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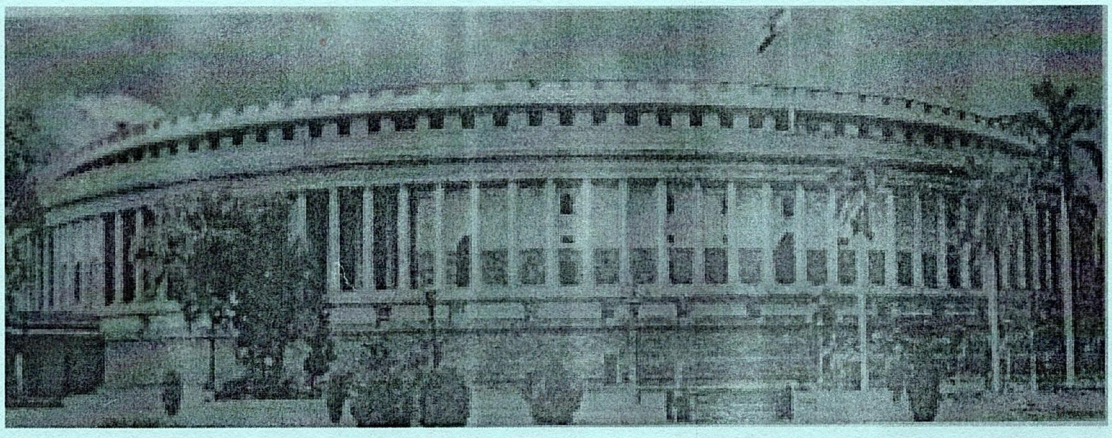
GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

"SPACE IN PARLIAMENT"



MONSOON SESSION OF PARLIAMENT 2018
(JULY – AUGUST 2018)

COMPILATION OF REPLIES GIVEN IN PARLIAMENT DURING 2018

Government of India
Department of Space
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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.2

TO BE ANSWERED ON WEDNESDAY, JULY 18, 2018

LAUNCH OF SATELLITES

2. SHRI VENKATESH BABU T.G.:

Will the PRIME MINISTER be pleased to state:

(a) whether India has successfully launched several satellites in the last one year and also very recently;

(b) if so, the details thereof along with details of success, failure and utility thereof;

(c) whether there is any proposal to launch more such satellites in the coming years and if so, the details thereof;

(d) whether India is moving ahead in the select group of nations who have reached the advanced stage in the launching of satellites, missiles, etc.; and

(e) if so, the details thereof and if not, the reasons therefor?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) Yes, Madam.

Since April, 2017 to till date, several satellites were launched namely:

Communication Satellites (4 Nos), Remote sensing satellites (3 Nos) and Navigational satellites - IRNSS-1H, IRNSS-1I (2 Nos)

(b) During the above period, a total of 9 satellites were launched comprising of 4 communication satellites (GSAT-9, GSAT-19, GSAT-17, GSAT-6A) for providing satellite based services like communication and broadcasting, VSAT services, broadband, etc; 3 remote sensing satellites (Cartosat-2E, Cartosat -2F, MICROSAT) for cartographic & remote sensing applications and two navigational satellites (IRNSS-1H, IRNSS-1I) for providing positional services. Out of these 9 satellites, 7 were successfully launched and providing operational services.

IRNSS-1H, launched by PSLV C-39, could not be placed into orbit. GSAT-6A was launched by GSLV-F08. However, it lost the ground link during final orbit raising phase, due to problem in power system.

(c) The satellites viz Hysis, RISAT-2B, CARTOSAT-3, GSAT-29, GSAT-7A, Chandrayaan-2, GSAT-11, GSAT-31 are planned to be launched in the near future.

(d) & (e)

India is one of the few space faring Nations having capability to design, develop and launch the state-of-the-art satellites in the field of Communication, Navigation, Earth Observation & Space Science Missions, using indigenously built Launch vehicles.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.5

TO BE ANSWERED ON WEDNESDAY, JULY 18, 2018

MONITORING OF NATURAL RESOURCES

5. SHRI KUNWAR PUSHPENDRA SINGH CHANDEL:

Will the PRIME MINISTER be pleased to state:

(a) whether the Government has received any proposal for use of satellite and space science for monitoring of internal security and natural resources;

(b) if so, the details thereof;

(c) whether the Government has also received proposal for the formation of space security team in this regard; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

a) & b)

No proposal has been received by ISRO/DOS for use of satellite for monitoring of internal security. However, satellite data is being used by ISRO/ DOS and various stakeholder Ministries and Departments for mapping and monitoring of natural resources in

the areas of agriculture, land & water resources, bio and oceanic resources. Some of the major national projects include - land use and land cover mapping, agricultural and horticultural inventory, wasteland inventory, watershed development, mapping of surface and ground water resources, snow and glacier inventory, forest cover and biodiversity mapping, command areas development, mapping of mangroves and coral reefs, potential fishing zone forecasting and inland aquaculture.

c) ISRO/DOS has also not received any proposal for the formation of space security team.

d) Does not arise.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.17

TO BE ANSWERED ON WEDNESDAY, JULY 18, 2018

SPACE TECHNOLOGY

17. SHRI A. ARUNMOZHITHEVAN:

Will the PRIME MINISTER be pleased to state:

(a) whether the Indian Space Research Organization (ISRO) is providing space technology to Government departments in 126 areas to help them work on projects effectively and efficiently;

(b) if so, the details thereof;

(c) whether 156 areas were identified where ISRO could provide space technology solutions to fast track projects; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) & (b)

127 projects have been taken up by ISRO, which emerged out of National Meet deliberations organized at New Delhi in September 2015. These projects are being executed in association with various Central Ministries/ Departments in the

areas of Natural Resources Management, Planning, Monitoring & Decision Making and Disaster Risk Reduction. Considerable progress has been achieved in these projects in terms of technique development, development of web/ mobile applications and decision support systems for enabling efficient governance and development.

(c) & (d)

158 project proposals across 58 Central Ministries/Departments were deliberated during the National Meet for enhanced utilisation of Space Technology in Governance and Development. Out of these, 127 proposals, formulated as projects, have made considerable progress. 31 proposals are under different stages of discussions.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.63

TO BE ANSWERED ON WEDNESDAY, JULY 18, 2018

LAUNCH OF SATELLITES

63. SHRI NALIN KUMAR KATEEL:
SHRI D.K. SURESH:

Will the PRIME MINISTER be pleased to state:

(a) the details of total number of satellites launched in the country till date;

(b) whether the Government has set any target to improve the living standards of the people by launching the satellites particularly for agriculture, education, fishing, healthcare, etc.;

(c) if so, the details thereof;

(d) whether all the targeted objectives have been achieved successfully till now;

(e) if so, the details thereof, if not, the reasons therefore; and

(f) whether the Government is taking any effective measures to ensure still better performance of the satellite programs in the country and if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) As on date, 89 Indian satellites have been successfully launched by Indian Space Research Organisation. In addition, ISRO has also launched 9 Student Satellites and 237 customer satellites from 28 foreign countries.

(b) & (c)

The satellite enabled data and services are being used to improve the living standards of people. These include Television broadcasting, Direct-to-Home, ATM, Mobile communication, tele-education, tele-medicine and advisories on weather, pest infestation, agro-meteorology and potential fishing zones. Satellite data is also used for crop production estimation, crop intensification, agricultural drought assessment, wasteland inventory, identifying ground water prospect zones, inland aquaculture suitability and disaster risk reduction. ISRO has plans to launch more number of state-of-the-art satellites to further enhance operational applications and cater the needs of emerging applications.

