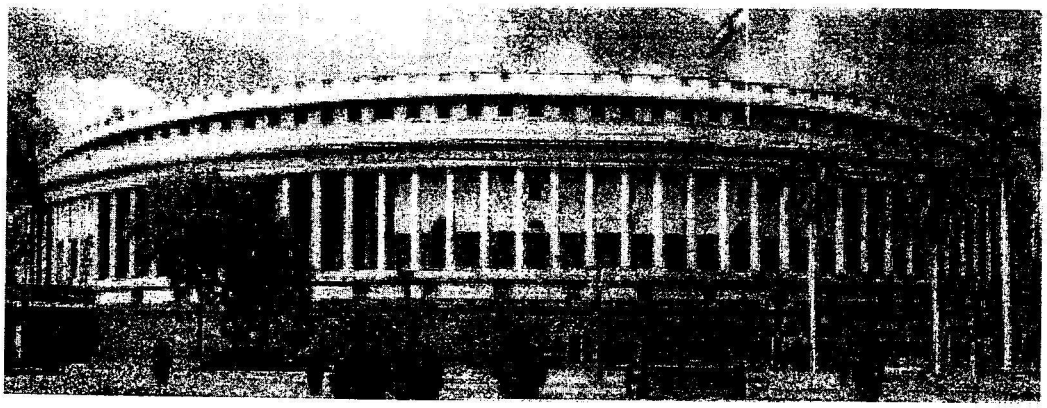
GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

"SPACE IN PARLIAMENT"



MONSOON SESSION OF PARLIAMENT 2016
(JULY-AUGUST 2016)

COMPILATION OF REPLIES GIVEN IN PARLIAMENT DURING 2016

Government of India
Department of Space
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PARLIAMENT QUESTIONS – MONSOON SESSION OF PARLIAMENT 2016

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
STARRED QUESTION NO. 49

TO BE ANSWERED ON WEDNESDAY, JULY 20, 2016

INNOVATION IN SPACE SCIENCE

*49. **SHRI PR. SENTHIL NATHAN:**

SHRIMATI V. SATHYA BAMA:

Will the PRIME MINISTER be pleased to state:

(a) whether the Government has taken up new innovative projects for the development of Space Science, Space Research and Satellite Technology in the country;

(b) if so, the details of the new space research projects under taken during the last three years,year-wise;

(c) the various steps taken by the Government to provide adequate funds for the development of various autonomous institutions and labs of ISRO in the country; and

(d) the total funds allocated and spent by the Union Government for the said purpose during the last three years?

ANSWER

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

(DR. JITENDRA SINGH):

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

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STATEMENT LAID ON THE TABLE OF THE LOK SABHA IN REPLY TO STARRED QUESTION NO. 49 REGARDING "INNOVATION IN SPACE SCIENCE" ASKED BY SHRI PR. SENTHIL NATHAN AND SHRIMATI V. SATHYA BAMA FOR ANSWER ON WEDNESDAY, JULY 20, 2016.

(a) Yes Madam.

(b) Innovation is an integral part of Research and Development activities carried out by Indian Space Research Organisation (ISRO) towards the development of Space Science, Space Research and Satellite Technology. The details of the new innovative space research projects undertaken/ realised during the last three years, year-wise is given under:

Year	Project undertaken / realized	Innovation
2013	Indian Regional Navigation Satellite System (IRNSS) (*rechristened as NavIC*)	• Unique constellation design of Geostationary (GEO) and inclined Geo-synchronous (GSO) satellites to ensure 24 x 7 visibility of all the spacecrafts over Indian subcontinent to provide optimal position, navigation & timing services.
	Realisation of INSAT-3D satellite	• First geostationary sounder system over Indian Ocean region for providing vertical profiles of temperature and humidity.

