamic Range : -35dBZ~+21dBZ
 - Field of View:850m
 - Doppler measurement: -10 ~ +10 m/s
 - Doppler Accuracy: <1 m/s
 - Radiometric accuracy; <2.7dBZ
- Physical characteristics
 - size 2500x2700x1300 [mm] (stow),
2500x2700x3550 [mm] (deploy)
 - Main reflector diameter: 2.5m
 - Mass: 216kg TBD
 - Power: 300W TBD
 - Max data rate: 240kbps TBD

Cloud Profiling RADAR(1)

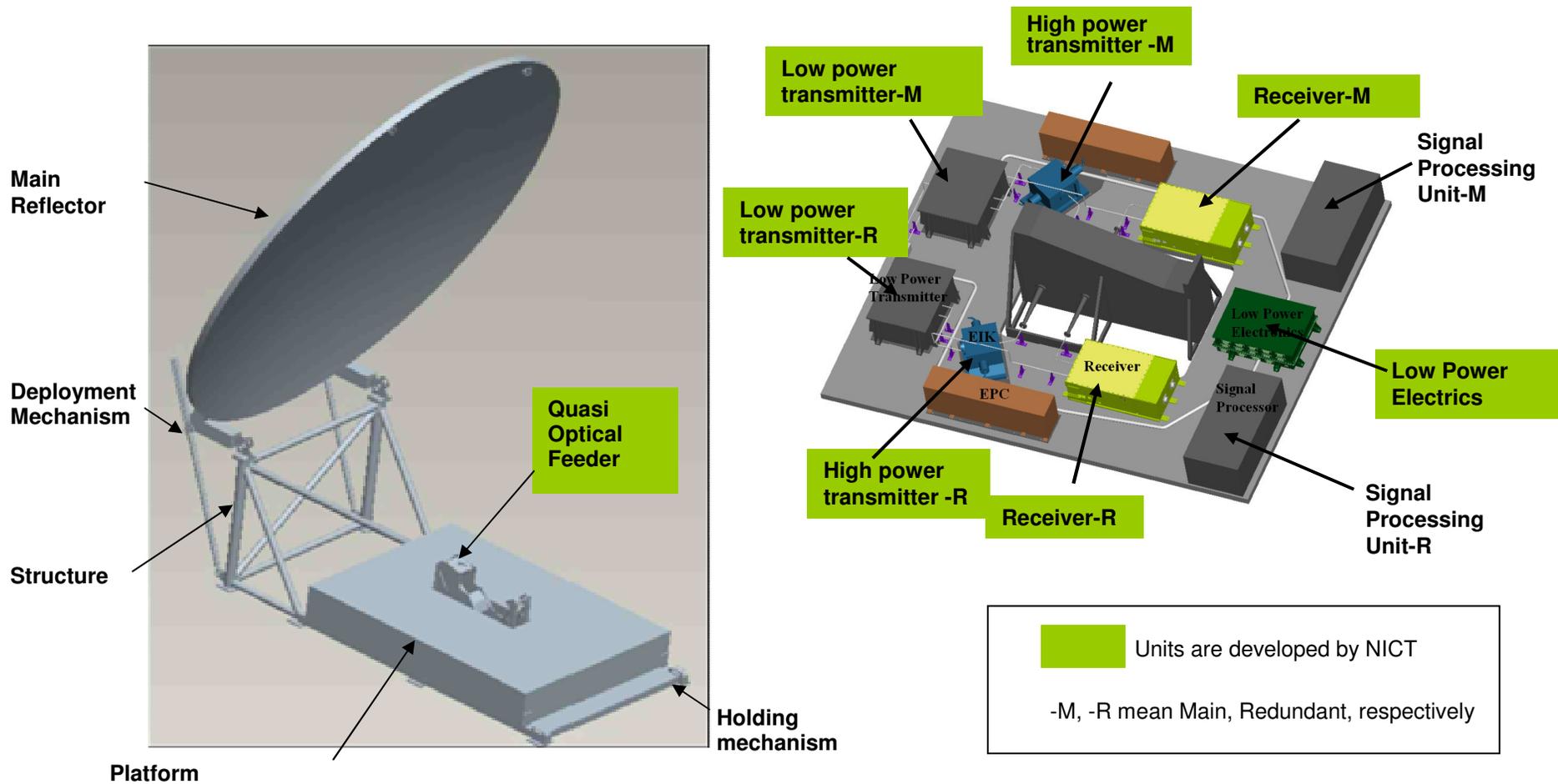
Observational Purpose of CPR

- Vertical structure of most of radiatively effective clouds (>-35dBZ Sensitivity)
- Updraft motion in cloud layer (1m/s accuracy)

