

Realisation of Spacecraft Hardware – Production Mode

Presentation To Chairman ISRO
/Secretary DOS

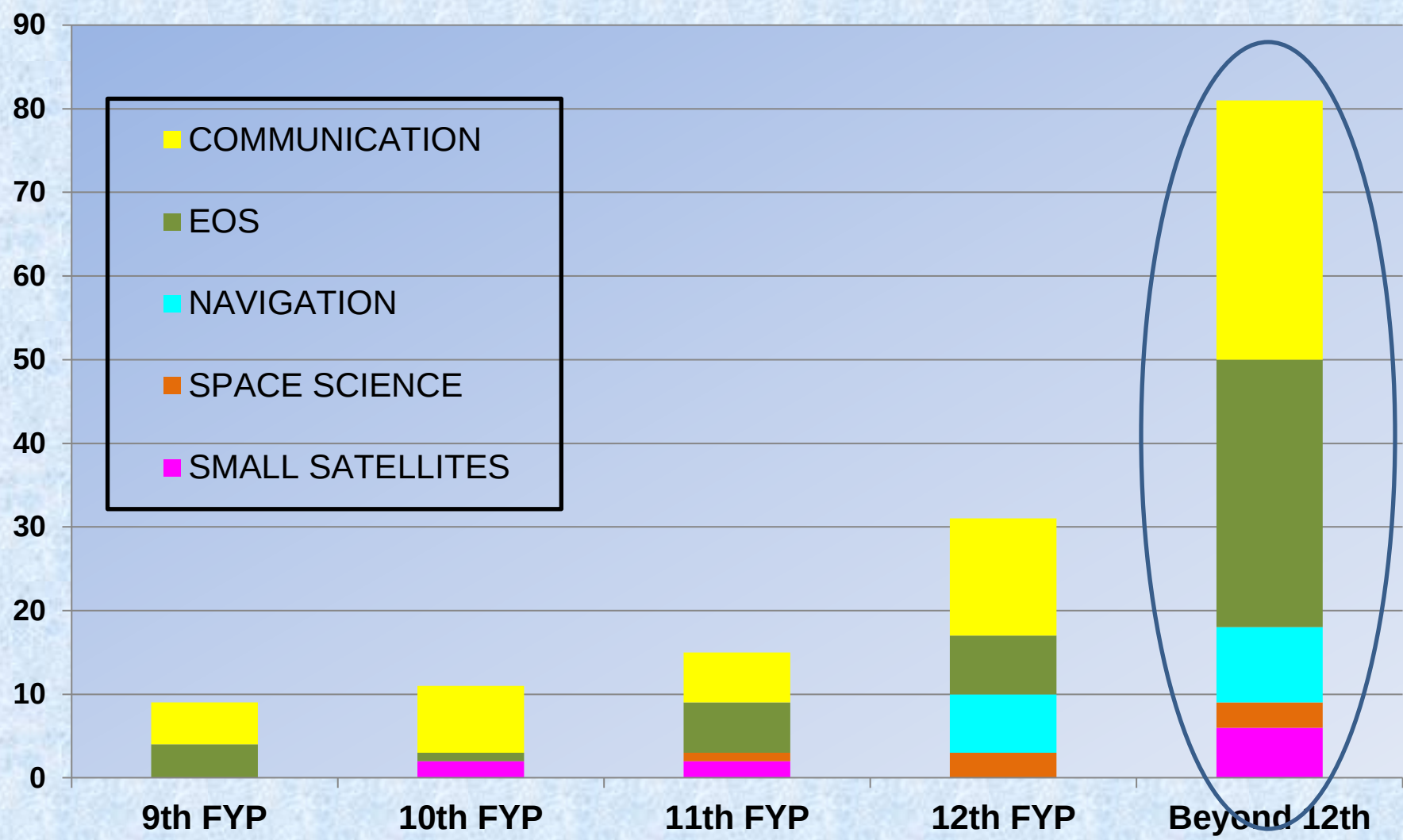
Dr SVSharma
Systems Production Area, ISAC