(d) & (e)

Many of the applications have been effectively adopted by stakeholder departments for operational use. A few of such applications include: Potential Fishing Zone Forecast & Ocean State Forecast (by Indian National Centre for Ocean Information Services, MoES), Crop Acreage and Production Forecasting & National Agricultural Drought Assessment and Monitoring System (by Mahalanobis National Crop Forecast Centre, MoA&FW), Biennial Forest Cover Assessment (by Forest Survey of India, MoEF&CC), Irrigation Infrastructure Assessment (by

Central Water Commission, MoWR, RD&GR), Weather forecasting (by India Meteorological Department, MoES), Ground Water Prospect and Suitable Recharge Locations' mapping (MoDW&S), Integrated Watershed Management Programme & MGNREGA (by MoRD).

(f) In order to ensure better performance of the satellite programmes, a National Meet was organised in September, 2015, with the participation of all the Central Government Ministries/Departments, for enhanced utilisation of space technology in Governance and Development. Further, to promote utilisation of space technology in State Government departments, State level workshops have also been conducted in 17 States. Other measures include (i) conduct of user interaction meets and utilization programmes; (ii) capacity building for space applications; (iii) creation of an outreach facility; (iv) development of geospatial tools and information systems; (v) Proof of Concept demonstration; and (vi) Institutionalisation of space applications.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.70

TO BE ANSWERED ON WEDNESDAY, JULY 18, 2018

CHANDRAYAAN-II MISSION

70. SHRIMATI POONAM MAHAJAN:

Will the PRIME MINISTER be pleased to state:

(a) whether the Indian Space Research Organisation, through Chandrayaan-II Mission, will deploy a rover on the lunar surface of the moon to mine and extract Helium-3 deposits;

(b) if so, the details thereof including the amount of funds earmarked for the Mission;

(c) whether the Government recognises the potential of using Helium-3 fuel mined from the Moon in the nuclear fusion reactor for the purpose of power generation; and

(d) if so, the details regarding the technological feasibility of the Helium-3 fusion?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) & (b) Indian Space Research Organisation (ISRO) is planning to deploy a rover on the lunar surface through Chandrayaan-2

mission. The instruments on Rover will conduct in-situ analysis of elements such as Na, Mg, Al, Si, etc; in the vicinity of landing site. Mining and extracting Helium-3 deposits is not planned. Total approved cost of the Chandrayaan-2 Mission is Rs.603.00 crores.

(c) This is outside the scope of current Moon mission.

(d) Not Applicable.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.71

TO BE ANSWERED ON WEDNESDAY, JULY 18, 2018

NavIC RECEIVERS

71. SHRI G. HARI: Will the PRIME MINISTER be pleased to state:

(a) whether ISRO currently has 42 satellites of different types in space and if so, the details thereof;

(b) whether ISRO is trying to synergize the data obtained from communication, navigation and remote sensing satellites, so that it can be used in innovative ways for the social good and if so, the details thereof;

(c) whether ISRO is considering to provide NavIC receivers to fishermen so that they can access ISRO's navigation system for boat navigation and locating fishing areas on high seas and if so, the details thereof;

(d) whether ISRO has asked industry to mass produce NavIC receivers for desi GPS; and

(e) if so, the details thereof and the response thereon?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) Yes, Madam. ISRO has a total of 42 satellites currently operational in orbit. These satellites include fifteen Communication satellites (INSAT-4A, 4B & 4CR and GSAT-6, 7, 8, 9, 10, 12, 14, 15, 16, 17, 18 & 19); eight Navigation satellites (IRNSS-1A, 1B, 1C, 1D, 1E, 1F, 1G & 1I); fifteen Remote Sensing satellites (Cartosat-1, 2, 2A, 2B, 2C, 2D, 2E& 2F; RISAT-2; Oceansat-2; Resourcesat-2 & 2A; SCATSAT-1; SARAL & Megha-Tropiques); two meteorological satellites (INSAT-3D & 3DR); and two Space Science satellites (Mars Orbiter Mission & Astrosat).

(b) Yes, Madam. A variety of applications are synergistically utilising the data from communication, navigation and remote sensing satellites. These include (1) crop damage assessment, planning crop-cutting experiments & crop yield estimation for Crop Insurance programme and crop production forecasting; (2) monitoring watershed development activities under Integrated Watershed Management Programme (IWMP); (3) crowd sourcing during natural disasters for damage assessment; (4) monitoring of mining activity with respect to the lease boundary; (5) national monuments' regulatory zones and online construction approval mechanism; (6) automated warnings at unmanned railway crossings; and (7) potential fishing zones & weather alert messages to fishermen at sea.

(c) **Yes, Madam. ISRO has developed and is providing NavIC receivers to fishermen, which can be utilised to find out their location on high seas. These receivers can also be utilised for navigating their boats and disseminating messages about potential fishing zones and alerts for high wave, cyclone and tsunamis.**

(d) **Yes, Madam.**

(e) **Industries are actively involved in fabricating NavIC receivers addressing the requirements of various applications. Six industry partners have taken up the technology to produce NavIC receivers for the same.**

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.1333

TO BE ANSWERED ON WEDNESDAY, JULY 25, 2018

MOU FOR MINERAL EXPLORATION

1333. SHRI SUNIL KUMAR MONDAL:

Will the PRIME MINISTER be pleased to state:

(a) whether the Indian Space Research Organisation (ISRO) has signed any Memorandum of Understanding with any department/organisation for using satellite data for mineral exploration in the country during the last three years and the current year; and

(b) if so, the details thereof and the further action taken by the Government in this regard, State/UT-wise?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) Yes, Madam.

(b) Indian Space Research Organisation (ISRO) has signed Memorandum of Understanding (MoU) with the following Departments/Organisations for using satellite data for mineral exploration in the country during the last three years and the current year:

(i) With National Mineral Development Corporation (NMDC), Ministry of Steel, in February 2017, towards using Satellite data, for identifying potential areas for exploration of Iron and Diamond, in Madhya Pradesh. ISRO has also trained NMDC officials and established a remote sensing lab at NMDC, Hyderabad, for internalising remote sensing technology within NMDC.

(ii) With Manganese Ore India Limited (MOIL), Ministry of Steel, in September 2017, for mineral exploration studies to identify prospective areas of Manganese mineralisation in parts of Madhya Pradesh, using satellite data.

