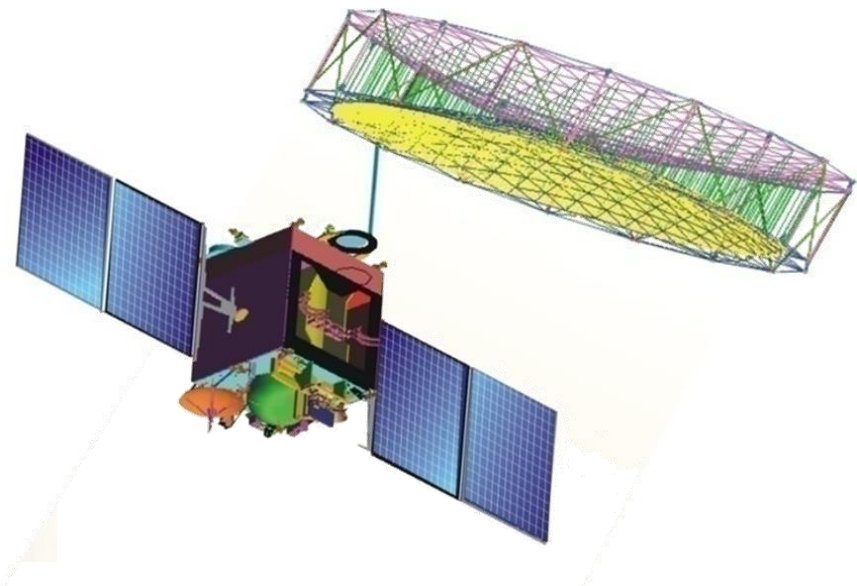
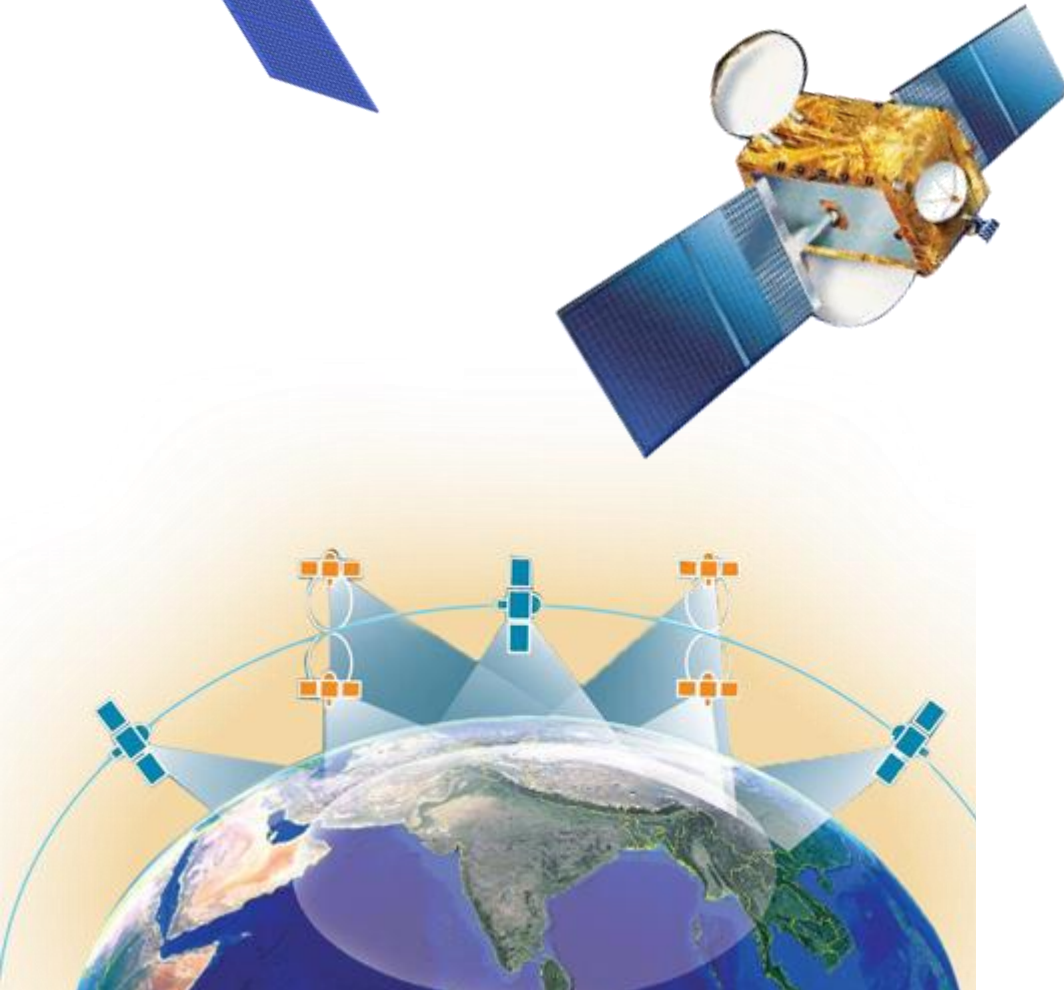
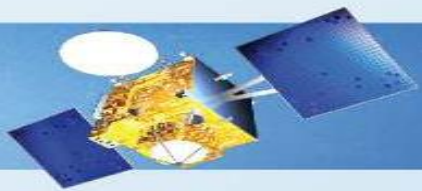