CONTENTS

- Recap - From Last Chairman's Review
 - S/C Program Profile 2015-2021
 - Production Models
- Realization Strategy-Initiatives : 2017 - 2020
 - Mandate & Achieved
 - Long term Rate Contract
 - Methodology followed
 - Current Position
- Contracts and details
 - SPA in 2016
- Conclusion

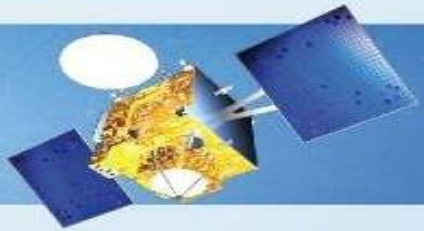


ISAC - TWO DECADES PLUS – S/C Growth Trajectory

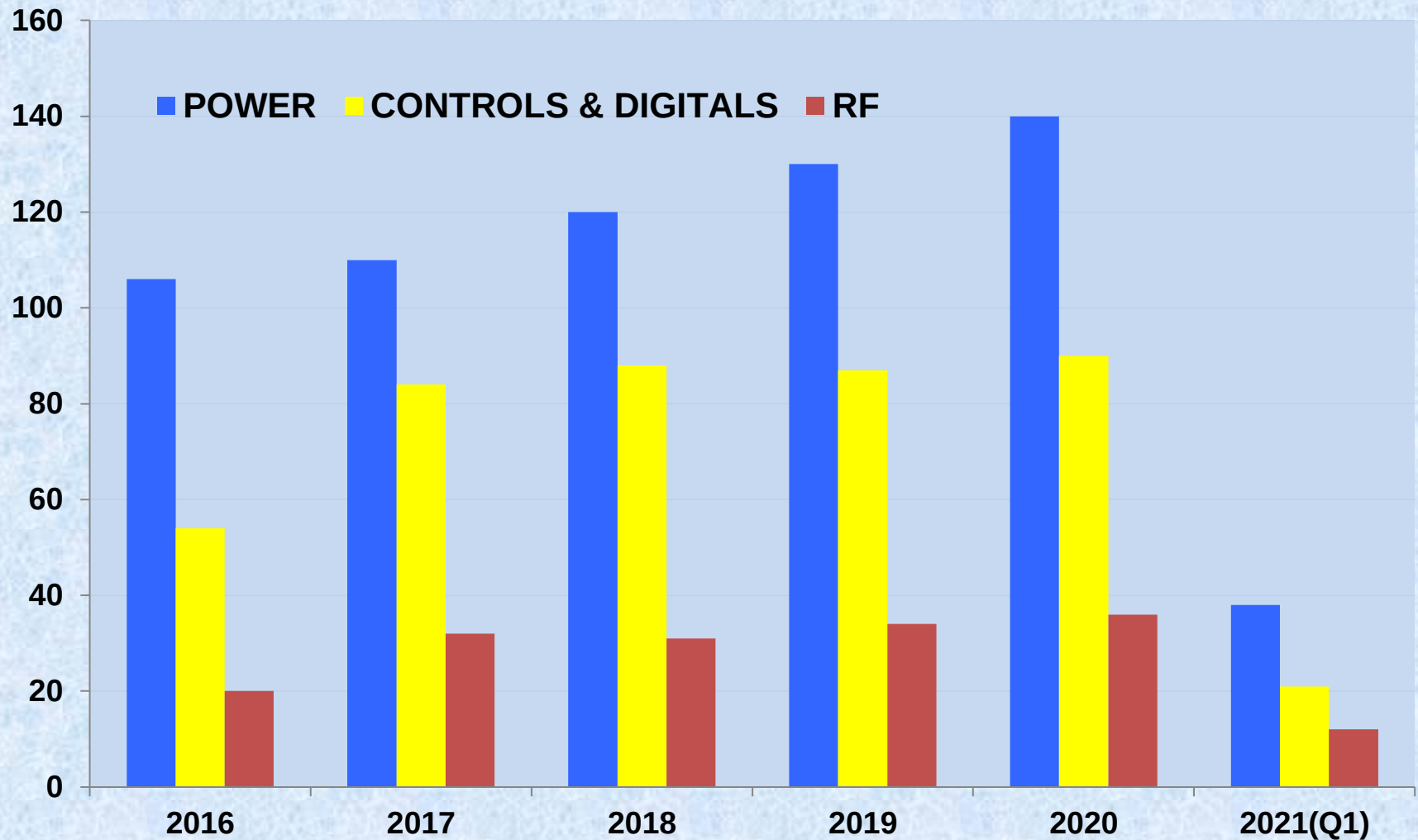


ESTIMATED PROGRAMME PROFILE 2015-2021 (71 Satellites)

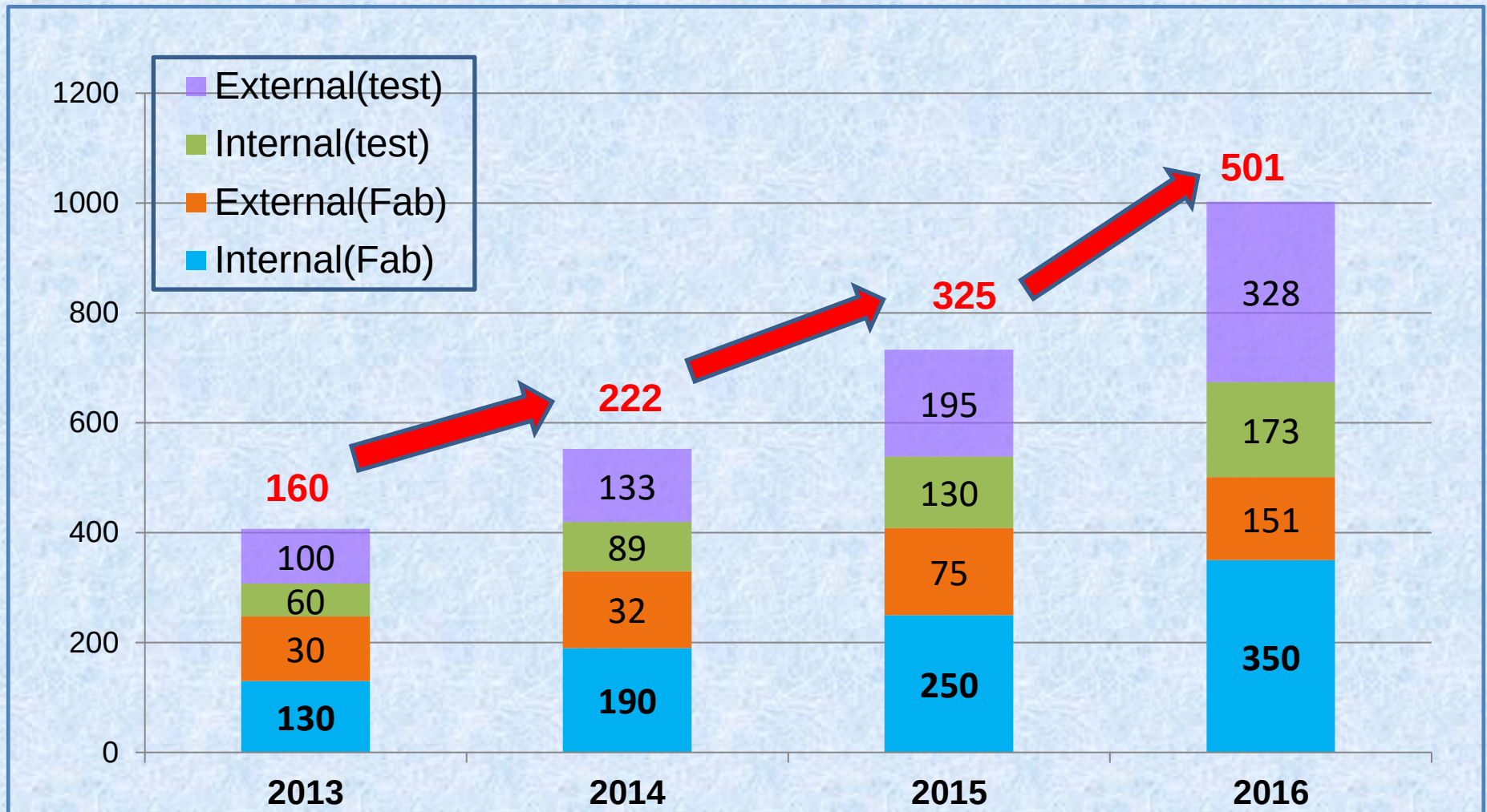
Programme	2015 (Q3...)	2016	2017	2018	2019	2020	2021
