

Hyper-X provides Answers versus Images

March 2010

*Duke TAKAHASHI, Space Programs
Aerospace & Industrial Systems Division*



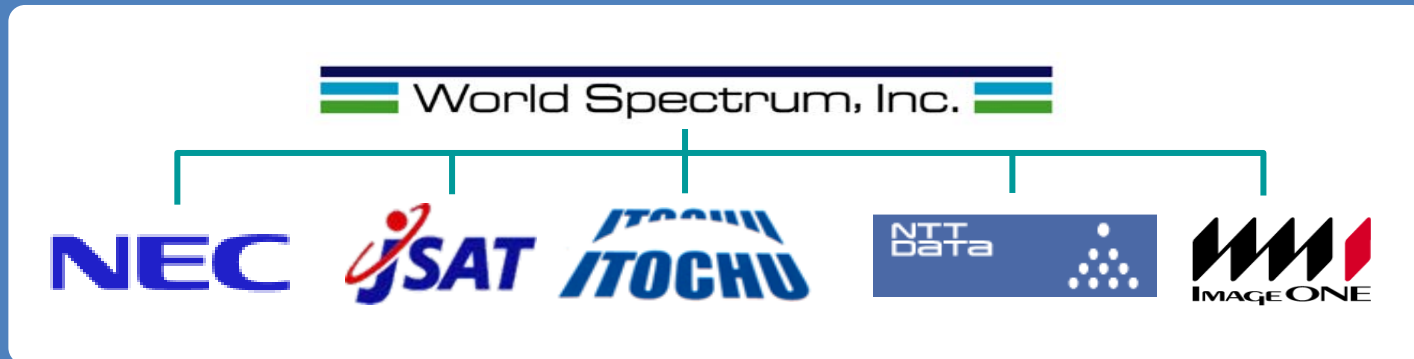
ITOCHU Corporation

http://www.intra.itochu.co.jp/cover1_e.shtml

Summary (1/2)

- *In August 2004, ITOCHU and the Japanese partners formed a joint venture company, World Spectrum Inc. (WSI)*

A planning company to conduct feasibility study for a commercial hyperspectral satellite system (“Hyper-X”). The company was dissolved in March 2006 after completion of 18-month feasibility study.



- *The study results did not support 100% commercial venture yet: too risky given the uncertainties in the market and in the technologies*

After the dissolution, ITOCHU consortium continued the study efforts and refined the business model – to include a public-private partnership structure.

Summary (2/2)

- ***METI R&D over 5-year Hyperspectral and Multispectral instruments development***

In FY 2007, JAROS and NEC were jointly awarded over US\$100M R&D contract over 5-year development of an advanced space-borne hyperspectral and multispectral imagers (“Hyper-X” imagers).*

- ***Hyper-X imagers are likely to be hosted on the ALOS-3 platform prepared by JAXA for launch in FY-2014***

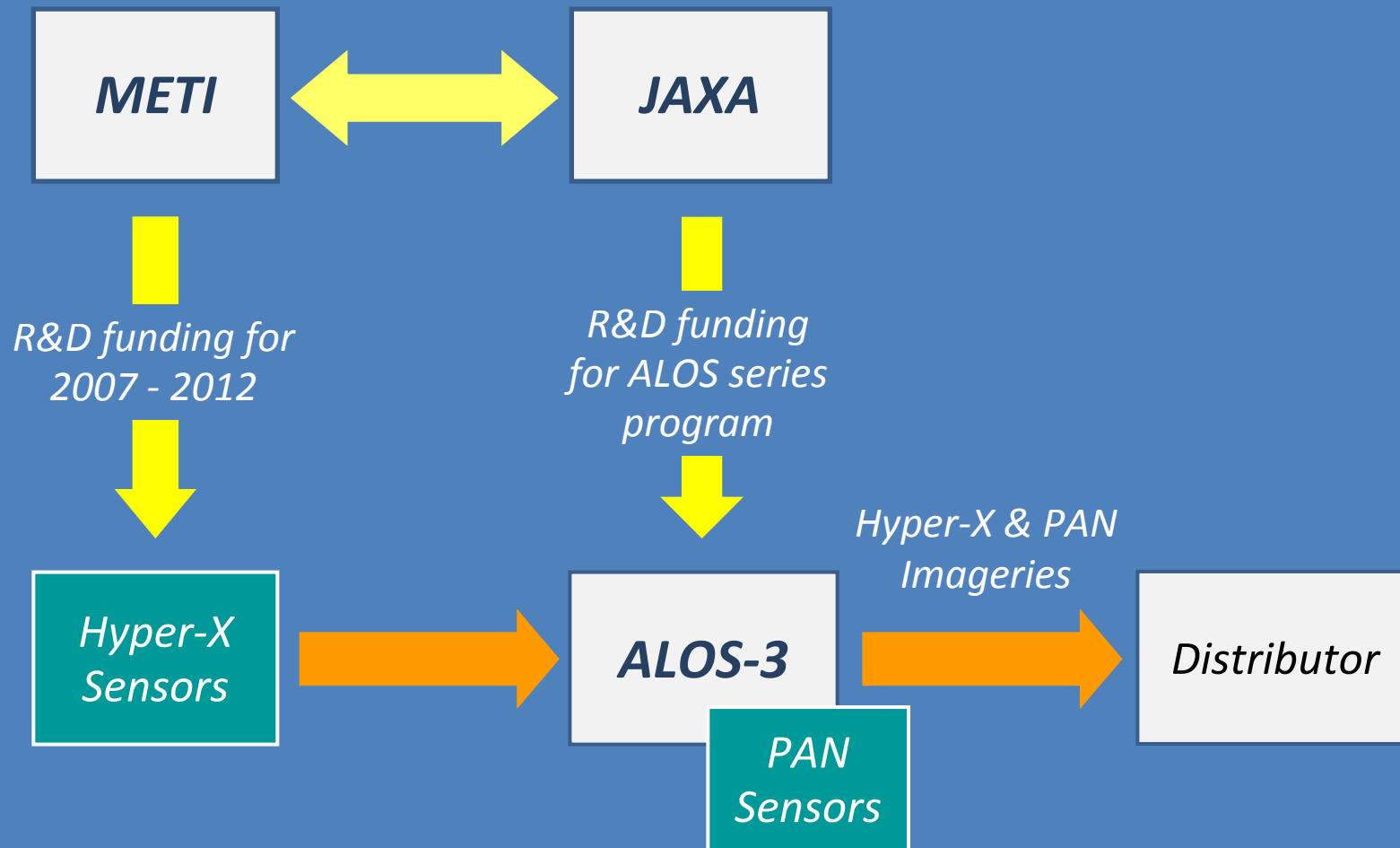
Official bilateral meeting between METI and JAXA is expected to start when the R&D budget for ALOS-3 program is properly allocated.