Satellite Programme Realization Plan up to year 2021

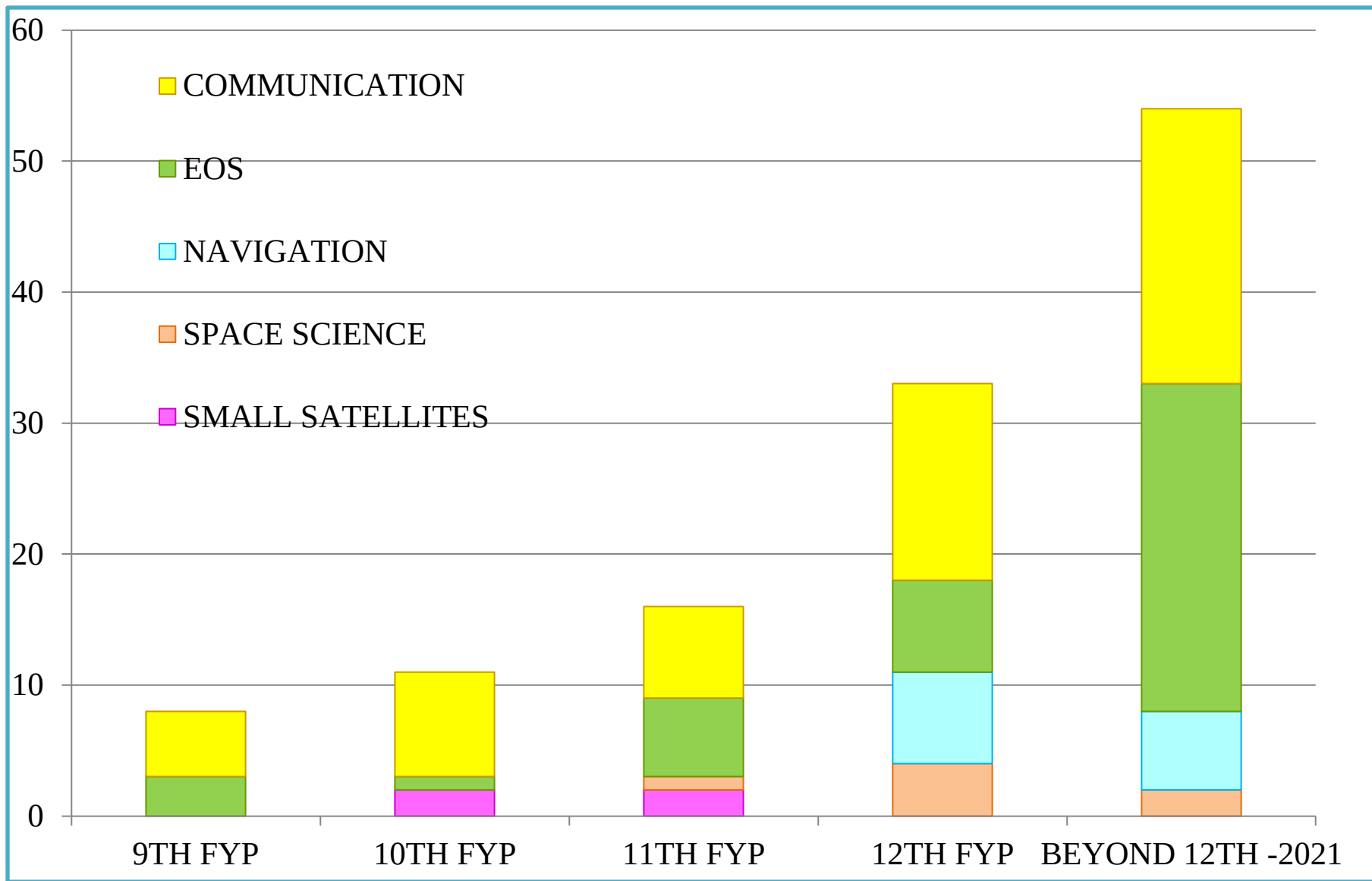


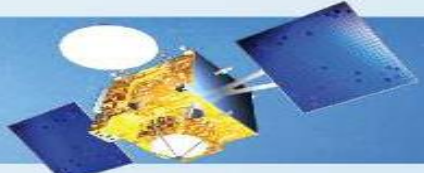
**ISRO Satellite Centre
Bangalore**



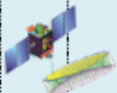


TWO DECADES AND PLUS – Satellite Growth Trajectory

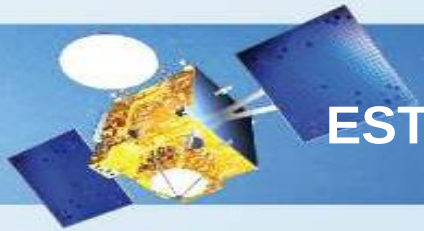




SPACECRAFT PROGRAMME PROFILE 2015-17

	2015 (10 spacecraft)												2016 (11 spacecraft)												2017 ⁽³⁾		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
GEOSAT PROGRAMME				 GSAT-6 GSLV							 INSAT-3DR GSLV			 GSAT-7A GSLV			 INSAT-3DS GSLV					 GSAT-11 GSLV MK-III D1 PROCURED	 GSAT-19E GSLV MK-III D1	 GSAT-17 GSLV PROCURED			
IRS & SSS PROGRAMME							 ASTROSAT PSLV					 SCATSAT-1 PSLV		 CARTOSAT-2C PSLV			 RESOURCESAT-2A PSLV					 EMISAT PSLV		 CARTOSAT-2D PSLV			
NAVIGATION PROG.	 IRNSS-1D PSLV					 IRNSS-1E PSLV	 IRNSS-1F PSLV			 IRNSS-1G PSLV								 IRNSS-1H PSLV						 IRNSS-1I PSLV			

TOTAL 24 Satellites to be realised



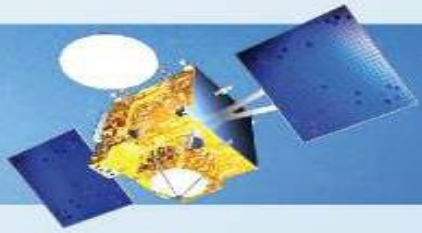
ESTIMATED PROGRAMME PROFILE 2015-2021 (71 Satellites)

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



SUBSYSTEM REQUIREMENTS 2015-2021 (71 Satellites)

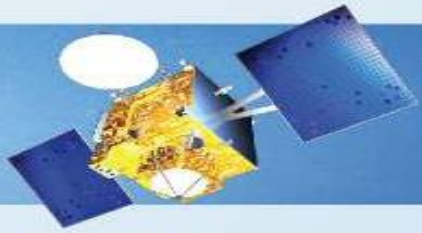
Deliverables	2015	2016		2017		2018		2019	2020		2021
	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q1-Q2	Q3-Q4	Q1
Power	45	48	60	53	56	56	63	65	36	36	22
DC-DC	140	155	168	218	230	205	234	220	140	140	50
Battery	11	13	13	14	21	15	20	18	10	9	6
Solar panel(Sq.m)	64	60	74	114	169	128	123	162	113	68	48
Sensors	64	90	85	90	84	94	98	96	76	67	23
AOCE	4	6	4	7	7	5	5	5	3	4	3
BMU/OBC	4	3	5	10	8	6	11	7	4	4	2
TZC	40	38	40	38	38	38	46	36	26	25	13
BDH &SSR	8	4	6	11	10	6	16	12	8	8	4
TMTC	5	13	10	16	15	11	12	13	7	7	5
TTC											
Transponder	16	18	20	32	28	22	30	26	18	16	6
Antennae	13	18	17	24	25	17	22	25	11	12	11
SPS & SPS Ant.	8	8	8	12	8	12	16	12	8	8	4
Data Tx	10	4	6	13	10	4	18	12	10	6	2