(iii) Jointly with Department of Fertilizers (Ministry of Chemicals and Fertilizers), Geological Survey of India (GSI) and Atomic Minerals Directorate (AMD), in August 2017, for rock phosphate exploration in the Country.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.1362

TO BE ANSWERED ON WEDNESDAY, JULY 25, 2018

CREW ESCAPE SYSTEM

1362. SHRI GAJANAN KIRTIKAR:
SHRI BIDYUT BARAN MAHATO:
KUNWAR HARIBANSH SINGH:
SHRI SUDHEER GUPTA:
SHRI S.R. VIJAYAKUMAR:
SHRI S. RAJENDRAN:
SHRI T. RADHAKRISHNAN:

Will the PRIME MINISTER be pleased to state:

(a) the name of Indian Space Research Organization's (ISRO) clients along with the revenue generated during each of the last three years;

(b) the total amount allocated, disbursed and spent by ISRO for its projects during the said period;

(c) the steps taken/being taken by the Government to make ISRO a profitable organization;

(d) whether the ISRO has carried out a series of tests to qualify a Crew Escape System recently; and

(e) if so, the details and the outcome thereof along with the aims/objectives thereto and expenditure incurred thereon?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) **The clients using ISRO's commercial products and services include strategic customers, Government of India/PSUs, private users and international customers. The Client list is enclosed as Annexure-1. The revenue generated during the last three years is as follows:**

2015-2016 :INR 1794.93Crores

2016-2017 :INR 1872.93Crores

2017-2018 :INR 1932.27Crores

(b) **The total amount allocated, disbursed and spent by ISRO for its projects/ programmes in the areas of Space Transportation Systems, Earth Observation, Satellite Communication & Navigation, Space Science and Planetary Exploration during last three years i.e. 2015-16, 2016-17 & 2017-18 are given below:**

(Rupees in Crore)

Financial Year	Amount Allocated (BE)	Amount Disbursed (RE)	Spent
2015-16	2477.79	2183.95	2207.67
2016-17	2208.10	2557.32	2613.27
2017-18	1762.96	2253.52	2388.24

(c) (i) Antrix Corporation Limited (ANTRIX), the commercial arm of Indian Space research Organisation, is marketing the Satellite Capacity on the Indian Communication Satellites bringing revenue to the Department of Space.

(ii) ANTRIX is marketing products and services from Indian Remote Sensing (IRS) program and also offers TTC services to international customers.

(iii) Launch Services is also an important business earning valuable Foreign Exchange. We have launched 237 satellites from 29 countries till date.

(iv) ANTRIX takes part in the major International and National Exhibition and portrays the products and services emanating from Indian Space Programme. It includes building and launching of satellites for customers, establishment of Ground Segment, provisioning of wide variety of data from Indian Remote Sensing Satellites, capacity building and consultancy application projects.

(d) Yes Madam, ISRO has carried out Pad Abort Test successfully to qualify Crew Escape System required for Human Spaceflight, on 5th July 2018 from Satish Dhawan Space Centre, Sriharikota.

(e) As part of the activities for development of critical technologies for future Human Spaceflight, Pad Abort Test was carried out to demonstrate the Crew Escape System during any exigency at launch pad. The Crew Escape System is configured using

specially designed quick acting solid motors that deliver a relatively large thrust to take the crew module to a safe distance. Experimental data from this mission will serve as a useful input to undertake human spaceflight programme. An amount of Rs.173.00 crores is approved for development of critical technologies including Crew Escape System

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ANNEXURE REFERRED TO IN REPLY TO PART (a) OF THE LOK SABHA UNSTARRED QUESTION NO. 1362 FOR ANSWER ON 25.07.2018

Annexure-1

Clients of ISRO/ Antrix Corp. Ltd.

Sl. No	Name of Customers/ Users
1	Airport Authority of India
2	All India Radio, Prasar Bharti
3	Bharat Sanchar Nigam Limited (BSNL)
4	Bhaskaracharya Institute of Space Applications and Geo - Informatics (BISAG)
5	Directorate of Police Wireless, POLNET
6	Doordarshan, Prasar Bharti
7	Directorate General (Radio & Television) Afghanistan through Ministry of External Affairs (MEA)
8	Dte of Police & Director of Police Wireless, Pune
9	Electronics Corporation of India (ECIL)
10	ERNET India
11	GyanDarshan, IGNOU
12	Indian National Centre for Ocean Information Services (INCOIS)
13	Indian Institute of Astrophysics
14	Indian Railways Project Management Unit (IRPMU)
15	Integrated Test Range, Chandipur
16	Karnataka Power Transmission Corporation Limited
17	Ministry of Human Resource Development
18	National Center of Seismology (NCS), MoES
19	National Informatics Centre (NIC)
20	National Remote Sensing Centre
21	ONGC Limited

Sl. No	Name of Customers/ Users
22	A M Television Pvt. Ltd.
23	ABP News Network Pvt. Ltd.
24	Asianet News Network Pvt. Ltd.
25	Associated Broadcasting Co. Ltd. (TV9)
26	Bennett Coleman & Co. Ltd.
27	Bharti Airtel Limited
28	Bharti Telemedia Ltd.
29	Bhutan Broadcasting Corp. Ltd.
30	Brahmaputra Tele-productions
31	Broadcast Equipment India Pvt. Ltd.
32	Business Broadcast News Pvt. Ltd.
33	Calcutta TV Network Ltd.
34	Dish TV India Limited
35	Eastern Media Limited
36	Eenadu Television Pvt. Ltd.
37	HCL Comnet Systems & Services
38	Hughes Communications India Ltd.
39	Independent News Service Pvt. Ltd
40	Independent TV Limited (Reliance Big TV)
41	Indiasign Private Limited
42	Indira Television Limited
43	Information TV Private Limited
44	Infotel Satcom Pvt. Ltd.
45	Kalaignar TV Pvt. Ltd.
46	Kalinga Media & Entertainment Pvt. Ltd.
47	Kasthuri Medias Private Ltd.
48	Lamhas Satellite Services Limited
49	Malayalam Communications Limited

Sl. No	Name of Customers/ Users
50	Metronation Chennai TV Pvt. Ltd.
51	MH One TV Network Limited
52	MM TV Pvt. Ltd.
53	New Delhi Television Ltd. (NDTV)
54	News Nation Network Pvt. Ltd.
55	Ortel Communication Limited
56	Planetcast Media Services Limited
57	Pride East Entertainments Ltd.
58	Rachana Television Pvt. Ltd
59	Reliance JioInfocomm Ltd.
60	S.B. Multimedia Limited
61	Shreya Broadcasting Pvt. Ltd.
62	Skyline Telemedia Services Pvt. Ltd.
63	Sri Venkateswara Bhakti Channel
64	Sun Direct TV Pvt. Ltd.
65	Sun TV Network Limited
66	Surya Processing Food Pvt. Ltd.
67	Sri Venkateswara Bhakti Channel Pvt. Ltd.
68	Tata Sky Limited
69	Tatanet Services Limited
70	TV 18 Broadcast Limited
71	TV Today Network Limited
72	Writemen Media Pvt. Ltd.
73	Zee Media Corporation Limited
74	India Meteorological Department, New Delhi
75	Intelsat, USA
76	KSAT, Norway
77	CNES, France

Sl. No	Name of Customers/ Users
78	Centum Electronics Private Limited, Bangalore
79	Data Patterns Private Limited, Bangalore
80	DRDL, Hyderabad
81	PES University, Bangalore
82	GAF AG, Germany
83	CRIES, Algeria
84	University of Dundee, UK

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.2366

TO BE ANSWERED ON WEDNESDAY, AUGUST 01, 2018

NAVIGATION SATELLITES

2366. SHRI G. HARI:

Will the PRIME MINISTER be pleased to state:

(a) whether ISRO is considering to launch navigation satellite IRNSS1I which will replace the faulty IRNSS1A whose three atomic clocks had stopped working in 2016 and if so, the details thereof;

(b) whether the subsequent launches would be of Chandrayaan-2 mission, GSLV Mk III and PSLV C42; and

(c) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) IRNSS-1I spacecraft was successfully launched aboard PSLV-C41 on 12th April 2018. The spacecraft was the replacement for IRNSS-1A and is providing intended navigation services. However, IRNSS-1A continues to provide messaging services like disaster alerts and other societal applications.