- ***Hyper-X imagery products and services will be available for worldwide distribution, earliest in FY-2015***

*NEDO : New Energy & Industrial Technology Development Organization - Independent administrative institution
JAROS : Japan Resources Observation System & Space Utilization Organization (JERS-1, PALSAR, ASTER)*

Current Plan : Hosted by ALOS-3

As per initial consensus of the Hyper-X program



Alternative Plan: Hosted by a dedicated Platform

ITOCHU Proposal

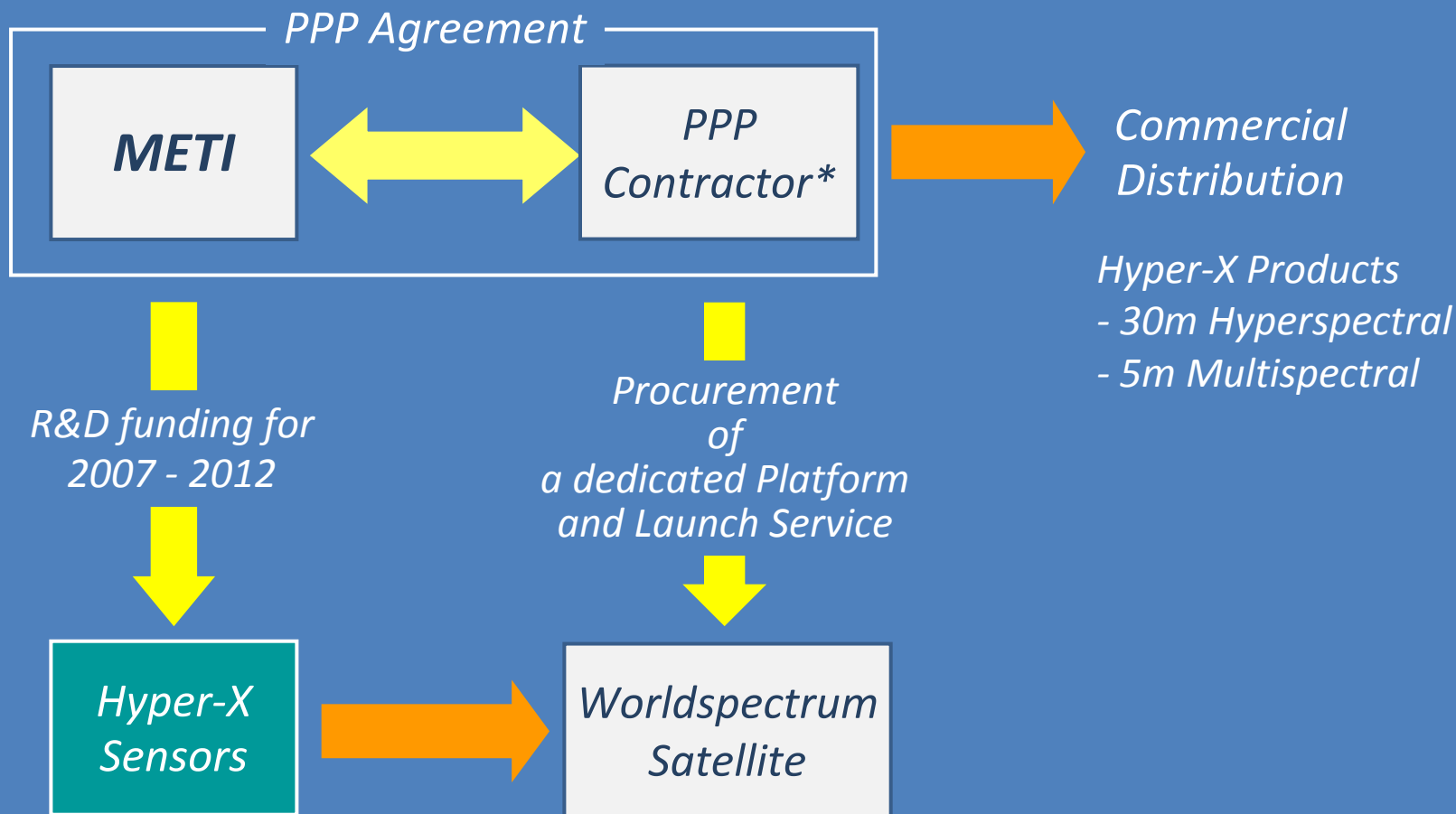
ITOCHU suggested METI procure a dedicated spacecraft bus to host the Hyper-X sensors, and proposed “Alternative Plan” (see next page).