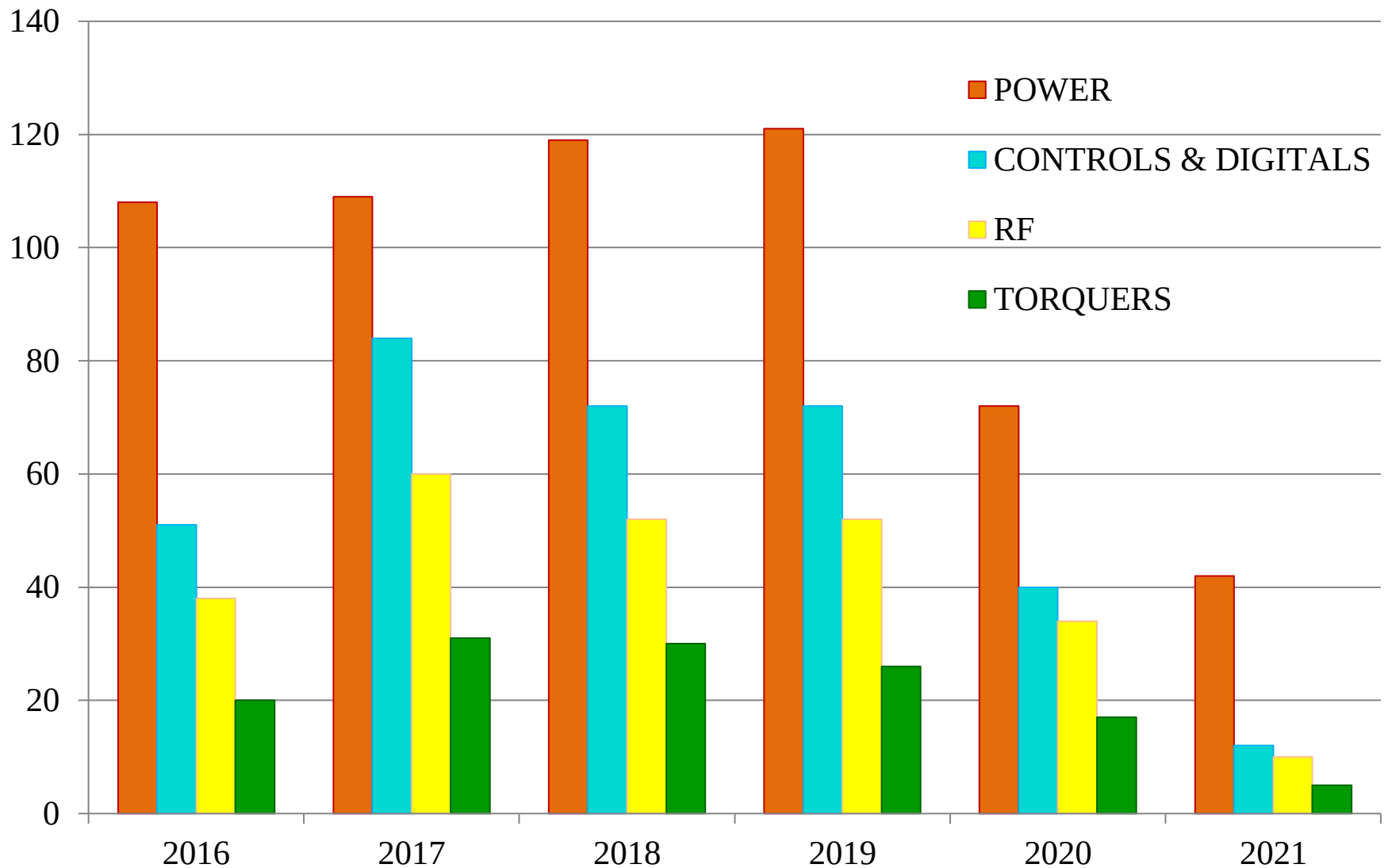
SUBSYSTEM REQUIREMENTS 2015-2021 (71 Satellites)

contd...

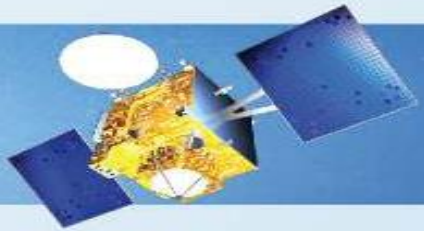
Deliverables	2015	2016		2017		2018		2019	2020		2021
	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q3-Q4	Q1-Q2	Q1-Q2	Q3-Q4	Q1
Data Tx Ant	4	4	2	7	6	2	9	6	4	4	2
Structure-Cylinder	2	5	4	7	6	7	6	7	4	5	1
Eqpt panel	14	37	35	42	49	50	54	49	32	28	12
SADM	9	10	10	12	13	15	13	12	10	10	4
RDM & Spl Mech.	6	11	11	13	14	11	10	11	9	7	4
Heat pipes	290	410	410	430	440	480	430	400	420	410	170
Prop.Tank	7	8	11	14	10	11	12	12	6	7	2
Press.Tank	14	37	35	42	49	50	54	49	32	28	12
LAM	4	2	5	5	5	4	4	3	2	1	0
Thrusters	52	75	73	82	78	94	84	84	66	58	16
MT	9	10	10	15	16	13	17	13	9	8	3
WIM	6	6	6	6	12	6	6	9	6	6	3



ANTICIPATED FUTURE REQUIREMENTS – A SNAPSHOT



Making of a Satellite



SATELLITE TYPICAL HARDWARES

SPACECRAFT

MAIN FRAME

PAYLOAD

STRUCTURE

POWER

BATTERY

COMMUNICATION

THERMAL

TTC - RF

SOLAR
PANEL

REMOTE SENSING

MECHANISM

TTC - BB

DC DC
CONVERTER

BMU

AOCS

NAVIGATION

SCIENTIFIC

AOCE

SENSORS

ACTUATORS

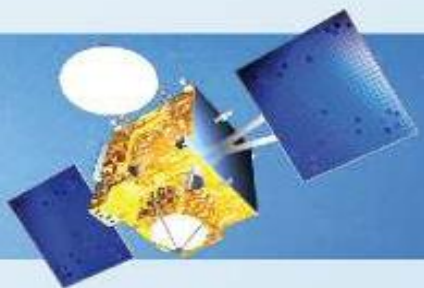
MANNED MISSION

PROPULSION

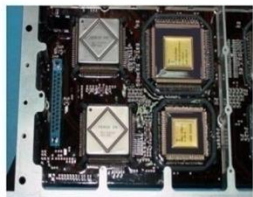
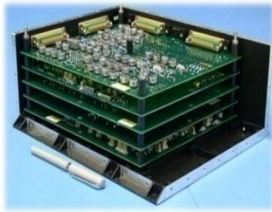
WHEELS / TORQUERS