(b) & (c)

Yes Madam. The subsequent launches include GSLV-MK III that is planned to launch GSAT-29, PSLV-C42 launch and Chandrayaan-2 Mission.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.2416

TO BE ANSWERED ON WEDNESDAY, AUGUST 01, 2018

ELECTRIC PROPULSION SYSTEM

2416. SHRI A. ARUNMOZHITHEVAN:

Will the PRIME MINISTER be pleased to state:

(a) whether ISRO is working on the Electric Propulsion System (EPS) which will help reduce dependence on chemical propellant and if so, the details thereof;

(b) whether with the help of EPS, ISRO can reduce the weight of a satellite and if so, the details thereof;

(c) whether a 4 tonne satellite with EPS can do the work of a 6 tonne satellite with the same efficiency; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) Yes Madam, ISRO is working on Electric Propulsion System (EPS) which can reduce the dependence on chemical propellant. The EPS system was first flown on South Asia Satellite (SAS) – GSAT-9 launched in the year 2017 and is working satisfactory.

(b) Yes Madam, with the help of EPS, satellite weight can be reduced as the chemical propellants are replaced by electrical system, the weight of which is not so significant compared to chemical propellant.

(c) & (d)

Yes Madam. A 4 tonne satellite with EPS can do the work of 6 tonne satellite with the same efficiency. In addition, it will also have few extra years of life compared to chemical propulsion.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.3458

TO BE ANSWERED ON WEDNESDAY, AUGUST 08, 2018

START-UPS IN SPACE SECTOR

3458. SHRIMATI POONAM MAHAJAN:

Will the PRIME MINISTER be pleased to state:

(a) the number of start-ups involved in space sector that have been registered in the country during each of the last ten years, year-wise;

(b) the efforts made by the Government towards creating a vision/roadmap in developing foundation for start-ups involved in space sector in the country;

(c) whether the Government has received proposals for Foreign Direct Investment in the space sector during each of the last five years; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) ISRO has a Technology Transfer system functioning since 1975, where many a technologies related to space is transferred to Indian industries for commercial applications.

Several companies including start-ups have utilised and got benefitted from this technology transfer programme. ISRO has transferred nearly 340 technologies so far.

(b) Department of Space/ ISRO has mooted a Capacity Building Programme with one of the core area as setting up Technology Incubation centres on Space Technology. These will connect ISRO with the academia and local industries in each region.

(c) & (d)

Yes Madam. Government has received proposals for Foreign Direct Investment in the space sector. The details are as follows:

Sl. No.	Name	Year
1	ANIARA Communications India Pvt. Ltd.	June 2016
2	Jupiter Satellite India Ltd.	June 2016
3	SES – World Skies Singapore Pte Ltd.	August 2016

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.3502

TO BE ANSWERED ON WEDNESDAY, AUGUST 08, 2018

WEATHER SATELLITES

3502. SHRI RAJESH KUMAR DIWAKAR:

Will the PRIME MINISTER be pleased to state:

(a) the details of satellites launched by ISRO specifically to predict accurate weather forecast, rainfall, cyclones etc. with a view to helping common man, farmers and fishermen;

(b) whether the Government proposes to launch more satellites in the country to provide all useful information for common people, agriculturists, fishermen and rural industries; and

(c) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) At present, India has four satellites operational in the orbit namely, INSAT-3D, INSAT-3DR, Megha-tropiques and Scatsat-1 providing data on various weather parameters viz. clouds, outgoing long-wave radiation, atmospheric motion vector, vertical profiles of temperature & humidity, sea surface temperature, ocean surface winds, radiation budget etc. The meteorological

data obtained from INSAT-3D & 3DR every 15 minutes and humidity profile data of SAPHIR on-board Megha-tropiques is being operationally assimilated in the numerical weather models by India Meteorological Department (IMD) for improving weather forecast. The Ocean surface wind vector data from SCATSAT-1 is also being used operationally for prediction of cyclone track, its intensity & landfall with improved accuracy. The fishing sector is being supported through advisories on Potential Fishing Zones and the ocean state forecast generated by Indian National Centre for Ocean Information Services (INCOIS).

(b) Yes, Madam.

(c) ISRO proposes to launch 17satellites for earth observation, including weather satellites during next three years. The data from these satellites will be used to ensure data continuity for operational applications and enhance satellite-enabled services, which include (i) advisories on weather, pest infestation, agro-meteorology to support farming operations; (ii) advisories on potential fishing zones for fishermen; (iii) rural development applications viz. crop intensification, wasteland inventory, identifying ground water prospect zones, inland aquaculture suitability.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.3522

TO BE ANSWERED ON WEDNESDAY, AUGUST 08, 2018

LITHIUM-ION BATTERIES

3522. SHRI K. ASHOK KUMAR:

Will the PRIME MINISTER be pleased to state:

(a) whether ISRO is offering production technology for producing lithium-ion batteries to Indian industry;

(b) if so, the details thereof;

(c) whether ISRO has also invited industries to take up other new technologies from its centre; and

(d) if so, the details thereof and the response received by it from the industry?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) Yes, ISRO is offering the technology for Li-Ion cell manufacture to Indian industries. A Request For Qualification (RFQ) document for selecting the industries is already prepared in consultation with NITI Aayog and is released through ISRO website.

(b) ISRO/DOS has taken initiatives for transfer of technology for Li-Ion cell manufacture to Indian industries through a Request For Qualification (RFQ). The proceedings are based on guidelines from NITI Aayog. There has been overwhelming response to this and nearly 140 industries (big/medium/small/start-ups) have responded for this Technology Transfer and have purchased the RFQ document. Currently ISRO is awaiting the submission of RFQ by these companies, the due date for which is 13th August 2018. Subsequently, review of RFQs and short listing of industries that are eligible for this Technology Transfer shall be done through a two stage process involving ISRO team along with members from NITI Aayog, Ministry of Law and Justice (MOLJ) and Department of Industrial Policy and Promotion (DIPP).

(c) ISRO has been inviting industries to transfer various technologies developed by them for the Space Programme. This process started as early as 1975 and is continuing till now.

(d) ISRO has carried out nearly 345 technology transfers so far to various Indian industries on a wide range of areas. This is a continuing activity.

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O.I.H.

GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.3536

TO BE ANSWERED ON WEDNESDAY, AUGUST 08, 2018

ARMS IN SPACE

3536. SHRI SADASHIV LOKHANDE:

Will the PRIME MINISTER be pleased to state:

(a) whether the Government is concerned about the use of arms in space;

(b) if so, the measures being taken by the Government to avoid such situation;

(c) whether the Government has discussed/proposes to discuss the said matter with other countries; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) to (d)

Yes Madam. The Government is against the weaponisation of Outer Space and supports international efforts to reinforce the safety and security of space based assets.