Technical characteristics of CPR Hardware

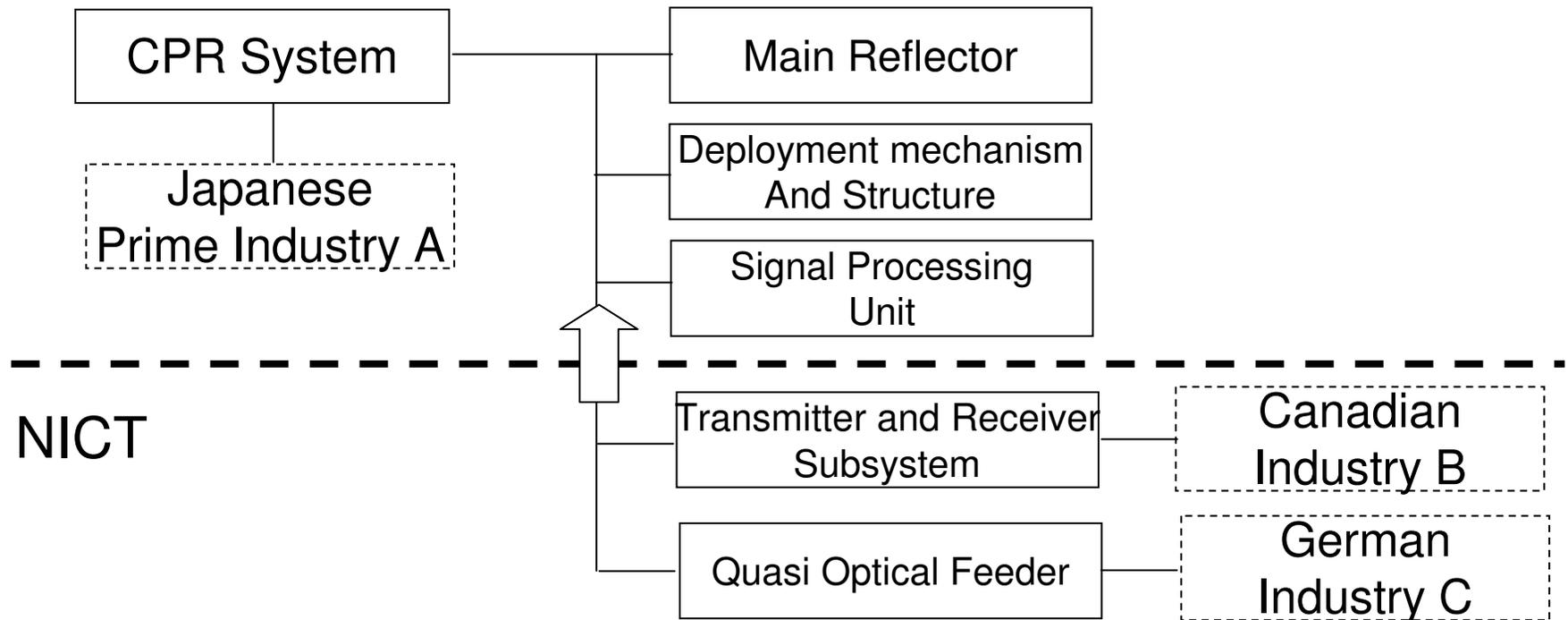
- High sensitivity RADAR
 - High Frequency (94.05GHz)
 - High Power Transmitter (2.2 kW max)
 - Large Main Reflector (Dia. 2.5 m)
 - Low Noise Amp
- High pointing accuracy for synergy observation with other sensors on EarthCARE
 - Low Thermal Distortion antenna / structure
- Doppler measurement function
 - Accurate surface figure of main reflector
 - Valuable pulse repetition frequency scheme
- Longer lifetime
 - Long life of high power transmitter
 - Cross strapped redundancy configuration

Cloud Profiling RADAR(2)



Organizational structure of CPR Project

JAXA (integration responsibility for CPR)



- Individual developments by two independent agencies
- Industries are widely distributed internationally

Risk Management approach on CPR Project

1. Integrated management regarding technical aspects

Technical risks of NICT are merged into JAXA list, and managed as whole CPR RISK with JAXA own risk. Technical risk evaluation was made by each agencies with TRL / “design change level” table scheme

2. Separate management regarding programmatic aspects

Because JAXA/NICT are totally independent agencies. Programmatic risks (budget, personnel) are managed By each agencies, independently.

3. Basically, unified risk management requirement specification

For uniform management, NICT employs JAXA management Standard with tailoring to fit own organization.