2014	Insertion of Mars Orbiter Mission (MOM) into Martian orbit	• First Indian spacecraft to have on-board autonomy, to manage crucial operations like insertion into the Martian orbit, fault detection, isolation & reconfiguration of systems and operations during non-visibility to earth. • Development of highly sensitive radio receivers, powerful transmitters and antenna system to manage deep space communication up to 400 million km. • Development of Delta-DOR technique to enable accurate navigation modeling.
	Realisation of Crew module Atmospheric Re-entry Experiment (CARE) Mission	• Innovative mission planning in a sub-orbital flight with respect to the launch, controlled re-entry into the atmosphere, splashdown and recovery. • Development of critical technologies for Deceleration system with redundant parachutes in clustered configuration and Indigenous thermal protection system.
2015	Realisation of Astrosat	• Involvement of academia and research institutions in the country for realisation of instruments. • Simultaneous multi-wavelength (from Ultraviolet to X-Ray) observations of stars & galaxies from single platform. • Indigenous realisation of high resolution ultraviolet mirrors, thin foil X-ray optics, high pressure gas filled detectors

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	NASA-ISRO Synthetic Aperture Radar (NISAR)	• **Indigenous development of S-band Synthetic Aperture Radar for all weather and day/night imaging.**
	ADITYA-L1 - scientific mission for solar studies	• **Trajectory to Halo orbit around the Sun-Earth Lagrangian point 1 (L1), which is about 1.5 million kilometre from the Earth to enable continuous viewing of the Sun.** • **Highly polished primary mirror and spectro-polarimetry using coronagraph payload.** • **Thermal design and attitude for accurate Sun pointing.**

(c) **The autonomous institutions/ labs under the administrative control of Department of Space are – (i) Indian Institute of Space Science & Technology, Thiruvananthapuram, (ii) Physical Research Laboratory, Ahmedabad, (iii) North-Eastern - Space Applications Centre, Shillong, (iv) National Atmospheric Research Laboratory, Gadanki and (v) Semi-conductor Laboratory, Chandigarh. Adequate funds are made available by the Government to meet the programmatic requirements of these autonomous institutions/ labs.**

(d) **The total funds allocated and spent by these autonomous institutions/ labs during the last three years are as under:**

(₹ in Crores)

S.N.	Financial Year	Funds Allocated	Spent
1.	2013-2014	263.23	263.23
2.	2014-2015	336.23	332.70
3.	2015-2016	451.98	451.68

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 468

TO BE ANSWERED ON WEDNESDAY, JULY 20, 2016

SATELLITE FOR REGIONAL GROUPING

468. SHRI C.S. PUTTA RAJU:

Will the PRIME MINISTER be pleased to state:

(a) whether a meeting of experts from South Asian Association for Regional Cooperation (SAARC) countries was held last year to finalise modalities for developing a satellite exclusively for regional grouping and if so, the details thereof; and

(b) the time by which the satellite is likely to be launched and the areas in which it would give information?

ANSWER

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

(DR. JITENDRA SINGH):

(a) No Madam. The conference on "Satellite for the SAARC region and Space Technology Applications" held on June 22, 2015 at New Delhi was intended to familiarise the representatives from all member countries of SAARC Region about the satellite configuration and its potential utilisation for the benefit of SAARC Region. Indian Space Research Organisation (ISRO) is developing a communication satellite for use by South Asian countries. The satellite is now named as Satellite for South Asia.

(b) The proposed satellite is planned to be ready for use by South Asian countries by first half of 2017. The satellite will have capability to provide services in the areas of broadcast and telecommunication including Disaster management, Tele-education & Tele-health, Television and Very Small Aperture Terminals.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 593

TO BE ANSWERED ON WEDNESDAY, JULY 20, 2016

PRIVATISATION OF PSLV

593. SHRI CHANDRA PRAKASH JOSHI:

Will the PRIME MINISTER be pleased to state:

(a) whether there is a proposal to privatise the operation of ISRO's Polar Satellite Launch Vehicle (PSLV) and if so, the details thereof;

(b) whether the construction and integration of satellites and launch of rockets will be contracted and/or independently or through Antrix Corporation and if so, the details thereof;

(c) whether private players are to be allowed to operate satellites on their own;

(d) if so, the details thereof; and

(e) 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)&(b) ISRO has been pursuing a conscious approach of building up and nurturing the industrial capabilities in the country to maximally support the Indian Space Programme. Through appropriate transfer of technology and hand-holding, ISRO is

making focused efforts to consolidate and enhance participation of Indian industries for manufacturing and production of space related hardware such as rocket engine & stages, propellant tanks, spacecraft structures, solar panels, thermal control systems, electronic packages etc., required for satellites and launch vehicles.