Background of ITOCHU Proposal :

- 1. ALOS-3 has not been yet funded by JAXA*
- 2. Too many missions (HS , MS, PAN) are technically questionable*
- 3. Hyperspectral Imagery is assumed very limited for commercial sales*

Alternative Plan : Hosted by a dedicated Platform

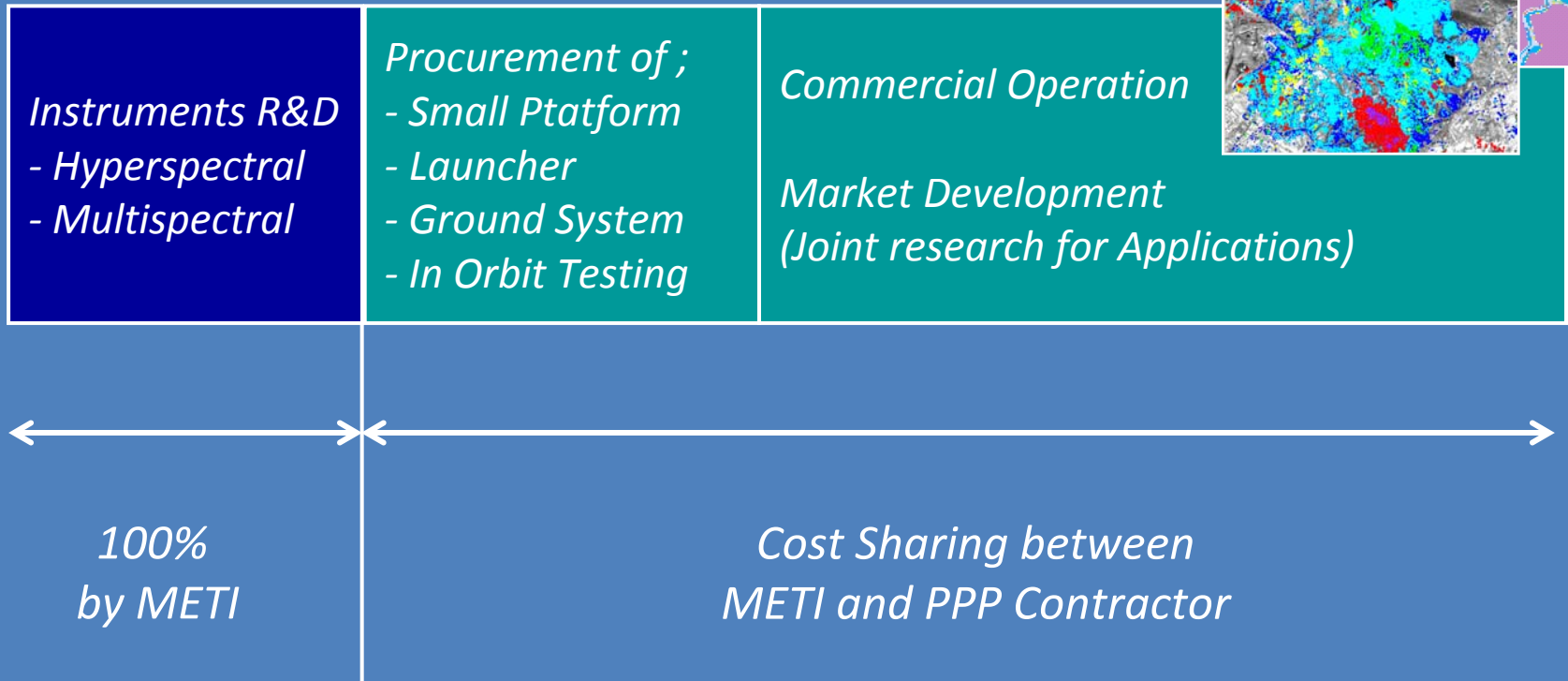
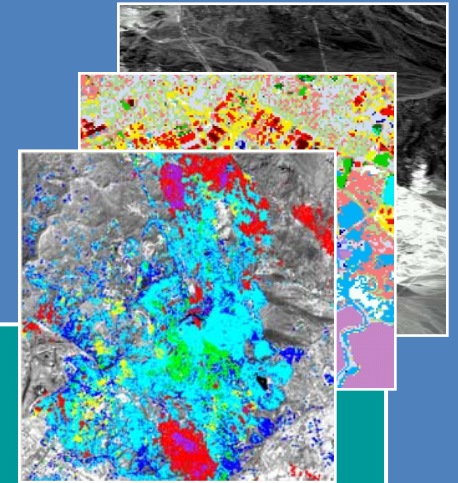
ITOCHU Proposal