Communication	GSAT-15	GSAT-18 SAARCSAT GSAT-19	GSAT-11 GSAT-7A GSAT-17	INSAT-4AR GSAT-9 Ka-Multi Ku-48 S band 12m Ku-24	User Funded-1 Ka/Ka-1 Ku-24 Ext ComSat-1 Ka/Ka-2 User Funded-2 GSAT-11R	Ku-48 GSAT-6A Ext ComSat-2 IDRSS-1	IDRSS-2 Ext ComSat-3 Ka/Ka-3 GSAT-7R
Navigation	IRNSS-1E IRNSS-1F	IRNSS-1G IRNSS-1H	IRNSS-1I IRNSS-1J	IRNSS-1K	IRNSS-S1	IRNSS-S2	IRNSS-S3
Earth Observation		INSAT-3DR SCATSAT-1 CARTO-2C RES-2A EMISAT	GISAT-1 CARTO-2D MICROSAT CARTO-2E	GISAT-2 CARTO-3 OCEAN-3	INSAT-3DS HySIS CARTO-3A RISAT-1A SPADEX RES-3S OCEAN-3A RISAT-1B RES-3MX	Adv. GISAT CARTO-3B RISAT-2A RES-3SA OCEAN-3B RES-3AMx NISAR	RES-3SB RES-3BMx
Space Science	ASTROSAT		CHAND-2		ADITYA-L1		
TOTAL	4	10	10	10	18	12	7