India is party to all the major international treaties relating to Outer Space and Government believes that this international legal framework needs to be strengthened to enhance the security of space assets for all users and to prevent the weaponisation of Outer Space. To this end, Government is actively engaged in international forums such as Conference on Disarmament (CD), United Nations Committee on Peaceful Uses of Outer Space (UNCOPUOS) and the UN General Assembly. India has contributed in particular to the discussions in the Working Group on Long Term Sustainability of Outer Space activities for peaceful purposes in the Legal Sub-committee of UNCOPUOS and the discussions on the Prevention of Arms Race in Outer Space (PAROS) in Conference on Disarmament. India has also participated actively in discussions led by the European Union on a draft International Code of Conduct for Outer space activities since 2012.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.3544

TO BE ANSWERED ON WEDNESDAY, AUGUST 08, 2018

TRAINING TO SPACE SCIENTISTS

3544. DR. K. GOPAL:

Will the PRIME MINISTER be pleased to state:

(a) whether India has decided to train space scientists of countries that lack satellite building capacity;

(b) if so, the details thereof;

(c) whether India would not charge for this capacity building programme but will play a role in short listing scientists for the training programme; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

(a) Yes Madam.

(b) Indian Space Research Organisation (ISRO) of Department of Space (DOS), Government of India has offered to conduct capacity building programme on small satellite development for the participants from developing countries who are interested in developing their space programme. An announcement in this

regard was made at Vienna on June 18, 2018 during the Symposium to commemorate the 50th Anniversary of the First United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE+50). The programme, named as 'India-UN Small Satellites Programme (INDOUNSSP)', will be conducted at ISRO's U.R. Rao Satellite Centre (URSC) at Bengaluru every year for next 3 years, starting from November 2018. This 8-week programme will comprise of theoretical coursework and hands-on-training on Assembly, Integration and Testing (AIT) of small satellite.

(c) Yes Madam.

(d) ISRO will bear travel, accommodation and living expenses for the selected candidates to attend the course as per the prevailing norms. The candidates will be shortlisted by a screening committee involving officials from ISRO and Ministry of External Affairs (MEA).

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO.3625

TO BE ANSWERED ON WEDNESDAY, AUGUST 08, 2018

ALLOCATION OF FUNDS FOR SPACE TECHNOLOGY

3625. SHRI VINOD LAKHAMASHI CHAVDA:

Will the PRIME MINISTER be pleased to state the funds allocated for the development of space technology during the last three years and the current year?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE

(DR. JITENDRA SINGH):

The funds allocated to DOS/ISRO under the head "Space Technology" during the last three years and the current year are as given below:

Financial year	Allocation (RE) (₹ in crores)
2015-16	4150.83
2016-17	4586.05
2017-18	5984.42
2018-19 (current year BE)	6576.02

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 294

TO BE ANSWERED ON THURSDAY, JULY 19, 2018

LAUNCHING OF REPLACEMENT NAVIGATION SATELLITE

294. SHRIMATI VIJILA SATHYANANTH:

Will the PRIME MINISTER be pleased to state:

(a) whether it is a fact that Indian Space Research Organisation would soon launch a replacement navigation satellite fitted with corrected atomic clocks to make up for the crippled satellite IRNSS-1A;

(b) whether it is also a fact that the move became imperative after all three rubidium atomic clocks on IRNSS-1A failed in mid 2016;

(c) whether the clock for ISROs NavIC and the European Space Agency's first 18 Galileo satellites came from the same Swiss company and had developed similar problems around the same time; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) Indian Space Research Organisation has launched IRNSS-1I on 12th April, 2018 to replace IRNSS-1A. IRNSS- 1I carried refurbished Atomic clocks.

(b) IRNSS 1A had failure of three Rubidium atomic clocks and IRNSS constellation is functioning with only six satellites. The move to launch the replacement satellite for IRNSS 1A was imperative to complete the seven satellite NavIC constellation. However, IRNSS-1A is still being used for messaging services.

(c) Yes, Sir, the Rubidium clocks were from the same Swiss company. The clocks of NavIC and GALILEO developed problems that were similar in nature.

(d) A thorough analysis and simulation on the failure of the atomic clocks was done. Finally, it was traced to one of the feed through capacitor carrying the DC supply to the physics package, getting in to problem due to excess temperature rise. This was corrected in the IRNSS-1I clocks.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 1091

TO BE ANSWERED ON THURSDAY, JULY 26, 2018

LAUNCHING OF ROCKETS AND SATELLITES

1091. SHRI C.M. RAMESH:

Will the PRIME MINISTER be pleased to state:

(a) the details of rockets and satellites launched by ISRO during the last five years; and

(b) the details of specific roles assigned to these rockets and satellites launched and whether ISRO and the country have been benefited from it?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) & (b)

During last five years, ISRO has launched 26 launch vehicle missions, 28 Indian satellites, 7 Technology Demonstrators (4 satellites + 3 launch vehicle related), 05 student satellites from Indian Universities/Institutions and 202 foreign satellites. The details of these satellites, the launch vehicles (rockets) in which they were launched and the purpose they serve are given in **Annexure**.

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ANNEXURE REFERRED TO IN REPLY OF THE RAJYA SABHA UNSTARRED QUESTION NO. 1091 FOR ANSWER ON 25.07.2018

Launch Date	Launch Vehicle	Satellite Name	Purpose
01-07-2013	PSLV-C22	IRNSS-1A	Navigational & positional services
26-07-2013	Procured Launch	INSAT-3D	Weather forecasting
30-08-2013	Procured Launch	GSAT-7	Satellite based communication
05-11-2013	PSLV-C25	Mars Orbiter Mission	Space science research and planetary exploration
05-01-2014	GSLV-D5	GSAT-14	Satellite based communication
04-04-2014	PSLV-C24	IRNSS-1B	Navigational & positional services
30-06-2014	PSLV-C23	SPOT-7	Foreign customer satellite
30-06-2014	PSLV-C23	AISAT	Foreign customer satellite
30-06-2014	PSLV-C23	NLS-7.1(CAN-X4)	Foreign customer satellite
30-06-2014	PSLV-C23	NLS-7.2(CAN-X5)	Foreign customer satellite
30-06-2014	PSLV-C23	VELOX-1	Foreign customer satellite
16-10-2014	PSLV-C26	IRNSS-1C	Navigational & positional services
07-12-2014	Procured Launch	GSAT-16	Satellite based communication
18-12-2014	GSLV MK III-X	CARE	Technology demonstrator
28-03-2015	PSLV-C27	IRNSS-1D	Navigational & positional services
10-07-2015	PSLV-C28	DMC3 (3 Nos)	Foreign customer satellite
10-07-2015	PSLV-28	CBNT-1	Foreign customer satellite
10-07-2015	PSLV-28	De-OrnitSail	Foreign customer satellite
27-08-2015	GSLV-D6	GSAT-6	Satellite based communication
28-09-2015	PSLV-C30	ASTROSAT	Space science research and planetary exploration
28-09-2015	PSLV-C30	LAPAN-A2	Foreign customer satellite