* PPP Contractor will be selected by METI

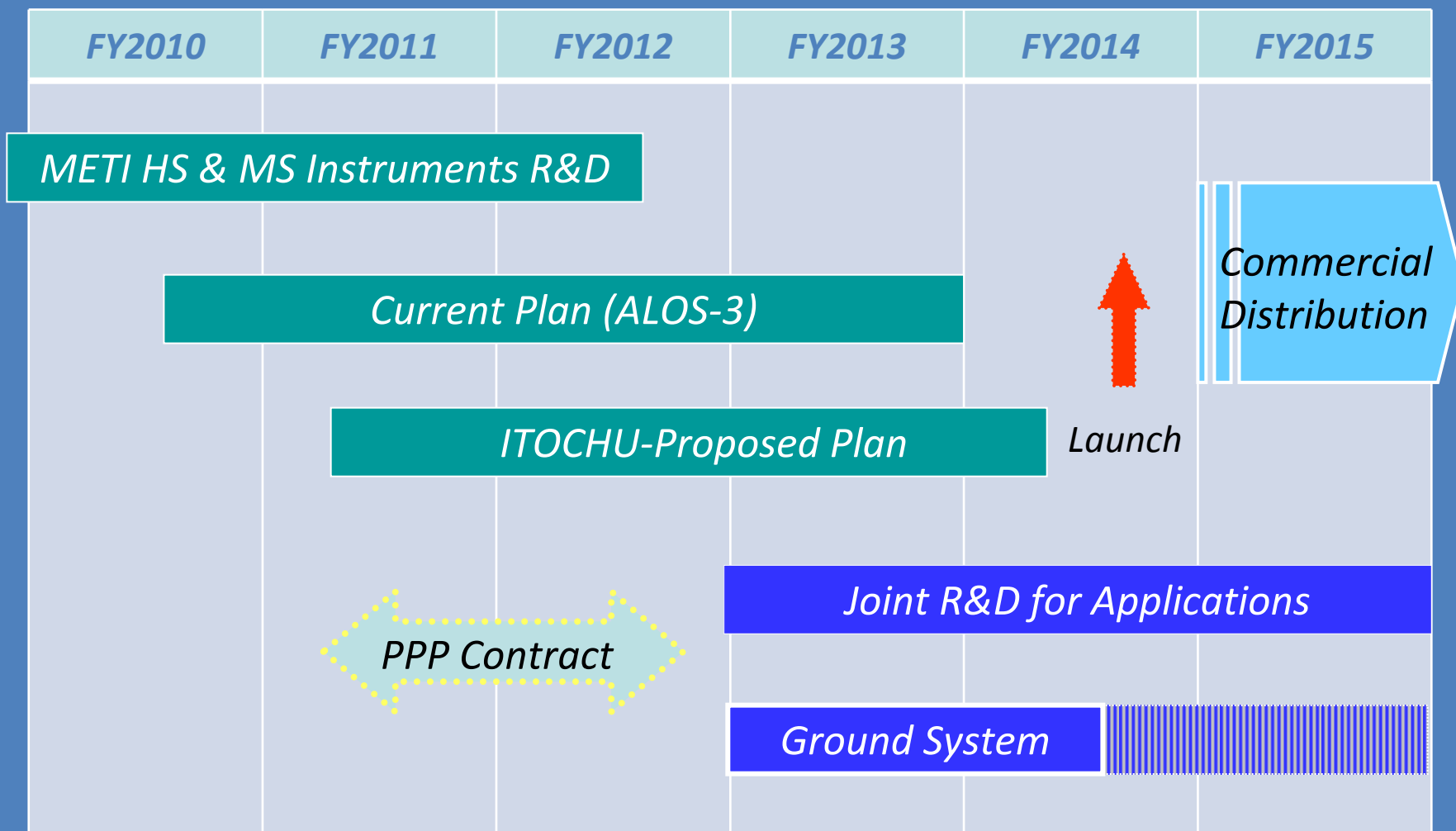
PPP Cost Sharing

ITOCHU Proposal



Implementation

ITOCHU Assumption



* FY ; Fiscal Year from April 1 to March 31

Study of Sensor Performance

	<i>SNR at 620 mm</i>	<i>SNR at 2,100 mm</i>
<i>Requirements</i>	<i>400 : 1</i>	<i>200 : 1</i>
<i>Goal</i>	<i>600 : 1</i>	<i>400 : 1</i>
<i>Current Hyper X Plan</i>	<i>450 : 1</i>	<i>300 : 1</i>

Itochu believes that 30 m GSD with today's technology is required to sustain adequate SNR and commercially directed swath widths.