ANTICIPATED FUTURE REQUIREMENTS – A SNAPSHOT



GROWTH IN DELIVERABLES – A FINE PERFORMANCE !



Total Packages delivered by SPA From Feb 2013 to Dec 2016 : 1208

REALIZATION STRATEGY

2017- 2020

INITIATIVES

REALIZATION STRATEGY - INITIATIVES

STANDARDISATION

- Standardization of main frame systems through modular concept
- T & E philosophy - Production Hardware

PRODUCTIONISATION

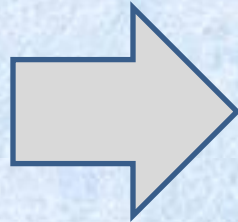
- Production – Cover majority of subsystem
- In house production capability increased
- Long term contract with Vendors
- New vendor development
- Off-the-shelf - Standard hardware
- Delinking design phase from production phase in project lifecycle

Subsystems end-to-end Production Model

Beginning

Design
Components
Test Facilities

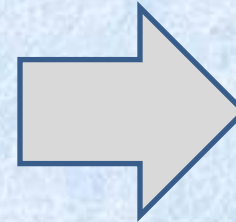
Documentation
Fabrication
Testing



Present

Design
Components

Documentation
Fabrication
Test Facilities
Testing



Target

Design

Components
Documentation
Fabrication
Test Facilities
Testing

Target Spacecraft AIT

Target Realization of 550 to 600 Packages per year

Packages to be realised

C-Band TTC TX. System	TC Decoders	Relay packages
S-Band TTC RX. System	TM processing	Battery cell by pass circuit.
C-Band TTC RX. System	Core power packages.	Domestic regulator/s
S-Band TTC TX. System	Shunt packages	Bus/ battery regulators
DC-DC Converters	Telemetry & Telecommand (TMTC)	EED Packages
Independent Cell and battery voltage Monitoring	Attitude and Orbit Control Electronics (AOCE)	Distribution packages
Charge management and protection Logics	On Board Computer (OBC)	BIM Packages
	Wheel Inter phase Module (WIM)	