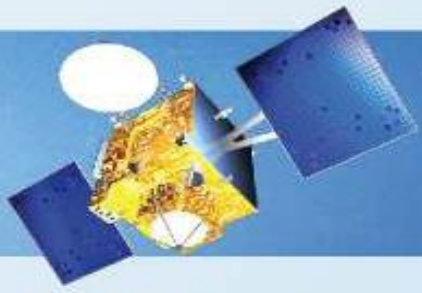
BDH/SSR

AIT
QA
MISSION



REPRESENTATIVE HARDWARE PACKAGES





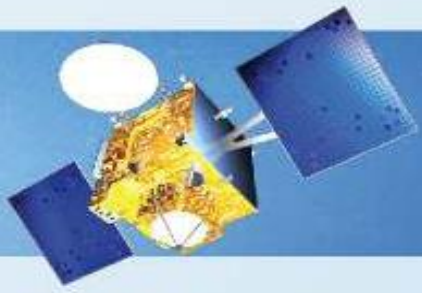
MAKING OF A SATELLITE



ELECTRONIC FABRICATION & TESTING



AOCS HILS TEST



MAKING OF A SATELLITE

Contd....



**SPACECRAFT STRUCTURE
IN CLEANROOM**

THERMAL IMPLEMENTATION



MAKING OF A SATELLITE

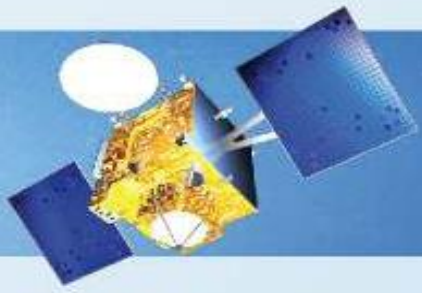
Contd....



**SOUTH PANEL READY
FOR ASSEMBLY**

**NORTH PANEL READY FOR
ASSEMBLY**





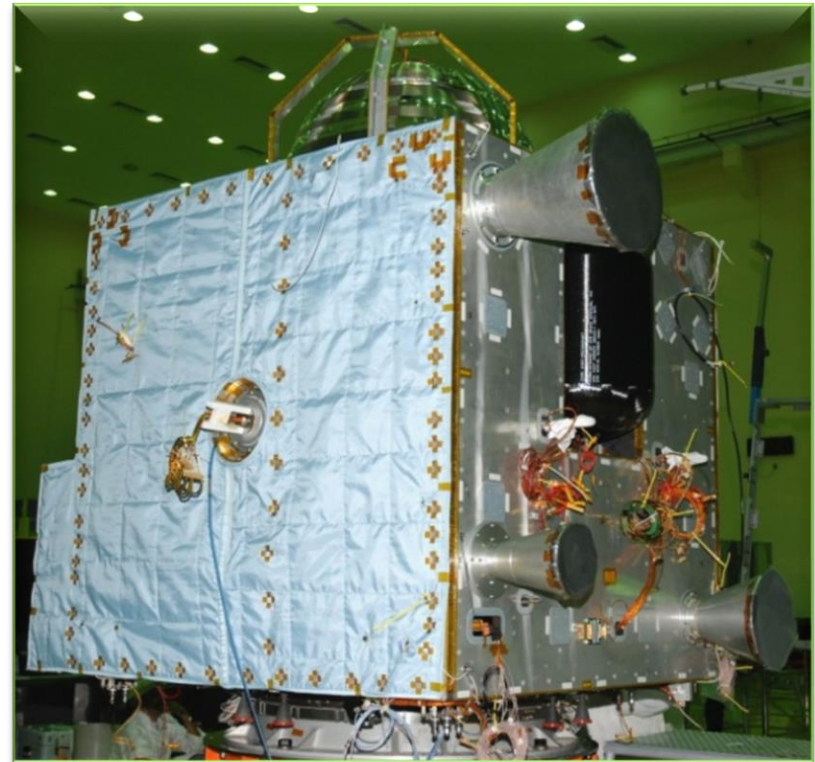
MAKING OF A SATELLITE

Contd....



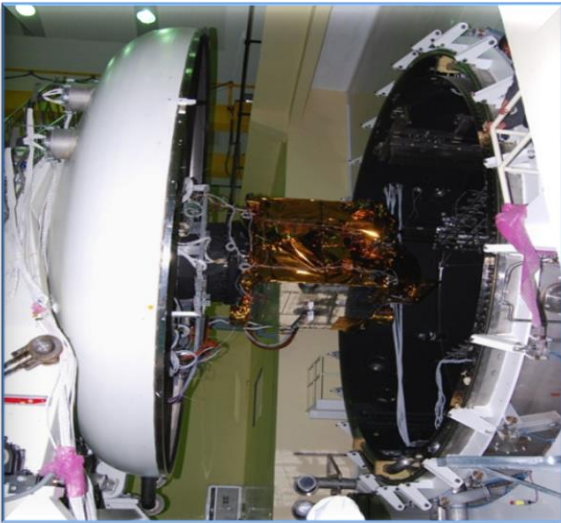
**PANEL ASSEMBLY IN
PROGRESS**

CLOSED MODE IST

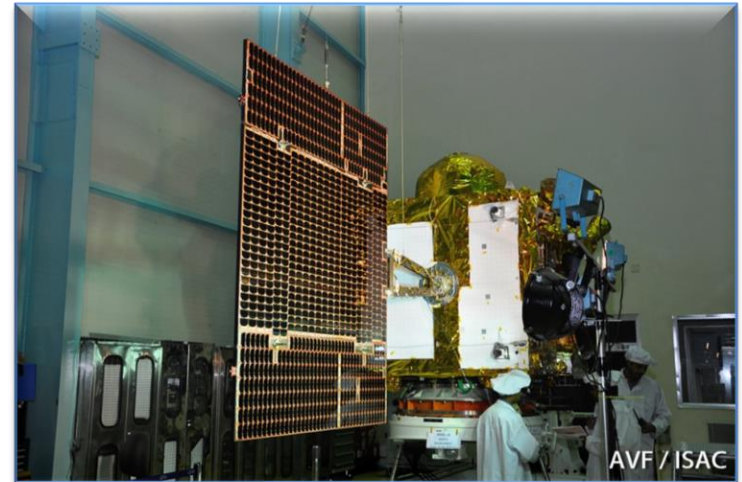


MAKING OF A SATELLITE

Contd....