Launch Date	Launch Vehicle	Satellite Name	Purpose
28-09-2015	PSLV-C30	NLS-14	Foreign customer satellite
28-09-2015	PSLV-C30	LEMUR(4No)	Foreign customer satellite
11-11-2015	Procured Launch	GSAT-15	Satellite based communication
16-12-2015	PSLV-C29	TeLEOS-1	Foreign customer satellite
16-12-2015	PSLV-C29	Kent Ridge-1	Foreign customer satellite
16-12-2015	PSLV-C29	VELOX-C1	Foreign customer satellite
16-12-2015	PSLV-C29	VELOX-II	Foreign customer satellite
16-12-2015	PSLV-C29	Galassia	Foreign customer satellite
16-12-2015	PSLV-C29	Athenoxat-1	Foreign customer satellite
20-01-2016	PSLV-C31	IRNSS-1E	Navigational & positional services
10-03-2016	PSLV-C32	IRNSS-1F	Navigational & positional services
28-04-2016	PSLV-C33	IRNSS-1G	Navigational & positional services
23-05-2016	RLV-TD	-	Technology demonstrator
22-06-2016	PSLV-C34	Cartosat-2(C)	Remote sensing
22-06-2016	PSLV-C34	SWAYAM	Student Satellites from Indian Universities/Institutions
22-06-2016	PSLV-C34	SATYABHAMASAT	Student Satellites from Indian Universities/Institutions
22-06-2016	PSLV-C34	LAPAN-A3	Foreign customer satellite
22-06-2016	PSLV-C34	BIROS	Foreign customer satellite
22-06-2016	PSLV-C34	M3MSat	Foreign customer satellite
22-06-2016	PSLV-C34	SkySat Gen2-1	Foreign customer satellite
22-06-2016	PSLV-C34	DOVE QP (12 Nos)	Foreign customer satellite
22-06-2016	PSLV-C34	GHGSat-D	Foreign customer satellite
28-08-2016	SCRAMJET	-	Technology demonstrator

Launch Date	Launch Vehicle	Satellite Name	Purpose
08-09-2016	GSLV-F05	INSAT-3DR	Weather forecasting
26-09-2016	PSLV-C35	SCATSAT-1	Weather forecasting
26-09-2016	PSLV-C35	PRATHAM	Student Satellites from Indian Universities/Institutions
26-09-2016	PSLV-C35	PISAT	Student Satellites from Indian Universities/Institutions
26-09-2016	PSLV-C35	ALSAT-1B	Foreign customer satellite
26-09-2016	PSLV-C35	ALSAT-2B	Foreign customer satellite
26-09-2016	PSLV-C35	ALSAT-1N	Foreign customer satellite
26-09-2016	PSLV-C35	NLS-19	Foreign customer satellite
26-09-2016	PSLV-C35	Pathfinder-1	Foreign customer satellite
06-Oct-16	Procured Launch	GSAT-18	Satellite based communication
07-12-2016	PSLV-C36	Resourcesat-2A	Remote sensing
15-02-2017	PSLV-C37	CARTOSAT-2(D)	Remote sensing
15-02-2017	PSLV-C37	INS-1A	Indian Nano Satellites - Technology demonstrator
15-02-2017	PSLV-C37	INS-1B	Indian Nano Satellites - Technology demonstrator
15-02-2017	PSLV-C37	DOVE(88No)	Foreign customer satellite
15-02-2017	PSLV-C37	LEMUR(8No)	Foreign customer satellite
15-02-2017	PSLV-C37	PEASS	Foreign customer satellite
15-02-2017	PSLV-C37	DIDO-2	Foreign customer satellite
15-02-2017	PSLV-C37	BGUSat	Foreign customer satellite
15-02-2017	PSLV-C37	AI-Farabi-1	Foreign customer satellite
15-02-2017	PSLV-C37	Nayif-1	Foreign customer satellite
05-05-2017	GSLV-F09	GSAT-9	Satellite based communication

Launch Date	Launch Vehicle	Satellite Name	Purpose
05-06-2017	GLSV-MkIII-D1	GSAT-19	Satellite based communication
23-06-2017	PSLV-C38	CARTOSAT-2(E)	Remote sensing
23-06-2017	PSLV-C38	NIUSat	Student Satellites from Indian Universities/Institutions
23-06-2017	PSLV-C38	CE-SAT-1	Foreign customer satellite
23-06-2017	PSLV-C38	CICERO-6	Foreign customer satellite
23-06-2017	PSLV-C38	Tyvak-53b	Foreign customer satellite
23-06-2017	PSLV-C38	LEMUR-2 (8 Nos)	Foreign customer satellite
23-06-2017	PSLV-C38	D-SAT	Foreign customer satellite
23-06-2017	PSLV-C38	Max Valier	Foreign customer satellite
23-06-2017	PSLV-C38	URSAMAIOR	Foreign customer satellite
23-06-2017	PSLV-C38	Venta-1	Foreign customer satellite
23-06-2017	PSLV-C38	SUCHAI-1	Foreign customer satellite
23-06-2017	PSLV-C38	QB50-BE06	Foreign customer satellite
23-06-2017	PSLV-C38	UCLSat	Foreign customer satellite
23-06-2017	PSLV-C38	InflateSail	Foreign customer satellite
23-06-2017	PSLV-C38	QB50-DE04	Foreign customer satellite
23-06-2017	PSLV-C38	Aalto-1	Foreign customer satellite
23-06-2017	PSLV-C38	PEGASUS/AT03	Foreign customer satellite
23-06-2017	PSLV-C38	SkCUBE	Foreign customer satellite
23-06-2017	PSLV-C38	LituanicaSAT-2	Foreign customer satellite
23-06-2017	PSLV-C38	ROBUSTA-1B	Foreign customer satellite
23-06-2017	PSLV-C38	VZLUSAT-1	Foreign customer satellite
23-06-2017	PSLV-C38	The3Diamonds	Foreign customer satellite
29-06-2017	Procured Launch	GSAT-17	Satellite based communication

Launch Date	Launch Vehicle	Satellite Name	Purpose
31-08-2017	PSLV-C39	IRNSS-1H	Navigational & positional services
12-01-2018	PSLV-C40	CartoSat-2F	Remote sensing
12-01-2018	PSLV-C40	MicroSat	Remote sensing - Technology Demonstrator
12-01-2018	PSLV-C40	INS-1C	Indian Nano Satellites - Technology demonstrator
12-01-2018	PSLV-C40	TeleSat phase-1	Foreign customer satellite
12-01-2018	PSLV-C40	POC-1	Foreign customer satellite
12-01-2018	PSLV-C40	PICSAT	Foreign customer satellite
12-01-2018	PSLV-C40	CANYVAL-X	Foreign customer satellite
12-01-2018	PSLV-C40	CNUSAIL-1	Foreign customer satellite
12-01-2018	PSLV-C40	KAUSAT-5	Foreign customer satellite
12-01-2018	PSLV-C40	SIGMA	Foreign customer satellite
12-01-2018	PSLV-C40	STEP CUBE LAB	Foreign customer satellite
12-01-2018	PSLV-C40	CBNT-2	Foreign customer satellite
12-01-2018	PSLV-C40	Flock-3P (4No)	Foreign customer satellite
12-01-2018	PSLV-C40	LEMUR (4No)	Foreign customer satellite
12-01-2018	PSLV-C40	DemoSat-2	Foreign customer satellite
12-01-2018	PSLV-C40	Micromas-2	Foreign customer satellite
12-01-2018	PSLV-C40	Tyvak-61C	Foreign customer satellite
12-01-2018	PSLV-C40	SpaceBEE (4No)	Foreign customer satellite
12-01-2018	PSLV-C40	Fox-1D	Foreign customer satellite
12-01-2018	PSLV-C40	Corvus BC3	Foreign customer satellite
12-01-2018	PSLV-C40	Arkyd-6	Foreign customer satellite
12-01-2018	PSLV-C40	CICERO-7	Foreign customer satellite
29-03-2018	GSLV-F08	GSAT-6A	Satellite based communication

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 1092

TO BE ANSWERED ON THURSDAY, JULY 26, 2018

LINKING OF SPACE RESEARCH WITH CONTEMPORARY NEEDS

1092. DR. VINAY P. SAHASRABUDDHE:

Will the PRIME MINISTER be pleased to state:

(a) whether Government has evolved and laid down any policy about linking space research related Government establishments to the contemporary development needs of the lives of the people in general and if so, the details thereof and if not, the reasons therefor; and

(b) whether there is any practice of appealing Government departments for promoting use of space technology for governance and public administration and if so, the details thereof and if not, the reasons therefor?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) Indian Space Research Organisation (ISRO), since its inception, has been driven by the objective of harnessing the benefits of space technology for national development and improving the lives of the people. The satellite enabled data and services are being used to improve the living standards of people. These include Television broadcasting, Direct-to-Home, ATM, Mobile communication, Tele-education, Tele-medicine and advisories on weather, pest infestation, agro-meteorology and potential fishing zones. Satellite data is also used for crop production estimation, crop intensification, agricultural drought assessment, wasteland inventory, identifying ground water prospect zones, inland aquaculture suitability and disaster risk reduction, which indirectly benefits the people.