PRODUCTION MODELS FOR RATE CONTRACTS

Mode-1	Mode-2	Mode-3	Mode-4	Mode-5
Fabrication @ Vendor	Testing@ ISAC	Fabrication & Testing @ ISAC	Fabrication @ Testing @ Vendor	End-to- End @ Vendor

ISAC support with

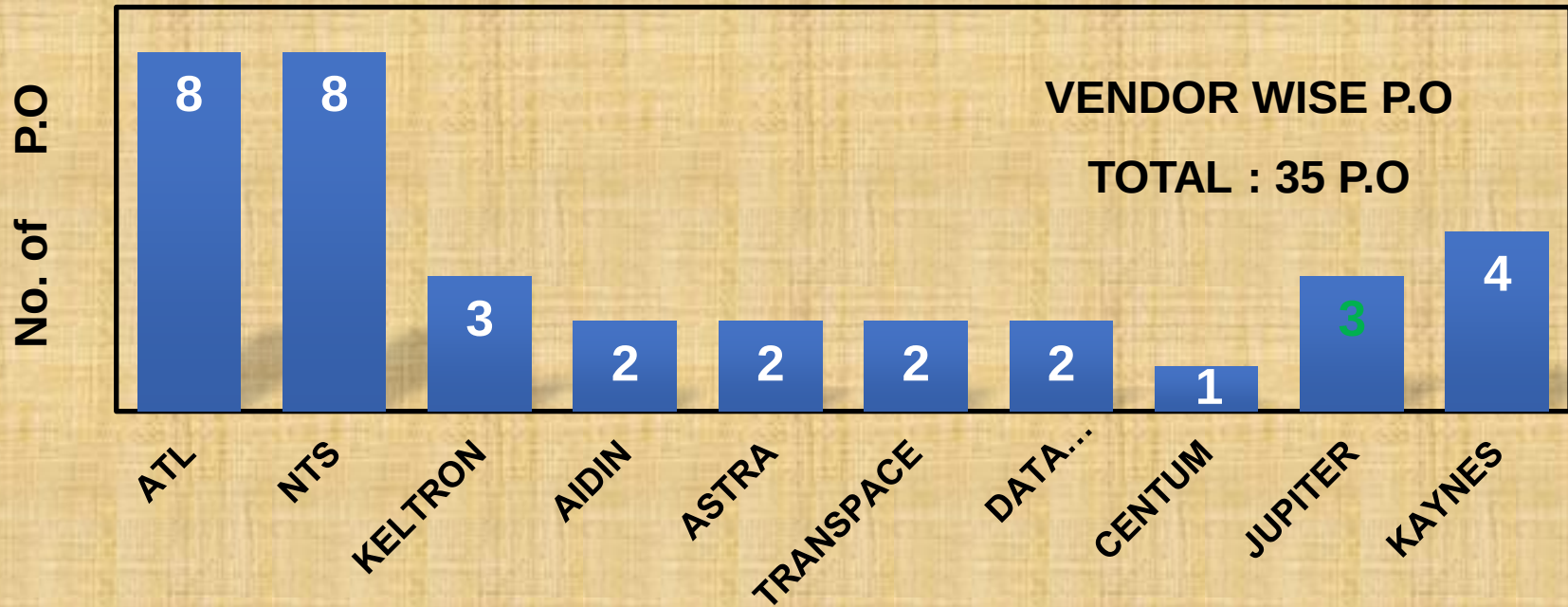
- EEE components,
- Mechanical Housings
- Environmental Test Facilities
- Test Consoles
- Technical Know-how

INDENTING TIMELINE

SI.	PROGRESSION OF INDENTS	DATE
1	Indent Registration & Online Publishing	20-06-16
2	ESSRI Conference	23-06-16
3	Pre – Bid Conference	13-07-16
4	Quotation Due Date	(i) 25-08-16 (ii) 30-08-16
5	Recommendations for Price Bid Opening	29-09-16
6	SWC Recommendation for Price Bid Opening	30-09-16
7	Recommendations for Negotiation	13-10-16
8	SWC Recommendation	14-10-16
9	SWC Negotiation Recommendations	15-10-16
10	Recommendations for Parallel Contract Post Negotiation	17-10-16
11	SWC Recommendations for Placement of Purchase Order	24-11-16
12	Release of Purchase Order	28-11-16
13	Handing Over of Purchase Order	28-11-16