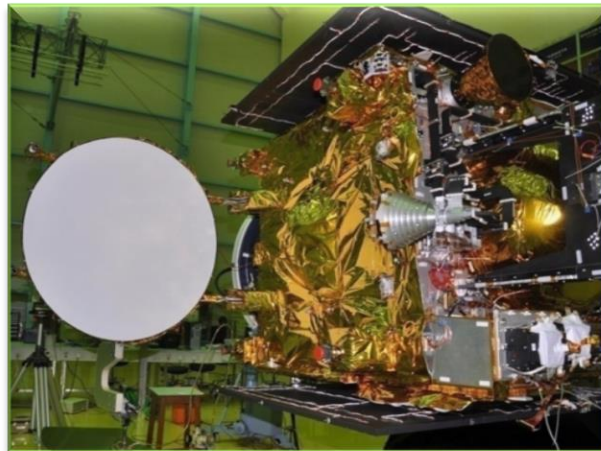


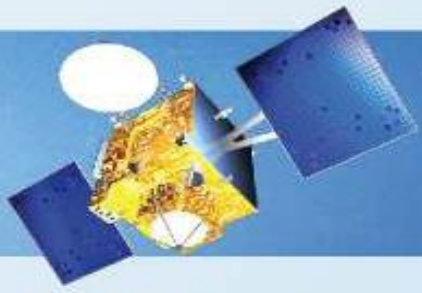
**S/C ENTERING TVAC
CHAMBER**



PANEL DEPLOYMENT TEST

**REFLECTOR
DEPLOYMENT TEST**



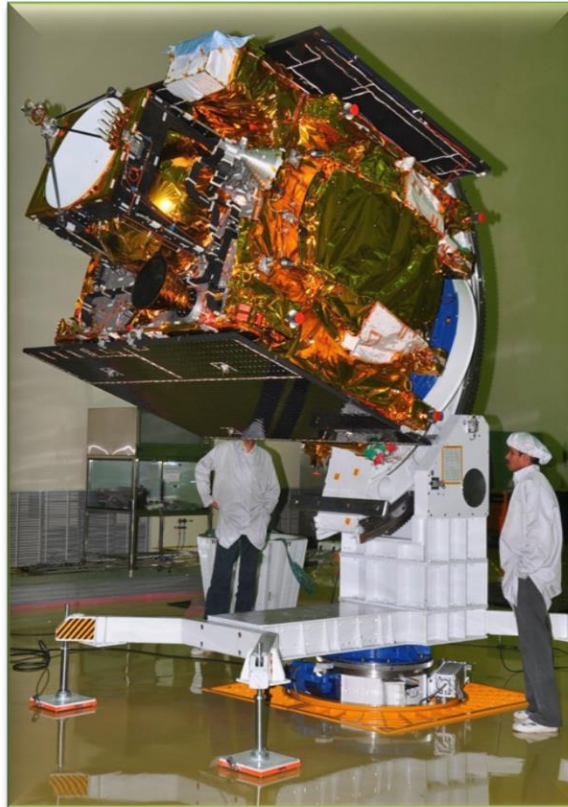


MAKING OF A SATELLITE

Contd....



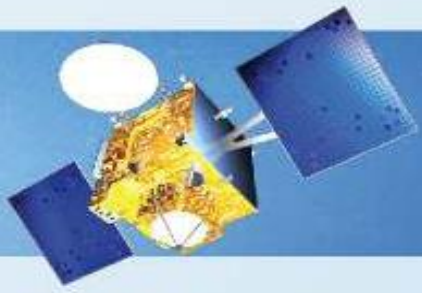
**CG
MEASUREMENTS**



MI MEASUREMENTS



**DYNAMIC
BALANCING**



MAKING OF A SATELLITE

Contd....



VIBRATION TEST



ACOUSTIC TEST



CATF TESTS

Production Approach At ISAC



PROPOSED PRODUCTION MODELS

Example of Present Contracts

Fabrication & In-house Testing

- Distribution packages
- Control system packages: BMU & ADE
- Digital system packages: SSR& BDH
- Communication packages (S-band)
- Antenna elements

ISAC/ISITE

Fabrication In-house & Testing by Vendor

- Communication packages
- Power packages
- DC-DC Converters & Relays
- Control system packages

M/s Aidin
M/s Ananth Tech
M/s Newtech Solutions
M/s Keltron &
M/s SGS etc

Fabrication & Testing by Vendors @ISAC/ISITE

- Power packages except Distribution
- DC-DC Converters
- Magnetic Torquers
- Thruster Zener packages

M/s Newtech Solutions
M/s Ananth Tech
M/s High Tech magnetics & M/s
Aidin etc

Fabrication & Testing by Vendors @ vendors site

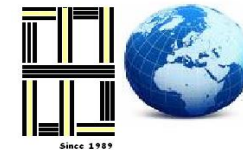
- Power Packages DC-DC Converters
- Telemetry, Telecommand Package

M/s Multitech
M/s Newtech Solutions
M/s Ananth Tech etc

End-to-End Productionisation (Excluding EEE Components)

- Telemetry, Telecommand Package

M/s Data Pattern
M/s Ananth Tech etc



Our Partners

ANANTH TECHNOLOGIES LIMITED
"Forging innovative results through Technologies"

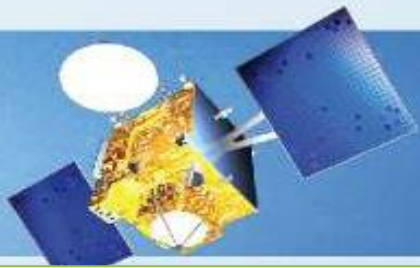


QUALITY. TECHNOLOGY. INNOVATION.



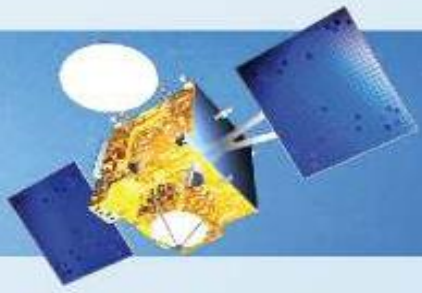
JAI JAWAN SERVICES
Vacuum pumps, Vacuum chambers,
All vacuum related Services and
Maintenance





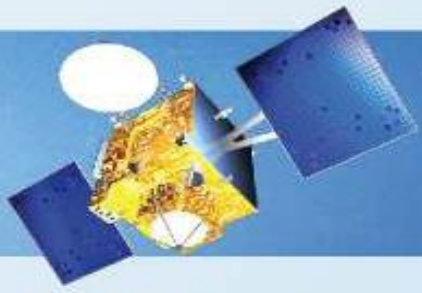
FACILITY PLAN

1. **Assembly Integration Test (AIT) facility plan**
 - **ISAC Clean room extension**
 - **Space Park clean room at ISITE**
 - **Extension of ISITE clean room by 90x35m**
2. **Vibration test facility augmentation**
 - **29 Ton shaker at ISITE**
3. **Solar panel fabrication lab and HDI facility at ISITE**
4. **Mechanical System Area (MSA) Facility**
5. **Additional Hardware-in-loop Simulation (HILS) facility**
6. **Associated test systems, checkout systems & Ground support equipments readiness to be planned.**
7. **Augmentation of CATF for I-6k bus**
8. **Satellite Storage Facility – Planned**
9. **Multi Junction Solar Cell (MJSC) realization along with BHEL**