Technical risk evaluation scheme

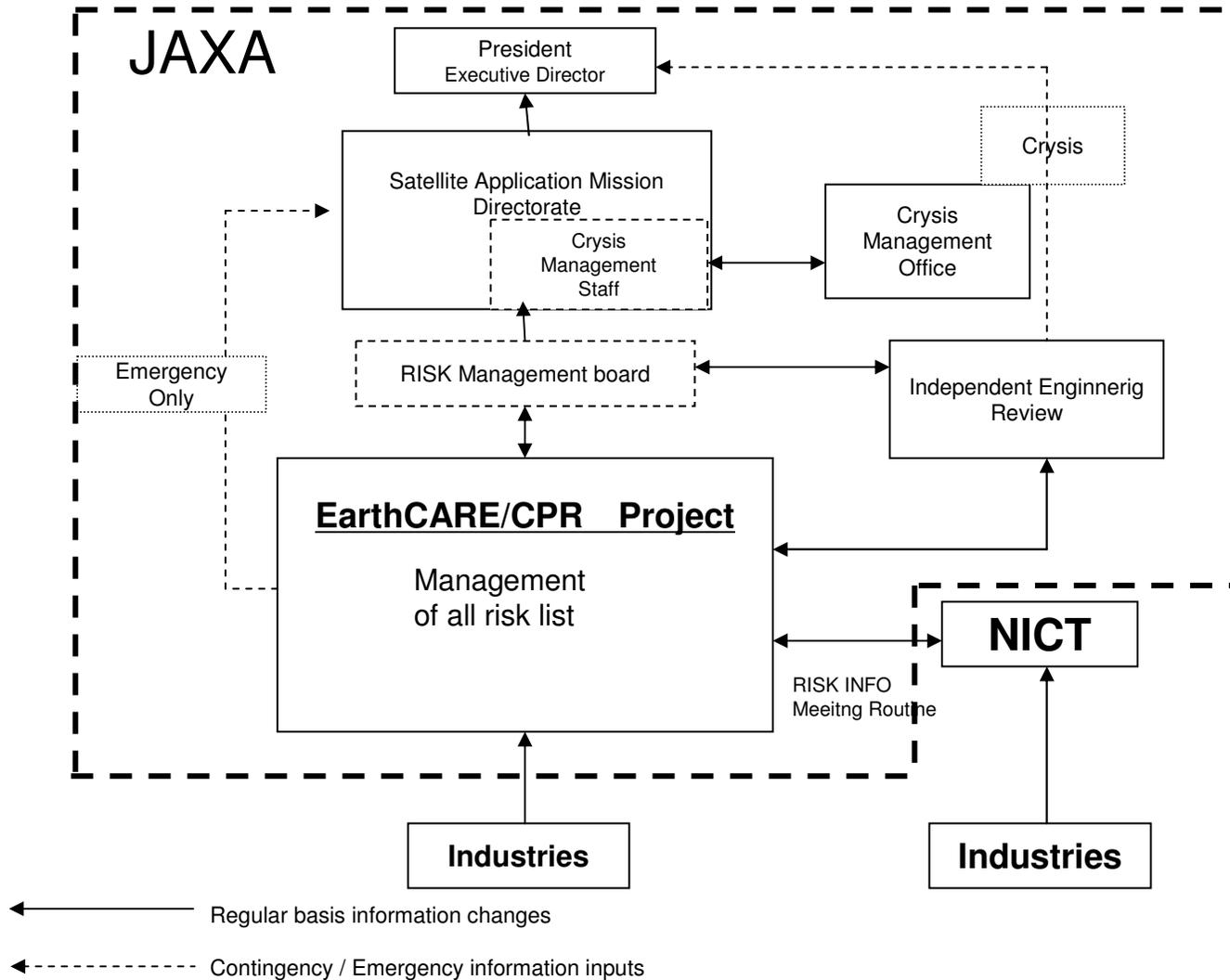
Evaluation Table		Design Change level			
		I	II	III	IV
Technical Readiness Level (TRL)	9				
	8				
	7				
	6				
	5				
	4				
	3				
	2				
1					

Note: The grid is shaded light blue for TRL 5-9 and light red for TRL 1-4. An arrow points from 'Low Risk' (TRL 8, DC level II) to 'High Risk' (TRL 3, DC level III).

	TRL description
9	Space flight proven (full success)
8	Space flight proven (not full success)
7	Space flight proven with Proto Model
6	QT qualified PM or PFT qualified PFM
5	Development test qualified EM
4	Complete BBM evaluation
3	Evaluation with analysis
2	Under application study
1	Under fundamental study

	Design Change level description
IV	Nearly new development
III	Design changes (physical design change, change of manufacturer etc.)
II	Light design changes (process, parts replacement, etc.)
I	Reproduce with same drawings

Management Flowchart



First iteration result as CPR system

- As CPR system, we run through with information flow from all industries to JAXA CPR Project via NICT.
- Brief results of the run
 - The JAXA standard of SMA and risk evaluation were successfully deployed to NICT and all industries
 - We saw some differences in “design change level” evaluation between Japan and Canadian/European industries
 - Rather severe evaluation was made by Canadian/European industries (some were marked as TRL 8 or 9-IV)
 - The cause is supposedly rather subjective description of the design change level definition
 - As overall, the first risk evaluation trial was in success to identify all risks even with some differences.

Summary

- EarthCARE/CPR project consists of two Japanese independent agencies and industries of various countries.
- JAXA and NICT construct the risk management structure with integrated management by JAXA
- During Phase-A-ext, JAXA/NICT tested the information flow of risk management
- The result was sufficient. However, we identified some differences regarding each “design change level” evaluation between each industries. We recognized the difficulties of level definition.
- Towards proper risk identification, to collect more examples of technical evaluation, looks important for improving the common risk evaluation.