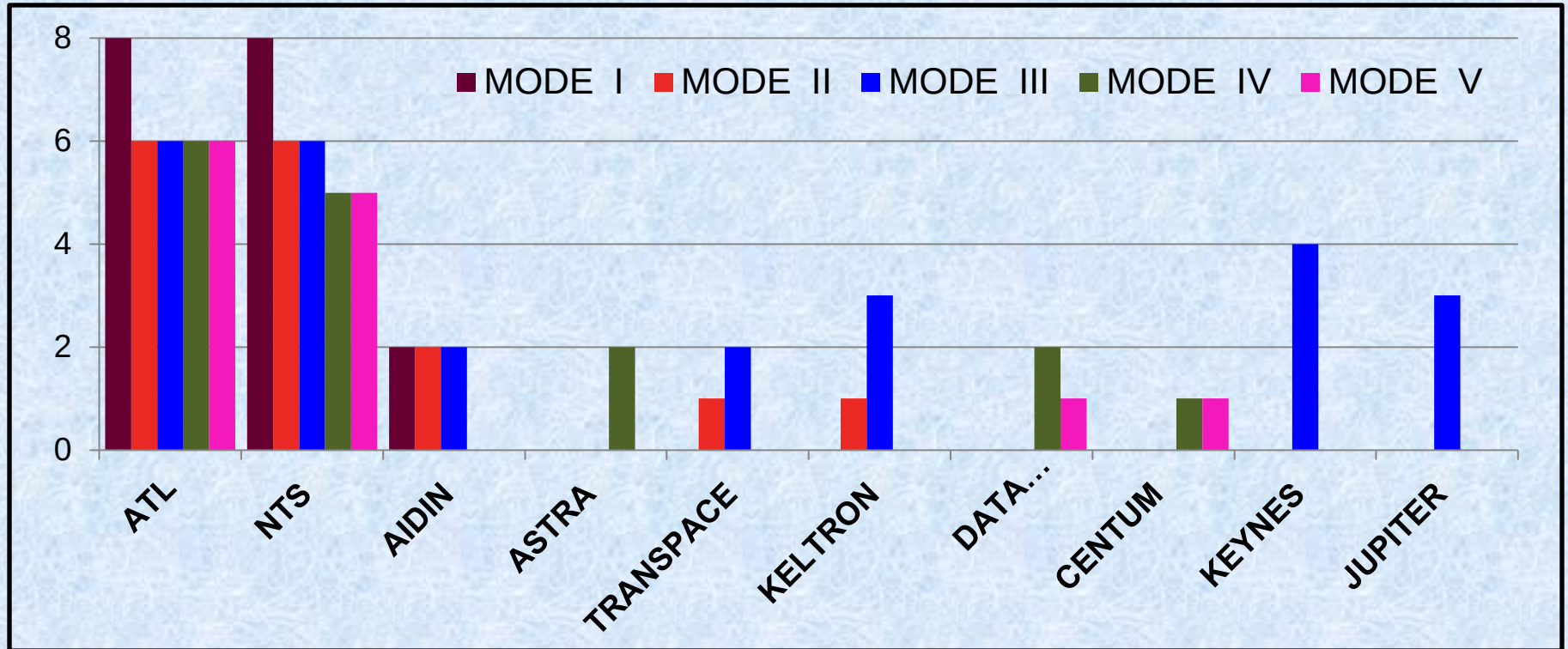
TIME FROM INDENT TO PURCHASE ORDER : 5 MONTHS 8 DAYS

CONTRACTS FOR AVIONICS HARDWARE



- TEN VENDOR IDENTIFIED FOR AVIONICS HARDWARE REALISATION
- EIGHT ARE QUALIFIED AND EXPERIENCED VENDORS; TWO ARE NEW
- THE ENTIRE CONTRACT CAN PROVIDE 1200-1400 PACKAGES