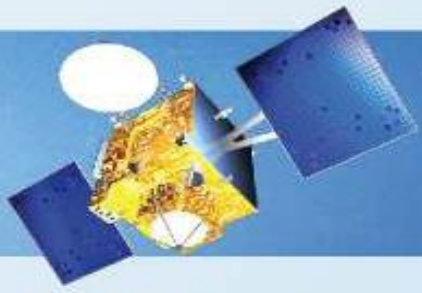
ISRO SATELLITE CENTRE





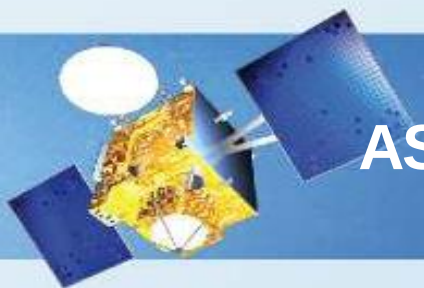
AVIONICS SYSTEMS LAB, ISITE





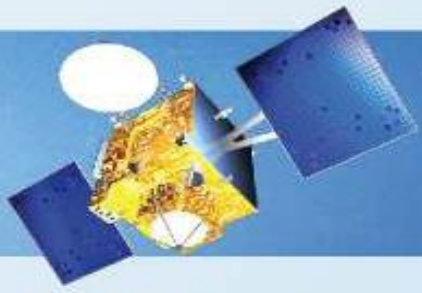
COMPACT ANTENNA TEST FACILITY, ISITE



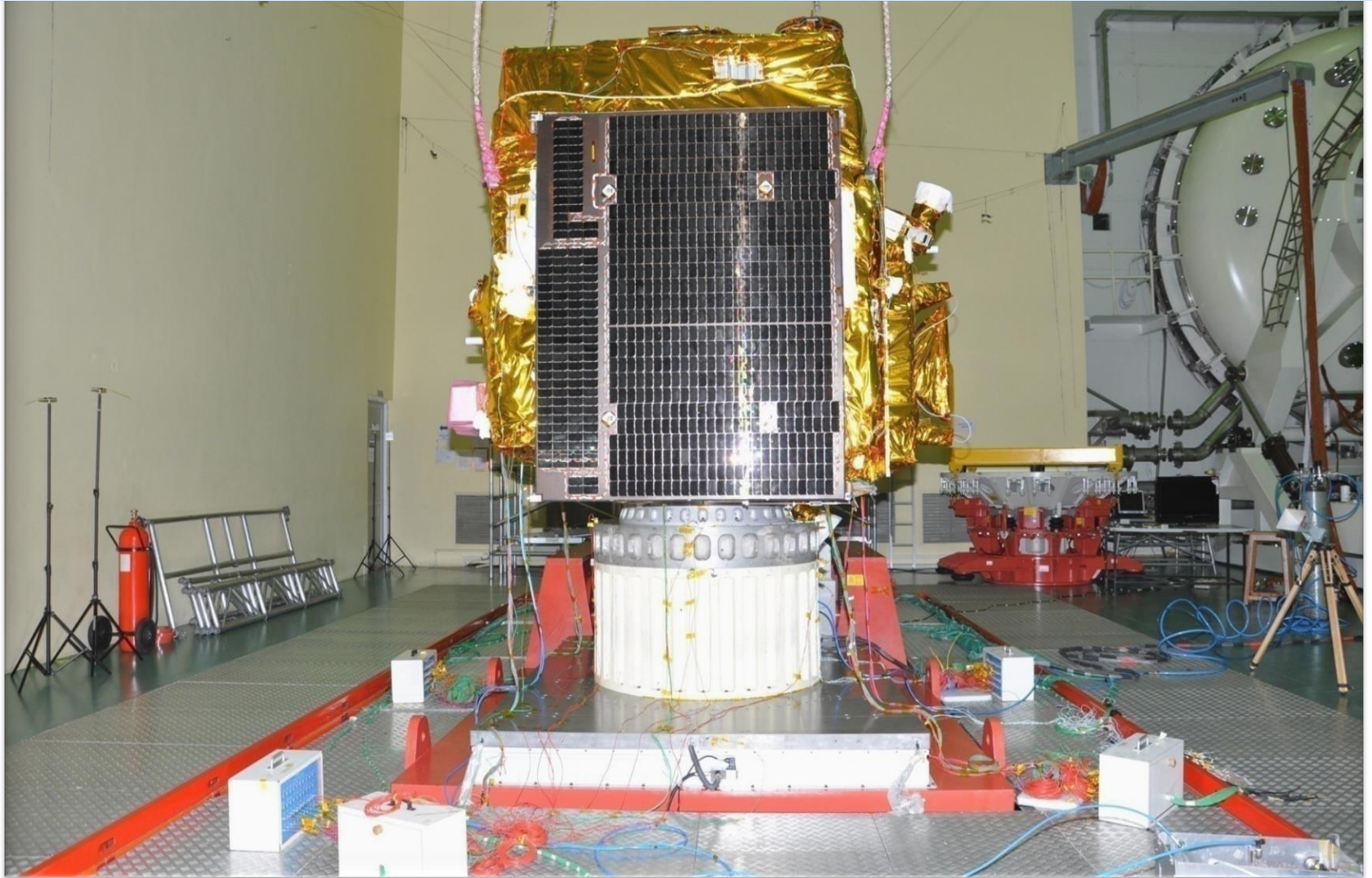
A graphic of a satellite with solar panels and a central body, set against a blue background.