In order to step up the launch capacity within the country, ISRO is in the process of exploring the possibility of involving Indian industry in a greater role to meet the increased national requirements and possible commercial demand for launch services. Discussions are being held with the Indian industry towards formulating a plan & strategy to enhance the capacity and capability of managing the Polar Satellite Launch Vehicle (PSLV) programme on an end to end basis.

(c)(d)&(e) A provision exists for private players to operate communication satellites on their own in the country through an established mechanism called Committee for Authorising the establishment and operations of Indian Satellite Systems (CAISS).

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 607

TO BE ANSWERED ON WEDNESDAY, JULY 20, 2016

LAUNCHING OF SATELLITES

607. **SHRI BIDYUT BARAN MAHATO:**

SHRI CH. MALLA REDDY:

SHRI S.R. VIJAYAKUMAR:

SHRI SATAV RAJEEV:

DR. J. JAYAVARDHAN:

KUNWAR HARIBANSH SINGH:

SHRI MUTHAMSETTI SRINIVASA RAO (AVANTHI):

SHRI GAJANAN KIRTIKAR:

DR. HEENA VIJAYKUMAR GAVIT:

SHRI SUDHEER GUPTA:

SHRI ASHOK SHANKARRAO CHAVAN:

DR. SUNIL BALIRAM GAIKWAD:

SHRI MOHITE PATIL VIJAYSINH SHANKARRAO:

SHRI VENKATESH BABU T.G.:

SHRI B. SENGUTTUVAN:

Will the PRIME MINISTER be pleased to state:

(a) **whether the Indian Space Research Organisation (ISRO) has successfully launched 20 Satellites into space in one shot recently and if so, the details thereof;**

(b) **whether the satellites launched include satellites of foreign countries and if so, the details thereof;**

(c) the quantum of foreign exchange earned therefrom;

(d) the steps taken/being taken by the Government to make ISRO more professional;

(e) whether ISRO is also planning to set up space station; and

(f) if so, the details thereof and probable year of its launch?

ANSWER

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

(DR. JITENDRA SINGH):

(a) Yes Madam. Indian Space Research Organisation (ISRO) has successfully launched 20 satellites in a single launch mission onboard Polar Satellite Launch Vehicle 'PSLV-C34' on June 22, 2016 from Satish Dhawan Space Centre, Sriharikota. These satellites are (i) Indian CARTOSAT-2 series of satellite (weighing 727 kg); (ii) 2 University/academic institute's satellites (weighing 2.5 kg) namely SWAYAM (College of Engineering, Pune) & SATHYABAMASAT (Sathyabama University, Chennai) and (iii) 17 satellites (total weighing 555 kg) of foreign customers.

(b) Yes Madam. Seventeen satellites of foreign customers from 4 countries were launched. These satellites are LAPAN-A3 (Indonesia); BIROS (Germany); M3MSat & GHGSat-D (Canada); and SkySat-Gen2-1 & twelve Dove satellites (USA).

(c) Through launch of these 17 foreign satellites, Antrix Corporation Ltd. has earned revenue of 10.24 Million Euros and 4.54 Million USD.

(d) ISRO executes its missions in a professional manner by proper planning of the missions and conducting thorough reviews to ensure timely realisation.

(e) As of now, there are no approved programmes leading to space station activities.

(f) Does not arise.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 1797

TO BE ANSWERED ON WEDNESDAY, JULY 27, 2016

SATELLITE SYSTEM SUPPLIES

1797. SHRI BHEEMRAO B. PATIL:

Will the PRIME MINISTER be pleased to state:

(a) **whether Indian Space Research Organisation (ISRO) has called a meeting of suppliers to raise the levels of their contribution to the country's satellite technology;**

(b) **if so, the details thereof;**

(c) **whether ISRO Satellite Centre estimates a demand for 71 satellites in the next five years, including the exploratory ones to study Moon and Sun and if so, the details and present position thereon; and**

(d) **whether ISRO hopes to get entire systems supplied in areas such as telemetry, power systems and satellite controls systems 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 Madam.**

(b) **A one day conference on "Enabling Spacecraft Systems Realisation through Industries (ESSRI 2016)" was held on June 23,**

2016 at ISRO Satellite Centre (ISAC), Bangalore. About 500 delegates from 103 industries have participated.