VENDORS INTEREST ACROSS DIFFERENT HARDWARE IN DIFFERENT MODES



SPA - INFRASTRUCTURE



SPA - INFRASTRUCTURE



Lab Area Available

CEFD-ISAC : 1000 sq.m

CEFD-ISITE : 1700 sq.m

TED lab : 750 sq. m

TED New : 2000 sq.m

Mech.Lab : 300 sq.m

PCB Lab : 500sq.m

HDI Lab : 1000sq.m





Package Handing Over November 2015 to March 2017

MANDATE

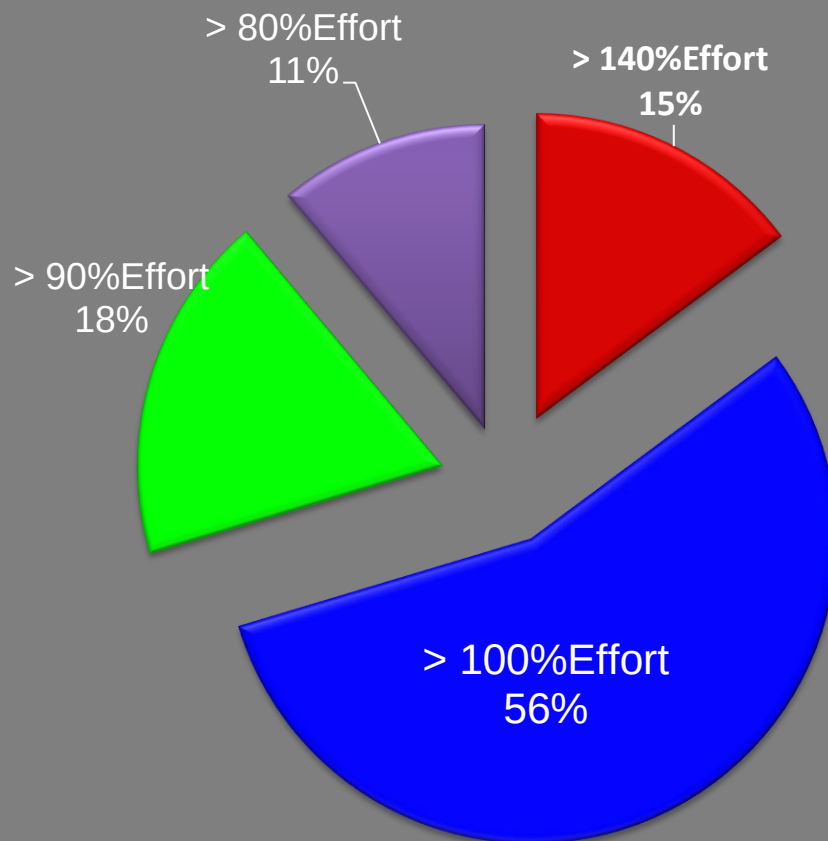
1. Contracts to be Available for Avionics hardware through Industry from January 2017.
2. Utilize potential of Qualified Empanelled Vendor
3. Increase the scope of qualified vendor where possible
4. Have vendors for immediate realization
5. Accommodate new vendor

CONTRACT HIGHLIGHTS

1. Contracts based on Production Framework Document (**PFD**) and Detail Specification
2. Emphasis on **type** of hardware – utilising vendor expertise to the maximum.
3. As Rate contracts on per card basis – provides flexibility.
4. Off-the-shelf availability for standard hardware.
5. Progressive evolution in vendor engagement from Mode-1 to Mode-5.
6. Almost 35-40 satellites hardware can be realised.
7. Vendors have better visibility and more stakes than before.