Alternatives exist if higher resolutions are required. Reducing spatial resolution merely makes the SNR issue more difficult to achieve,

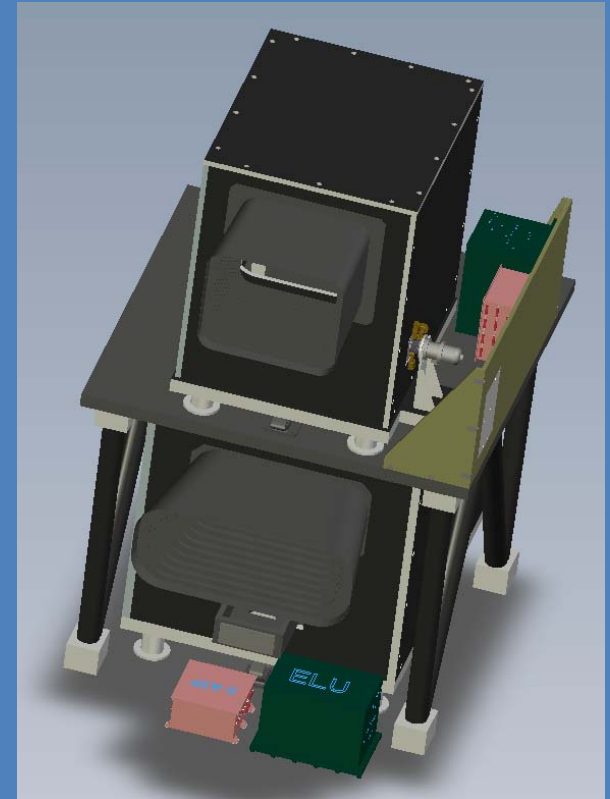
and

In imaging spectroscopy, "SNR rules!"

Hyper X Instruments Characteristics

Hyperspectral / Multispectral imagers on ALOS-3

	Hyperspectral/METI	Multispectral/METI
Spacial Resolution	VNIR: 30m SWIR: 30m	5 m
Swath Width	30 km	90 km
Number of Bands	VNIR 57 SWIR 128 TTL 185	4
Spectral Range	VNIR 0.4 ~ 0.97 μ m SWIR 0.9 ~ 2.50 μ m	0.45 ~ 0.90 μ m
Spectral Resolution	10.0 nm (VNIR) 12.5 nm (SWIR)	Band 1 : 0.45 ~ 0.52 μ m Band 2 : 0.52 ~ 0.60 μ m Band 3 : 0.63 ~ 0.69 μ m Band 4 : 0.76 ~ 0.90 μ m
S/N	> 450 @620nm > 300 @2100nm	> 200
MTF	> 0.2	> 0.3
Radiometric	12 bits	12 bits
Weight	340kg	
Down link	720 Mbps (16 QAM)	
Power	400 W	
Altitude	618.2 km	
EoL	7 years	



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US Market Survey

Estimation of the Future US Market for Hyper X Data and Products

April 2009

Prepared by

Mr. Charles Mondello

&

Dr. George F. Hepner,
Professor University of Utah

*Mr. Charles Mondello and Dr. George Hepner, principals in the Remote Sensing Industry Forecasts I-V under the auspices of the American Society for Photogrammetry and Remote Sensing (**ASPRS**) will lead this study.*

Current Market Opportunity

- *There is a lack of competition in the operational hyperspectral arena*
 - *EnMAP and PRISMA are likely satellite competitor, or **potential tandem partners***
 - *Aerial hyperspectral capabilities are small*

- *Hyper-X opens up the spectral and radiometric domains*
 - *Foster the development of new products, and services beyond the panchromatic and natural color*
 - *Hyper-X will expand the domain for clients, systems designers, software tool makers, and application developers to meet the needs of an expanded hyperspectral user base.*

Addressable Market in the US

- *Of the \$4.1B/Year 2014 market approximately 9.5-9.8% of the overall market is viable for the Hyper X product suite (HS+MS)*
 - *This is not the revenue forecast for Hyper X, but rather the segment directly addressable by the Hyper X system data and products.*
 - *The opportunity between hyperspectral versus multispectral breaks down as follows;*

Opportunity Size - NOT Market Share

US\$ million

North America RS Market	2009	2011	2014	2017	2020
Hyperspectral	195.5	204.9	214.4	221.9	229.4
Multispectral	218.0	233.0	248.0	258.5	269.0
Total	413.5	437.9	462.4	480.4	498.4

Market Survey Respondent Sample

The survey was targeted to include 40-50 respondents, who were emailed cover letter and surveys during December 2008 - March 2009 time period.

These respondents were selected from various market sectors representing potential decision makers for the acquisition of data, products and services in the hyper-X domain (Multispectral, satellite RGB, CIR and SWIR);

Government Agency

- US government agencies both civilian and military
- State governmental agencies
- Local/county governmental agencies

Private sector Firms

- Military/Intel contractors
- Civilian agency support contractors
- Value added vendors (VAR)