The conference was intended to enhance the participation of suppliers/ Industries in various aspects of satellite technology including production activities. During the conference, various opportunities for industries in satellite technology were discussed. The delegates were also informed about Expression of Interest (EoI) floated by ISRO seeking industry participation in Assembly, Integration and Testing (AIT) of standardized ISRO satellites.

(c) To meet the growing demands of space applications addressing the national priorities, ISRO has prepared a plan for realizing (i) Earth observation satellites with the capabilities of high resolution, hyper-spectral, all weather imaging, stereo imaging, wind vector measurements, ocean & meteorological observations; (ii) high throughput communication satellites, high power DTH satellites; (iii) enhanced navigation constellation; (iv) Space exploration missions viz. Chandrayaan-2, Aditya-L1, XpoSAT. The indicative demand in the next five years is estimated to be of 70 satellites. The approvals for 40 satellites missions have been obtained.

(d) ISRO has standardized design of major satellite subsystems in the areas viz. telemetry, tele-command, power, control systems, structural systems, spacecraft mechanisms etc. and has outsourced fabrication and testing activities to Industry. It is envisaged to enhance the industry participation towards productionization of such subsystems on an end-to-end basis, which include components procurement, fabrication, package assembly and testing by vendor as per ISRO's design.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
STARRED QUESTION NO.252

TO BE ANSWERED ON WEDNESDAY, AUGUST 03, 2016

SYNTHETIC APERTURE RADAR SATELLITE

*252. SHRI B. VINOD KUMAR:

Will the PRIME MINISTER be pleased to state:

(a) whether NASA and ISRO are working together to develop a synthetic aperture radar satellite to observe and measure ecosystem disturbances, icesheet collapses and natural hazards; and

(b) 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) A Statement is laid on the Table of the House.

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STATEMENT LAID ON THE TABLE OF THE LOK SABHA IN REPLY TO STARRED QUESTION NO.252 REGARDING "SYNTHETIC APERTURE RADAR SATELLITE" ASKED BY SHRI B VINOD KUMAR FOR ANSWER ON WEDNESDAY, AUGUST 03, 2016.

(a) Yes, Madam.

(b) ISRO and Jet Propulsion Laboratory (JPL)/ NASA are jointly working on the development of Dual Frequency (L & S band) Synthetic Aperture Radar Imaging Satellite named as NASA-ISRO Synthetic Aperture Radar (NISAR). The L-band SAR is being developed by JPL/ NASA, while ISRO is developing S-band SAR. The L & S band microwave data obtained from this satellite will be useful for variety of application, which include natural resources mapping & monitoring; estimating agricultural biomass over full duration of crop cycle; assessing soil moisture; monitoring of floods and oil slicks; coastal erosion, coastline changes & variation of winds in coastal waters; assessment of mangroves; surface deformation studies, ice sheet collapses & dynamics etc. The joint science observation plan has been documented with the participation of Indian and American scientists. The core science teams of both sides meet every six months to discuss observation requirements for various applications.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 2800

TO BE ANSWERED ON WEDNESDAY, AUGUST 03, 2016

BUDGET ALLOCATION FOR ISRO

2800. SHRI VENKATESH BABU T.G.:

Will the PRIME MINISTER be pleased to state:

(a) **the budget allocation made by the Government for space research in the country during the last three years along with its percentage comparison with GDP, year-wise;**

(b) **whether our allocation is very low as compared to other developing and developed countries;**

(c) **if so, the details thereof;**

(d) **whether any proposal is under consideration of the Government to increase the budgetary allocation later this year and also in the coming years and to make India in facing the challenges of space preparedness; 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):

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(a) The budget allocation of Department of Space, during the last three years along with its percentage comparison with GDP, year-wise, are given below:

(₹ in crores)

Financial Year	Budget Allocation (RE)	GDP*	Budget Estimates as % Share in GDP
2013-14	5172.00	9839434	0.05%
2014-15	5826.00	10552151	0.06%
2015-16	6959.44	11350962	0.06%

* *Source: Economic Survey, 2015-16*

(b)&(c) As per the report "Space Economy at a Glance 2014", published by Organisation for Economic Co-operation and Development (OECD), developed countries like USA, Russia and France have higher space budget in terms of percentage comparison with their respective GDPs, as given under:

USA – GDP: $ 16660 billion; Space Budget: $ 39.33 billion; % Share in GDP: 0.23%

Russia – GDP: $ 2097 billion; Space Budget: $ 5.27 billion; % Share in GDP: 0.25%

France – GDP: $ 2806 billion; Space Budget: $ 2.71 billion; % Share in GDP: 0.10%

Apart from these three countries, India's space budget, as percentage share of GDP, is comparable with other developed & developing countries, which is in the range of 0.05% to 0.07%.