(b) Yes Sir. In order to promote use of space technology for governance and public administration, Department of Space had formed expert working groups in ISRO for proactive interaction with the Government departments and prepared the joint action plan on "Effective use of Space Technology in Governance & Development". These action plans were deliberated in One Day National Meet held in New Delhi in September 2015, with the participation of all the Central Government Ministries/Departments. 127 projects emerged out of this Meet, are being executed in the areas of Natural Resources Management, Planning, Monitoring & Decision Making and Disaster Risk Reduction.

Further, to promote utilisation of space technology in State Government Departments, State level workshops have also been conducted in 17 states. Other measures include (i) institutionalisation of space applications in many Ministries/Departments, (ii) conduct of training sessions on space technology based applications at LBSNAA (DoPT) and training of Deputy Secretaries as part of ISTM Programs (DoPT).

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 1892

TO BE ANSWERED ON THURSDAY, AUGUST 02, 2018

REUSABLE LAUNCH VEHICLE

1892. DR. R. LAKSHMANAN:

Will the PRIME MINISTER be pleased to state:

(a) whether Government has achieved any demonstrable lead in its endeavour to have reusable launch vehicle;

(b) if so, the details thereof;

(c) whether Government has made any assessment regarding the cost cutting effect of reusable launch vehicle; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) & (b)

On May 23, 2016, India became the fifth nation to successfully conduct the flight demonstration of a scaled down version of a winged-body reusable launch vehicle, thereby validating the critical technologies such as autonomous navigation, guidance & control, reusable thermal protection system and re-entry mission management. This flight represented the first baby step towards the realisation of a future fully reusable Two Stage To Orbit (TSTO) space transportation system.

(c) Yes, Sir.

(d) A fully reusable Two Stage To Orbit (TSTO) Launch Vehicle, that can launch payloads to Low Earth Orbit with 15 times reusability, is expected to reduce the launch cost by approximately 50 - 60% when compared to that of an expendable launch vehicle.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 1893

TO BE ANSWERED ON THURSDAY, AUGUST 02, 2018

MAKING OF GREEN PROPELLANT

1893. SHRI R. VAITHILINGAM:

Will the PRIME MINISTER be pleased to state:

(a) whether the ISRO is making green propellant;

(b) if so, the details thereof;

(c) whether this is an effort to replace the conventional hydrazine rocket fuel, a highly toxic and carcinogenic chemical with a greener propellant for future missions; and

(d) if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) Yes, Sir. ISRO is developing green propellants for use in future rocket & satellite propulsion systems.

(b) All space faring nations have been investigating green propulsion systems to minimise environmental impact while improving overall efficiency and economy. ISRO has made a beginning by developing an eco-friendly solid propellant based on Glycidyl Azide Polymer (GAP) as fuel and Ammonium Di-Nitramide (ADN) as oxidizer at the laboratory level, which will eliminate the emission of chlorinated exhaust products from rocket motors. In addition, ISRO is also carrying out various technology demonstration projects involving green propellant combinations such as Hydrogen Peroxide (H_2O_2), Kerosene, Liquid Oxygen (LOX), Liquid Methane, ADN-Methanol-water, ADN-Glycerol-water etc.

(c) Yes, Sir.

(d) ISRO has already begun the move towards environment-friendly and green propellants with the acceptance of Liquid Oxygen (LOX)/Liquid Hydrogen (LH2) and LOX/Kerosene based propulsion systems for launch vehicles, and use of electric propulsion for spacecraft. The LOX/LH2 combination is already being used in the cryogenic upper stages of GSLV and GSLV Mk-III launch vehicles. ISRO has successfully developed ISROSENE, which is a rocket grade version of kerosene as an alternative to conventional hydrazine rocket fuel. ISRO has successfully demonstrated electric propulsion system for station keeping operations in the South Asia Satellite, launched on May 5, 2017.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 1894

TO BE ANSWERED ON THURSDAY, AUGUST 02, 2018

FLIGHT TESTING OF UNMANNED CREW ESCAPE SYSTEM

1894. DR. T. SUBBARAMI REDDY:
SHRIMATI AMBIKA SONI:

Will the PRIME MINISTER be pleased to state:

(a) whether Indian Space Research Organisation (ISRO) has successfully flight-tested unmanned Crew Escape System (CES);

(b) if so, the details thereof;

(c) whether it would enhance the capability for undertaking human spaceflight mission; and

(d) if so, whether the next mission is planned for Moon or Mars and any timeframe has been worked out and if so, the details thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) Yes Sir, ISRO has carried out Pad Abort Test successfully to qualify Crew Escape System required for Human Spaceflight, on 5th July 2018 from Satish Dhawan Space Centre, Sriharikota.

(b) Pad Abort Test has been conceived as an experimental mission to demonstrate the crew escape system during any exigency at launch pad. The crew escape system is configured using specially designed quick acting solid motors that deliver a relatively large thrust to take the crew module to a safe distance.

(c) Experimental data from this mission will serve as a useful input to undertake human spaceflight programme.

(d) As of now, human spaceflight mission is not planned for Moon or Mars.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
STARRED QUESTION NO. 244

TO BE ANSWERED ON THURSDAY, AUGUST 09, 2018

ISRO'S SHARE IN GLOBAL LAUNCH MARKET

*244. SHRI JOSE K. MANI:

Will the PRIME MINISTER be pleased to state:

(a) whether ISRO currently holds just 0.6 per cent of the global satellite launch market despite its highly successful performance in launching of rockets;

(b) whether till today ISRO has launched more than 230 foreign satellites of 28 countries and whether out of the 43 launches till now since 1993, only 3 launches failed with a success rate of 94 per cent;

(c) whether in September 2018, ISRO would launch a PSLV rocket solely for foreign satellites?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE (DR. JITENDRA SINGH):

(a) to (c) A Statement is laid on the Table of the House.

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STATEMENT LAID ON THE TABLE OF THE RAJYA SABHA IN REPLY TO STARRED QUESTION NO.244 REGARDING "ISRO'S SHARE IN GLOBAL SATELLITE LAUNCH MARKET" ASKED BY SHRI JOSE K. MANI FOR ANSWER ON THURSDAY, AUGUST 09, 2018.