Manpower Resource Utilisation in SPA

TIME & EFFORT - CONTRIBUTION OF EMPLOYEES



SPA IN 2016 – IN A NUTSHELL

1. PCB facility shifted to new HDI building at ISITE and operationalised.
2. SEG building - additional 2400 sq.m area over 2 floors ready for use.
3. Contracts for Avionics realisation for 35-40 satellites realised.
4. Augmentation of equipments and test consoles for catering to increased requirements.
5. SMT line –for automated soldering – established at ISAC.
6. New SMT line will be in place in 2017 at ISAC and ISITE.
7. Vendors being qualified for Automated reflow soldering at their premises.
8. More than 500 packages delivered during the year – including fast-tracked Carto- 2D/E and IRNSS-1G.
9. BDH-ASIC contract realised. Other ASIC and .. Under development.
10. HDI card development and evaluation in progress.
11. Qualification of indigenous gold-plated connectors completed.

CONCLUSION

- SPA focusing on Production and Productivity.
- SPA geared-up to meet Centre requirements.
- Necessary resources & contracts are in place
- Infrastructure expansion already in place.
- SEG/SPA gearing up to produce test systems, test consoles, ATE for productivity and reliability.
- Automated Soldering for all flight cards
- Strategies for next 5 years well mapped.
- SPA will deliver what the Organisation needs and Beyond.

LIFE CYCLE

THREE DOCUMENTS FORM THE BACKBONE OF THE CONTRACTS

- 1 Contract Review Document
- 2 Hardware Realisation Document
- 3 Hardware Implementation Document

CONTENTS OF CRD

SI No	Section
1	Background
2	Quantity Hardware
	Mandate
	Methodology of Realization
	Features of the Contract
	Single Window Committee
	Indent Review by the Committee
	Technical Evaluation (TEC)/ Need Aspect Approval (NAC) / Purchase Committee Approval
	List of cards/packages that are to be realized
	Modes of realization
	Other General Purchase Requirement
	Summary of Committee Recommend
	Pre- Bid Conference Details/ Pre-Bid Deliberations/ Technical Presentations/ Question and Answer Session
	Additional Points/ Terms Recommended
	Question and Answer Session
	Details of governing specific document for each hardware
	Methodology of Selection of Vendors
	Decision criteria table
	Vendors Deemed Qualified For A Mode Of Realisation
	Vendor Wise Purchase Orders Issued
	Modes of Realisation
	Vendor Participation in Different Mode
	Progression of Indents for Packages Realisation
	Process of Realization of Indents

Transpace	Training and qualification				Mode 3 OBC				Mode 3 AOCE									Mode 3 AOCE																						
NTS	Mode 4 AOCE					Mode 3 AOCE						Mode 5 AOCE			Mode 3 AOCE					Mode 2 AOCE				Mode 2 AOCE																
				Mode 4 AOCE						Mode 5 OBC																			Mode 5 AOCE											
				Mode 3 OBC					Mode 4 OBC						Mode 2 OBC																									
DP	Training			Mode 4 AOCE						Mode 4 AOCE									Mode 4 OBC																					
ATL			Mode 4 AOCE			Mode 5 AOCE		Mode 5 AOCE					Mode 4 AOCE		Mode 2 AOCE				Mode 3 AOCE		Mode 2 AOCE																			
									Mode 5 OBC								Mode 3 AOCE																							
	Mode 3 OBC				Mode 4 OBC							Mode 2 OBC																												
AOCE Availability	J	F	M	1 A	M	2 J	3 J	4 A	S	O	5 N	6 D	J	F	7 M	8 A	9 M	10	J	J	A	S	O	N	D	J	11 O	12 N	13 D	J	14 F	15 M	A	16 M	17 J	J	A	18 S	19 O	20 N
OBC Availability	J	F	M	A	M	1 J	J	A	2 S	O	N	3 D	J	F	5 M	6 A	M	7	J	J	A	8 S	O	N	9	D	J	F	M	A	M	10 J	J	A	S	O	N			
Year	2017																								2019															

A photograph of a modern, two-story building with a light beige facade and large glass windows. The building is surrounded by greenery, including trees and potted plants. A sign above the entrance reads "AVIONICS SYSTEMS LABS".

AVIONICS FACILITY, ISITE

THANK YOU







Release of first purchase orders by Director, ISAC



FUN-TIME!!