(d) Yes Madam.

(e) During current financial year 2016-17, an amount of ₹7509.14 Crores has been allocated for Indian Space programme. An additional allocation of ₹ 750 Crores has been sought to meet the programmatic requirements targeted during 2016-17. The budgetary allocations required for Indian Space programme to meet the future challenges and space preparedness is under preparation.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 2837

TO BE ANSWERED ON WEDNESDAY, AUGUST 03, 2016

SILICA AREOGEL

2837. SHRI M. CHANDRAKASI:

Will the PRIME MINISTER be pleased to state:

(a) whether the ISRO has developed the lightest synthetic material called Silica aerogel or Blue-air and if so, the details thereof;

(b) the advantages and uses of the material; and

(c) whether ISRO can claim patent rights for this product, its process 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) As a spin-off of Research & Development in Space Technology, Vikram Sarabhai Space Centre (VSSC) of Indian Space Research Organisation (ISRO) has developed Silica aerogel or Blue-air. Aerogels are

synthetic porous ultra-light materials derived from gel, in which the liquid component of the gel is replaced with air. Aerogels exhibit extremely low density and low thermal conductivity.

(b) It is extremely light in weight, has excellent thermal resistance and acts as a good insulator. Due to its very high thermal resistance, silica aerogel could be used for - (i) insulating jackets & foot insoles in boots for extreme cold conditions, (ii) insulating rocket engines, (iii) painting windows to keep them cool or warm, (iv) insulating pipelines.

(c) ISRO has assessed that the process through which the product is realised is patentable and necessary steps are being taken to filing the patent.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 2898

TO BE ANSWERED ON WEDNESDAY, AUGUST 03, 2016

CONTRACT WITH ISRAELI ORGANISATION

2898. SHRI P. KARUNAKARAN:

Will the PRIME MINISTER be pleased to state:

(a) whether the Government proposes to examine the commercial activities of Indian Space Research Organisation (ISRO);

(b) if so, the major areas decided to be inquired into;

(c) whether the deals including the commercial contract with certain Israeli organisations are also likely to be re-examined; and

(d) if so, the details in this regard along with the estimated financial benefits likely to accrue to Indian as a result thereof?

ANSWER

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

(DR. JITENDRA SINGH):

(a) No Madam.

(b) Does not arise.

(c) No Madam.

(d) Does not arise.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 2903

TO BE ANSWERED ON WEDNESDAY, AUGUST 03, 2016

MANNED SPACE PROGRAMME

2903. SHRI RAGHAV LAKHANPAL:

Will the PRIME MINISTER be pleased to state:

(a) the details of advancements in India's space programme during the last two years and details of co-operation and assistance received from other countries during the last two years for "A Manned Space Programme", country-wise; and

(b) the response received so far from each country?

ANSWER

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

(DR. JITENDRA SINGH):

(a) The major advancements in India's space programme during the last two years include – (i) Insertion of India's Mars Orbiter around the planet Mars, (ii) realisation of indigenous Cryogenic engine & stage and building indigenous capability of launching 2 Ton class satellites, (iii) realisation of space based services for en-route navigation & safety-of-life applications in aviation sector, (iv) completion of Indigenous satellite navigational system–NavIC, (v) placement of a observatory in space

"ASTROSAT" enabling simultaneous multi-wavelength (from Ultraviolet to X-Ray) observations of stars and galaxies, (vi) deployment of an indigenously built S-Band Unfurlable Antenna (6 meter) in space for satellite based mobile communications, (vii) technology demonstration of reusable launch vehicle, (viii) launching of 20 satellites in a single launch mission.