(a) ISRO has been launching national satellites meant for meeting the earth observation, communication and navigational requirements of the country to cater to various societal needs. The spare capacity available in these missions are being utilized for launching satellites of other countries on commercial basis through Antrix corporation limited, the commercial arm of ISRO. Over the years there has been increase in the number of international satellites that have been launched as co-passengers to the national missions. In the last four years more than 200 foreign customer satellites have been launched. Considering the future launch demand for increased number of nano and small satellites, there are plans to increase the number of PSLV launches and also develop dedicated small launcher to cater to this high market demand.

(b) As on date, 237 foreign satellites belonging to international customers from 29 countries have been successfully launched using PSLV.

Starting from 1993 till date, PSLV has completed 43 launches, of which 2 launches failed. Overall success rate of PSLV has been 95%.

(c) Yes Sir.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 2689

TO BE ANSWERED ON THURSDAY, AUGUST 09, 2018

COMMUNICATION SATELLITE WITH MILITARY APPLICATION

2689. SHRI A.K. SELVARAJ:

Will the PRIME MINISTER be pleased to state:

(a) whether the launch of another powerful communications satellite with military applications GSAT 11 has been postponed;

(b) if so, the details thereof;

(c) whether ISRO would conduct a few more tests on the satellite as a precaution to rectify glitches;

(d) whether this is because of the loss of contact with GSAT 6A recently; and

(e) if so, the details thereof and the present status thereof?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) & (b)

Yes Sir, GSAT-11 launch is postponed. Based on the experiences of GSAT-6A, Apex committee suggested a few extra tests on GSAT-11. Since this facility is not available at the launch site, the satellite was brought back to Bangalore. The spacecraft has successfully passed the test and is now ready for launch.

(c) All the necessary tests have been performed and it is confirmed that the spacecraft is healthy for launch.

(d) Yes, with GSAT-6A on-orbit-observations, it was decided to conduct this extra test (Critical pressure test).

(e) Presently the satellite completed all the tests and is planned for launch on 30th November 2018.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 2690

TO BE ANSWERED ON THURSDAY, AUGUST 09, 2018

LAUNCHING OF STATE OF ART SATELLITES

2690. DR. L. HANUMANTHAIAH:

Will the PRIME MINISTER be pleased to state:

(a) whether Government has any proposal to launch more state of the art satellites to further enhance operational applications and cater the needs of emerging applications;

(b) if so, the details thereof; and

(c) whether Government has identified the areas/sectors requiring such enhancements?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) Yes, Sir. ISRO has planned to launch more number of state-of-the-art satellites to further enhance operational applications and cater to the needs of emerging applications.

(b) The details of the state of the art satellites approved for launch till 2019-20 are:

(i) Third generation Cartosat series satellite for very high resolution mapping
(ii) Second generation stereo imaging satellite for Digital Elevation Model
(iii) Geostationary Imaging Satellite (GISAT) for Earth observation from Geostationary Orbit
(iv) Third generation Ocean imaging satellite for ocean colour, sea surface temperature mapping and ocean surface wind vector mapping
(v) Third generation ResourceSat series of satellite with improved spatial resolution and swath
(vi) C-band microwave imaging satellite for all weather and day & night imaging
(vii) Constellation of high resolution imaging satellites for frequent revisit
(viii) Nanosatellite for Aerosol monitoring
(ix) Satellite for monitoring chlorophyll fluorescence and radiation environment

(c) The areas requiring enhancement of operational applications, include monitoring of natural resources, crop acreage estimation & production forecasting, monitoring of surface water spread, potential fishing zone forecasting, near-real time monitoring of disasters, high resolution digital elevation model of the country, infrastructure planning & monitoring, and so on.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 2691

TO BE ANSWERED ON THURSDAY, AUGUST 09, 2018

MAPPING OF KHARIF RICE AREA

2691. SHRI MAHESH PODDAR:

Will the PRIME MINISTER be pleased to state:

(a) whether ISRO has done any mapping and inventorying of Kharif rice area in Jharkhand under the Bringing Green Revolution to Eastern India (BGREI) scheme;

(b) if so, the details of all the analysis of mapping done during the last one year; and

(c) the details of steps taken by Government to help farmers with these analysis?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE
(DR. JITENDRA SINGH):

(a) Mapping and inventorying of Kharif rice area in Jharkhand is carried out by Mahalanobis National Crop Forecasting Centre (MNCFC), Ministry of Agriculture and Farmers' Welfare, using ISRO developed methodology.

(b) Satellite data is used to assess the Kharif rice area and the post-kharif rice fallow lands in Jharkhand. One of the objectives of Bringing Green Revolution to Eastern India (BGREI) scheme is to promote cultivation in post Kharif-rice fallow areas to increase cropping intensity and income of farmers. The Kharif rice area estimate, in 2016-17, was 13.94 Lakh Ha for the state of Jharkhand. Preliminary analysis indicates that about 65-70% of Kharif rice area is left fallow during post kharif season. These are mostly located in the southern districts of the state. About 25-30% of these post kharif rice fallow lands are found to be suitable for cultivation of short duration pulse crops during post kharif season. These are mostly located in the districts of Ranchi, Gumla, Simdega, W. Singhbhum, Giridih, Koderma etc.

(c) The analysis findings are being provided to the local Government/ Department with locations/ maps where farmers can optimise or maximise the utilisation of resources by taking up another or additional crop during the post kharif fallow period.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 2692

TO BE ANSWERED ON THURSDAY, AUGUST 09, 2018

MoU FOR FLOOD CONTROL AND DISASTER MANAGEMENT IN NORTH EASTERN REGION

2692. SHRI SANTIUSE KUJUR:

Will the PRIME MINISTER be pleased to state:

(a) whether it is a fact that ISRO is going to sign a Memorandum of Understanding (MoU) with the State Government of Assam for the better management of flood control and disaster management;

(b) if so, the details thereof; and

(c) whether the North Eastern-Space Applications Centre (NE-SAC) exists there for the same purpose for the entire North East Region and if so, the need for another Space Centre for the same purpose?

ANSWER

MINISTER OF STATE IN THE MINISTRY OF PERSONNEL, PG & PENSIONS AND IN THE PRIME MINISTER'S OFFICE (DR. JITENDRA SINGH):

(a) & (b)

No Sir. As on date, ISRO is not contemplating any Memorandum of Understanding (MoU) with the Assam Government specifically for better management of flood control and disaster management of Assam. However, North Eastern Space Applications Centre (NESAC), under Department of Space, is in working relationship with Assam State Disaster Management Authority (ASDMA) since 2009. In association with ASDMA, NESAC has developed the Flood Early Warning System (FLEWS). It is a terrain-specific model and employs satellite based inputs, in-situ data on rainfall and river discharge data at critical locations to provide advance information on flood events as an input to disaster preparedness. The FLEWS model is being used in all 33 districts of Assam.

(c) NESAC, an autonomous organisation under Department of Space (DOS), was set up as a joint initiative of DOS and the North Eastern Council (NEC) at Shillong in September 2000. The Centre plays a catalytic role in holistic development of entire North East Region by providing Space Science & Technology support on natural resource management (agriculture, water resources, forestry, geology, minerals), infrastructure planning, telemedicine, tele-education, emergency communication, space & atmospheric science research, including disaster management support. North Eastern Regional node for Disaster Risk Reduction (NER-DRR) is also housed at NESAC to provide coordinated service to support management of disasters viz. floods, forest fire, thunderstorms, landslides, drought.

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