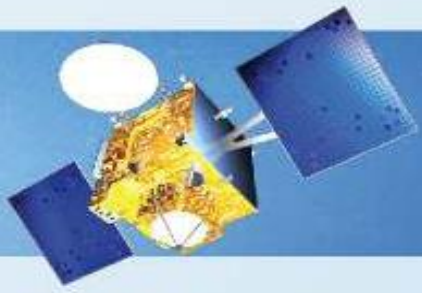
ASSEMBLY INTEGRATION & TEST FACILITY, ISITE



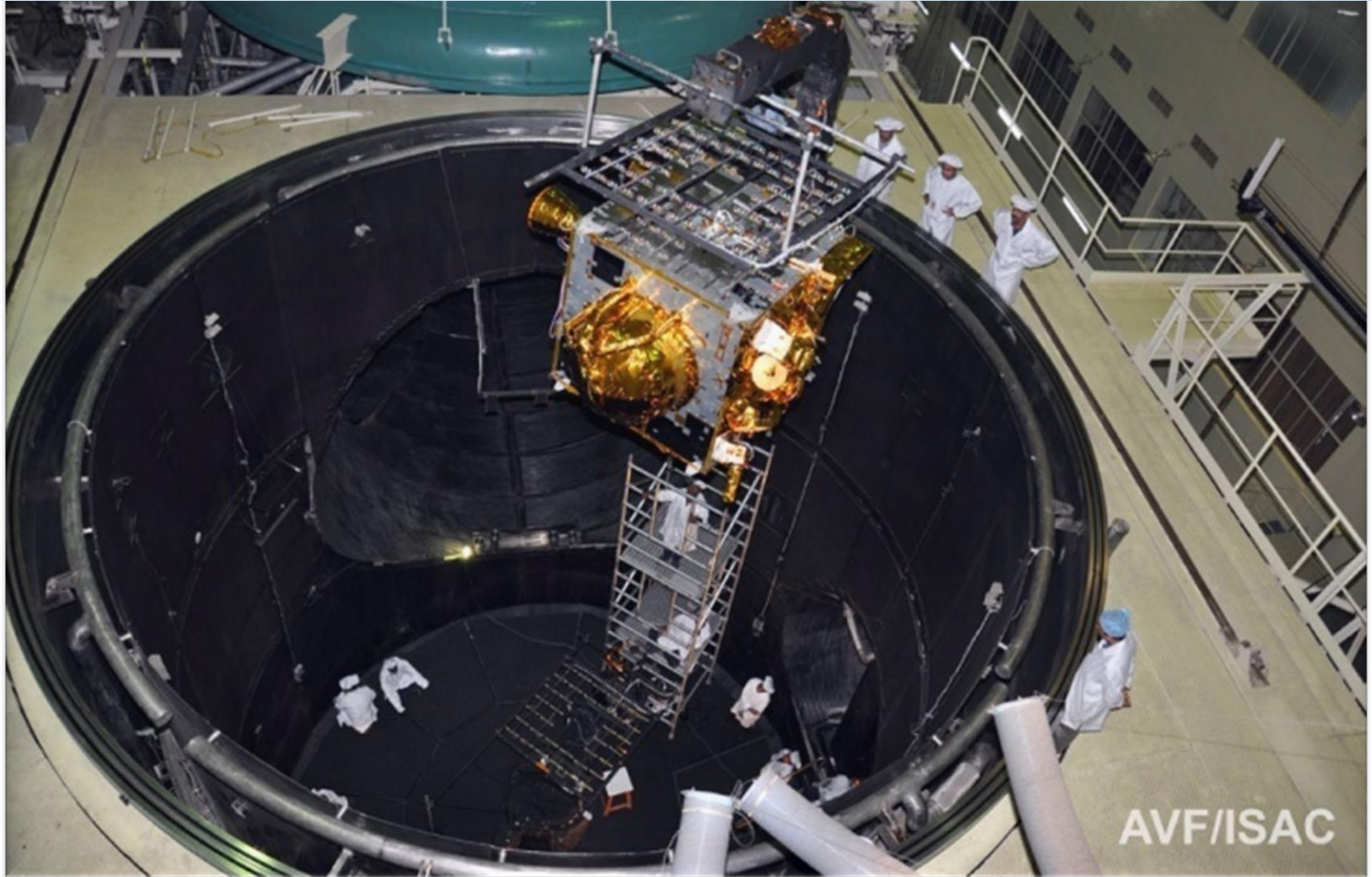


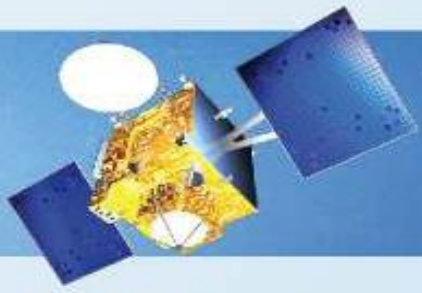
CATVAC VIBRATION TEST FACILITY, ISITE





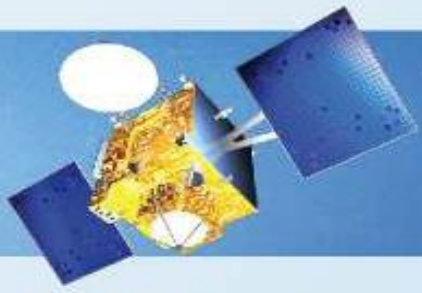
LARGE SPACE SIMULATION CHAMBER, ISAC





AIT CLEAN ROOM, ISITE