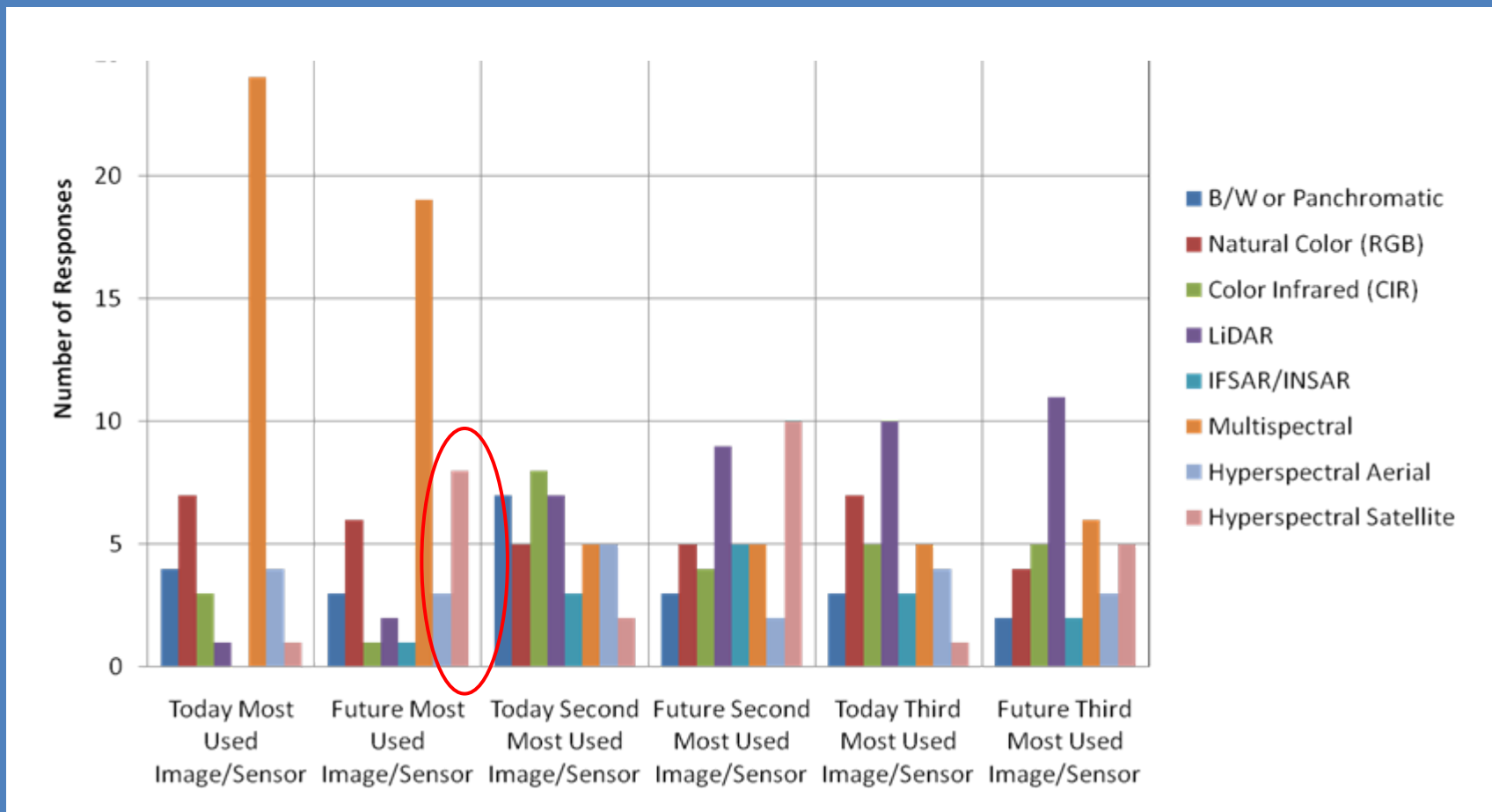
Academic/R&D Organizations

- Universities
- Governmental laboratories

<i>Agriculture</i>	<i>3</i>
<i>Environment</i>	<i>8</i>
<i>Resource Management</i>	<i>7</i>
<i>Forestry</i>	<i>3</i>
<i>General mapping</i>	<i>4</i>
<i>Infrastructure</i>	<i>2</i>
<i>R&D</i>	<i>11</i>
<i>Security & Military</i>	<i>6</i>
<i>Total respondents</i>	<i>44</i>