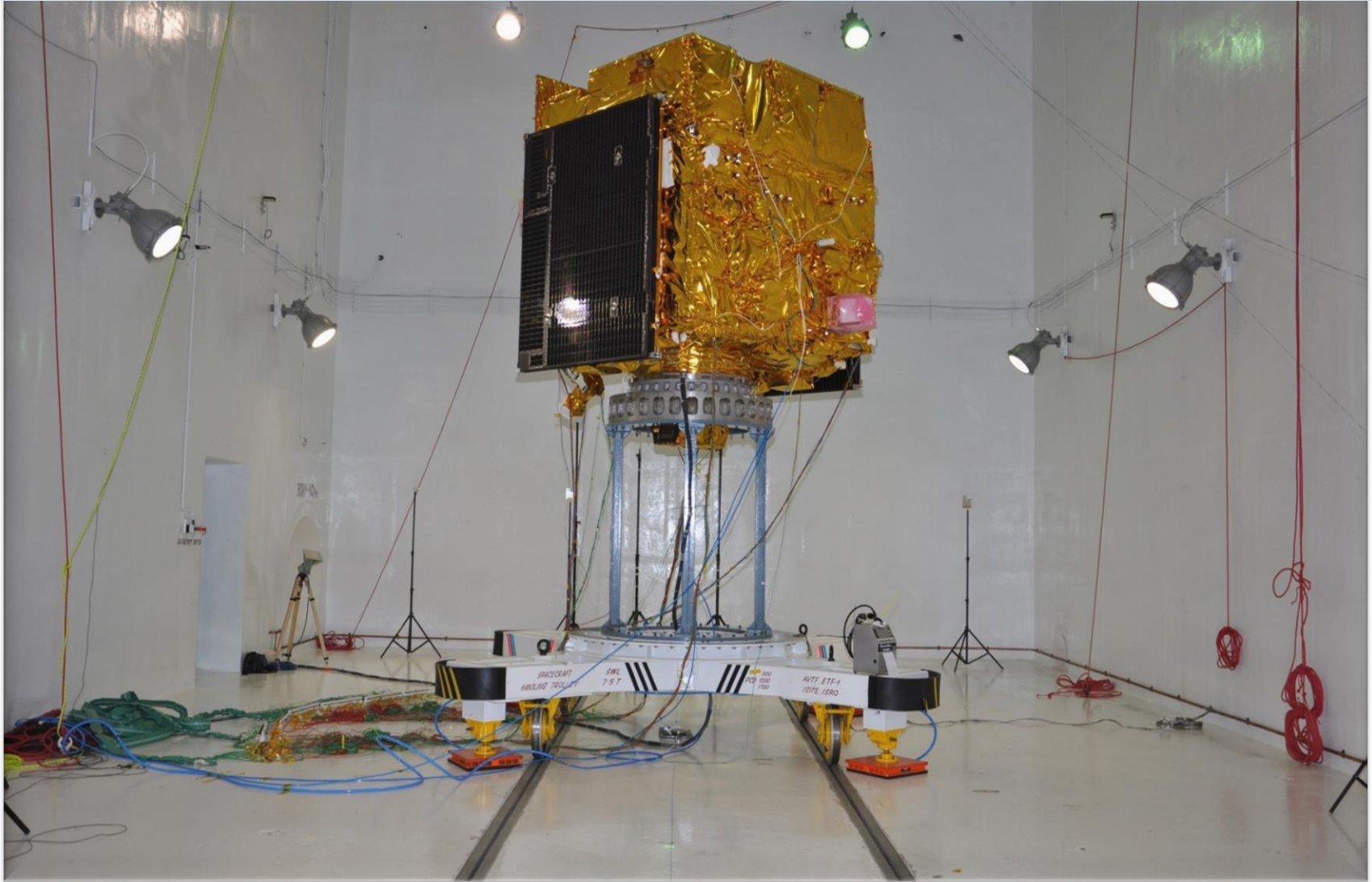


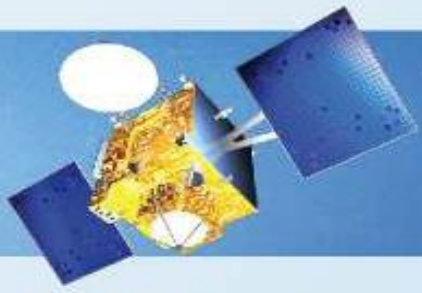


CATVAC FACILITY, ISITE

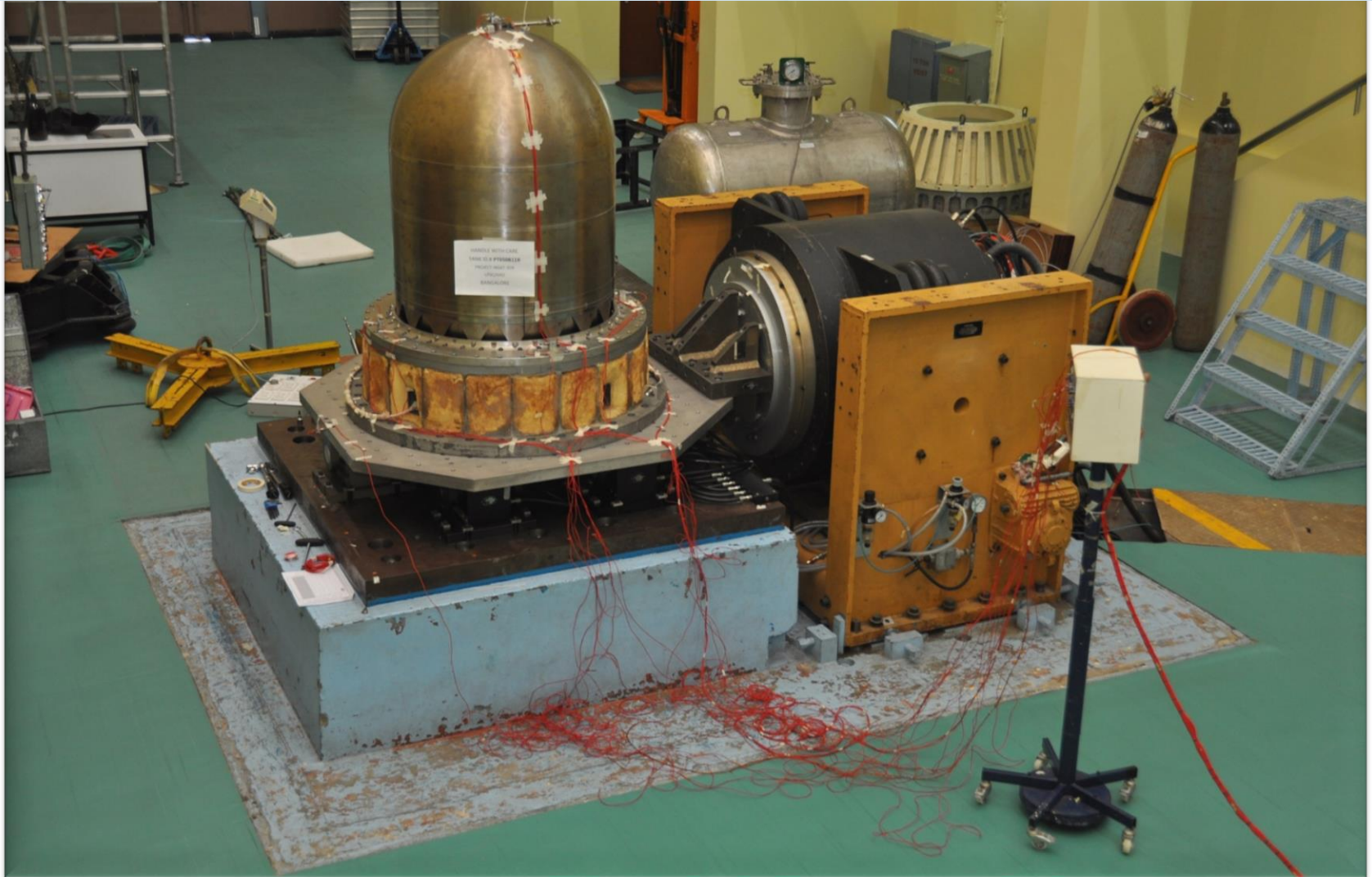


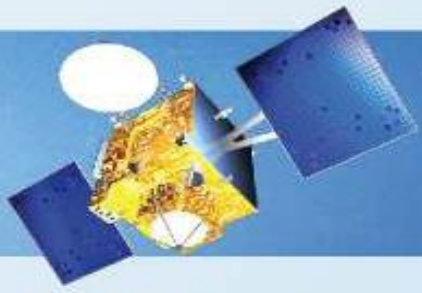
ACOUSTIC TEST FACILITY, ISITE





VIBRATION TEST FACILITY, ISAC





FOUR METRE THERMOVAC CHAMBER, ISAC





THANK YOU