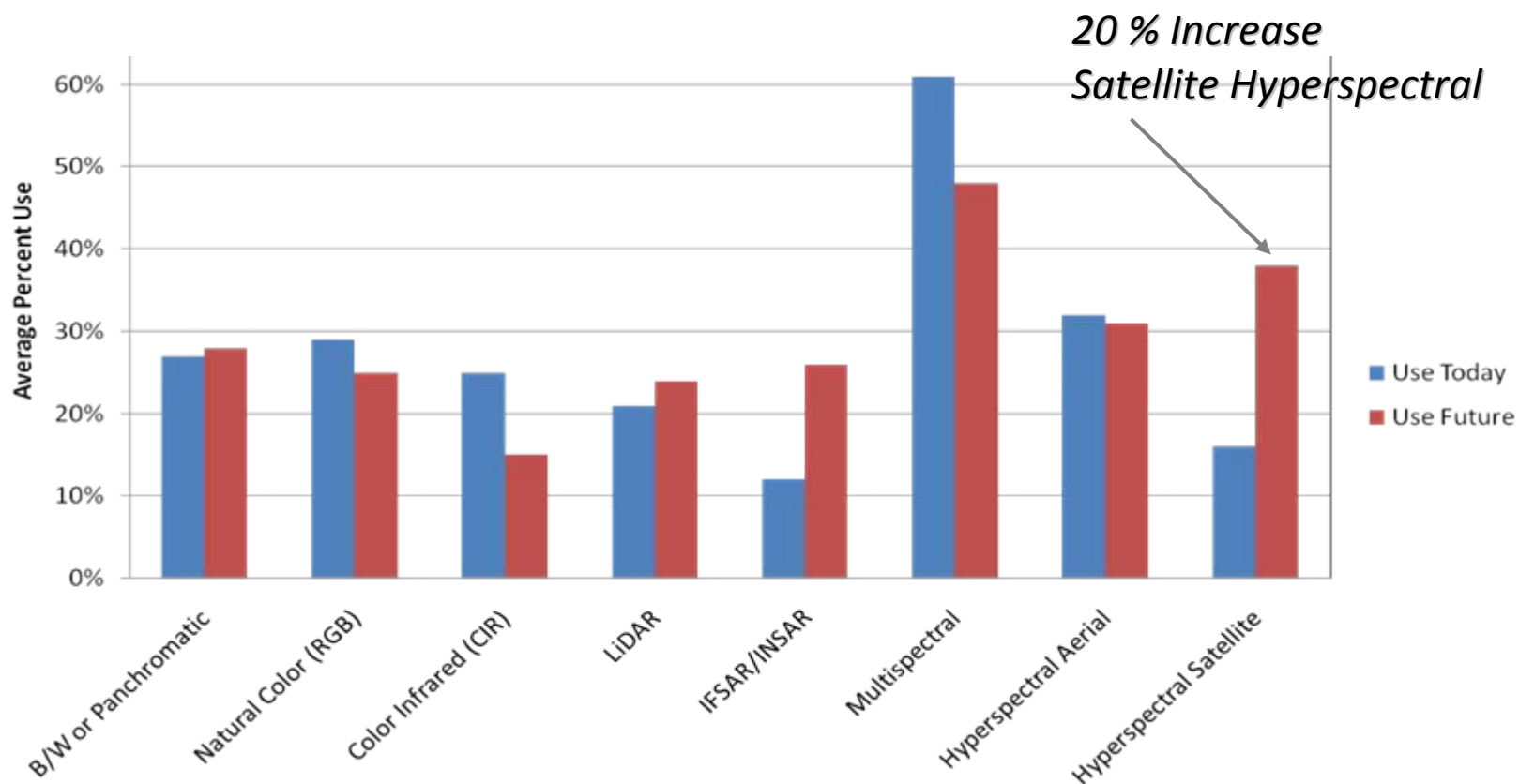
Needs Today and Future in 2015

The imagery most used today is multispectral. When asked most needed in 2014, the leading response was still multispectral with satellite hyperspectral now the second most needed.



Average Percent Use : Today vs. Future

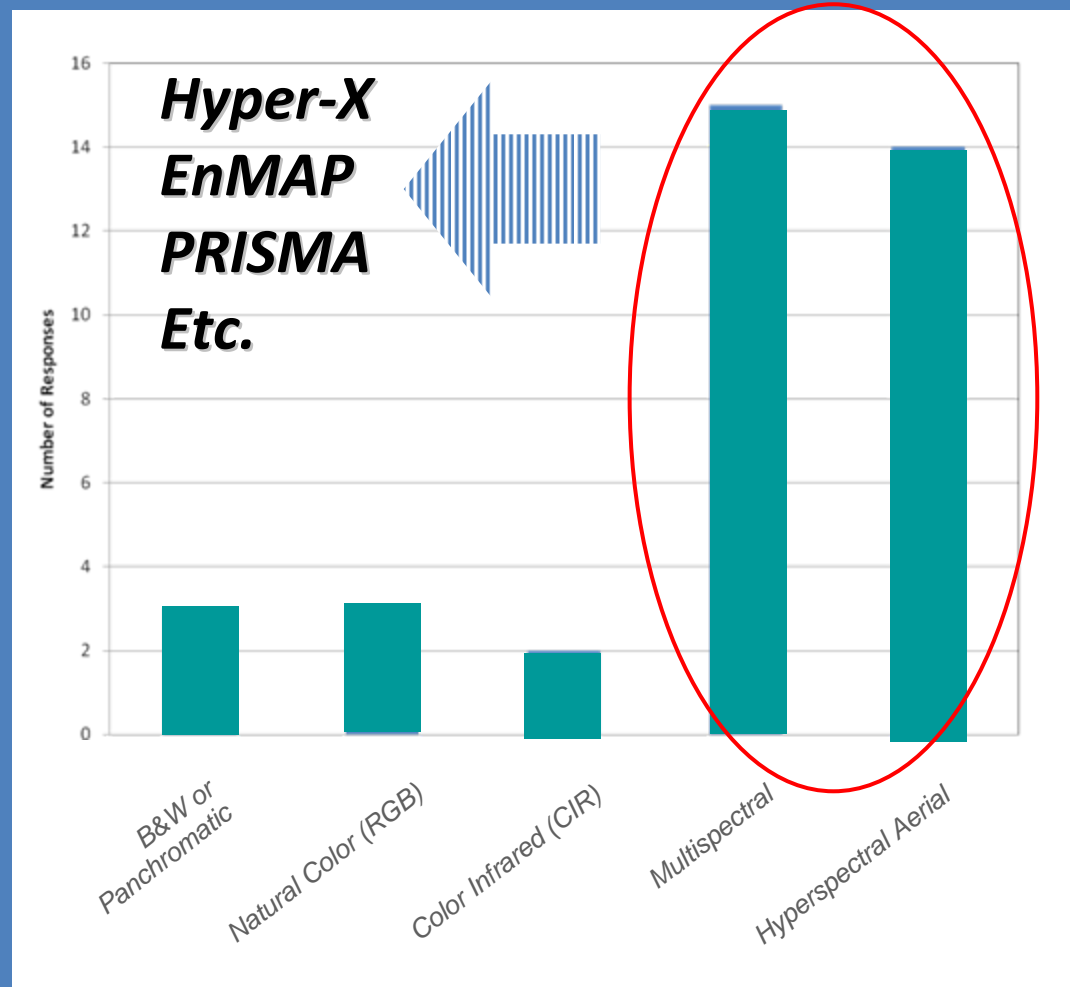
Satellite hyperspectral increases over 20% in the future use reflects the migration of users from aerial color and satellite multispectral to hyperspectral and other newer technologies .



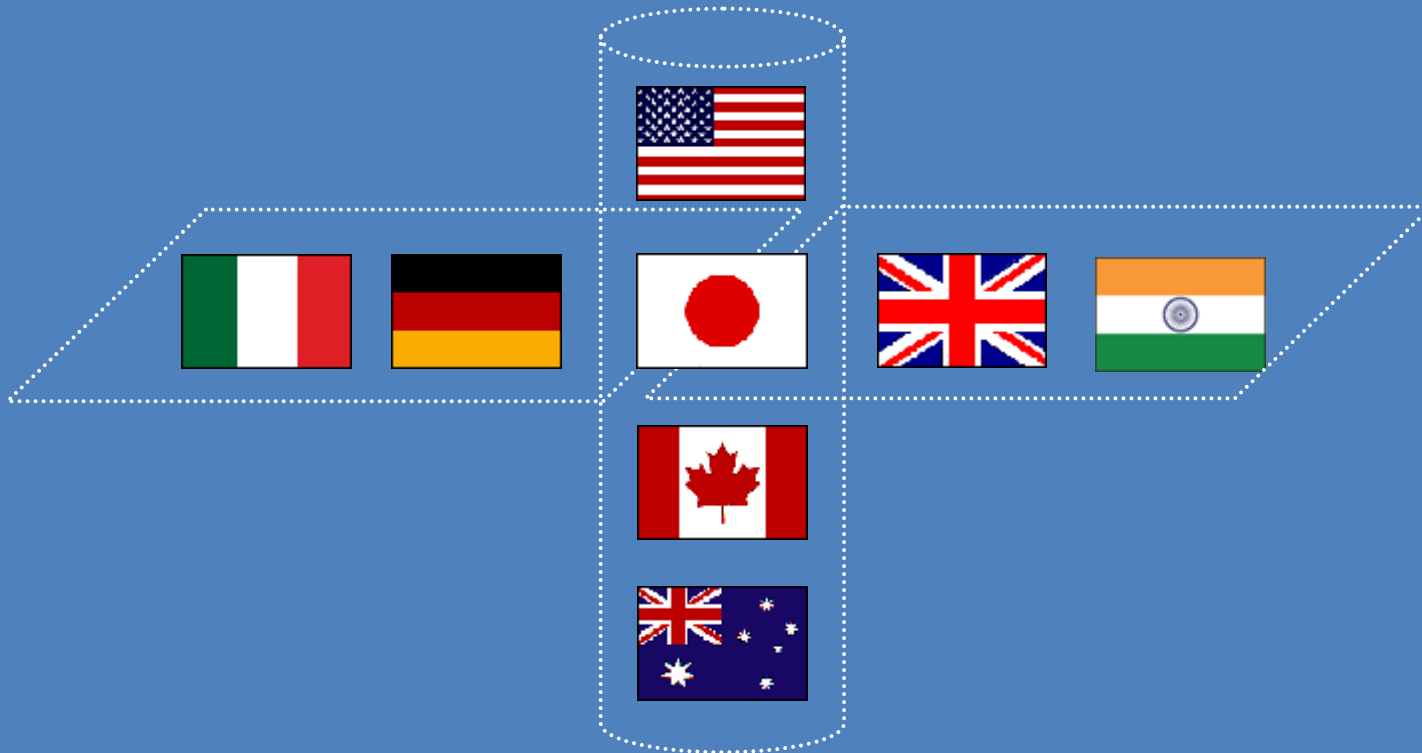
Replace Existing Sensor Data

Survey indicates that approximately 56% of responses believe that satellite hyperspectral imagery can replace at least some of their current uses of imagery.

The replacement was seen primarily in the *satellite multispectral* and *aerial hyperspectral* data products.



Proposal to ESA Workshop



Hyperspectral Space Alliance (HySPA)
for Joint Application Development and Global Coverage

Discussion and Q&A

Contact to;

Duke TAKAHASHI

高橋 秀人



*Senior Manager – Space Programs
Aerospace & Industrial Systems Division
Email : takahashi-hideto@Itochu.co.jp.*