ISRO has taken up the development of critical technologies as part of pre-project activities for the Manned Space Programme. Major activities identified under Pre-Project are Crew Module (CM) systems, Environmental Control & Life Support System (ECLSS), Flight Suit and Crew Escape System (CES). The Crew module was flight tested in the experimental mission of GSLV MkIII on December 18, 2014 and the re-entry characteristics and the recovery of the Crew Module were successfully demonstrated. The flight suit development has been completed. Development of the ECLSS and the Crew Escape Systems are progressing well and is targeted to be completed in 2016-17.

As of now, Manned Space Programme is not an approved programme. Currently, ISRO is developing critical technologies relevant for human spaceflight for building future capacity. No co-operation or assistance has been sought from any other country during the last two years in this regard.

(b) Does not arise.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 3954

TO BE ANSWERED ON WEDNESDAY, AUGUST 10, 2016

SHORTAGE OF ENGINEERS/SCIENTISTS

3954. SHRI RAGHAV LAKHANPAL:

Will the PRIME MINISTER be pleased to state:

(a) **the existing number of scientists and engineers in position, in the Indian Space Research Organisation (ISRO);**

(b) **whether there is any shortage of engineers/scientists in ISRO and if so, the details thereof; and**

(c) **the steps taken/being taken by the Government in the last two years to meet the shortage of scientists and engineers in ISRO?**

ANSWER

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

(DR. JITENDRA SINGH):

(a) **At present, the authorised level of total scientists/engineers is 7600 and as against this, a total of 7200 scientists/engineers are on the rolls at present.**

Recruitment actions to fill up the vacancies are in advanced stages of completion.

(b)&(c) Yes Madam. ISRO has been very cautious in sizing its Human Resources to meet the work load arising due to its challenging goals and objectives. The demand for space based services in the country is increasing resulting in increased launch frequency and applications of space technology in emerging areas. To meet these demands, a proposal for suitably augmenting the manpower, mostly in scientist/engineer category, is under process. The proposal has been reviewed and recommended by the Space Commission and the same is being submitted to the Department of Expenditure, Ministry of Finance, for their recommendations, before placing the same for the approval of the Union Cabinet.

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O.I.H.

GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 4040

TO BE ANSWERED ON WEDNESDAY, AUGUST 10, 2016

EDUSAT

4040. SHRI SANJAY KAKA PATIL:

Will the PRIME MINISTER be pleased to state:

(a) **whether the satellite placed in orbit exclusively for the education sector, EDUSAT has achieved its desired objectives;**

(b) **if so, the details in this regard;**

(c) **whether any agreements have been signed with any country for the launch of more such satellites from India; and**

(d) **if so, the details in this regard?**

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) **The Edusat satellite was planned for demonstrating the capabilities of satellite communication technology for education sector. The satellite was launched in**

September 2004 and supported the educational services till October 2010. During this period, 83 tele-education networks connecting about 5000 interactive and about 55000 receive only terminals were established and many educational transmission experiments were demonstrated using satellite communication networks. After October 2010, the tele-education networks are migrated to other communication satellites like INSAT-3C, INSAT-4CR and GSAT-12.

(c) No Madam.

(d) Does not arise.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

LOK SABHA
UNSTARRED QUESTION NO. 4104

TO BE ANSWERED ON WEDNESDAY, AUGUST 10, 2016

SCRAMJET ENGINE

4104. SHRIMATI VANAROJA R.:

SHRIMATI KOTHAPALLI GEETHA:

Will the PRIME MINISTER be pleased to state:

(a) whether Indian Space Research Organisation (ISRO) is gearing up to test a scramjet engine based on air breathing propulsion and if so, the details thereof;

(b) whether the test flight of the indigenously developed scramjet engine was scheduled to take place in July, 2016 and if so, the details thereof;

(c) whether the test is expected to help the country achieve good thrust value with the scramjet engine; 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) Yes Madam. The testing of sub-scale demonstrator scramjet engine is envisaged as a part of technology demonstration, by mounting it on a two stage solid

rocket. This test intends to demonstrate supersonic combustion in flight and evaluate the integrated functioning of the engine. The preparations for carrying out the test are underway and the test is likely to be conducted in the third quarter of 2016.

(c)&(d) Scramjet engine technology is a complex technology which is yet to be fully proven worldwide. A series of technology demonstration tests are required before inducting the engine with required thrust into future launch vehicles. The technology will be useful only during the atmospheric phase of the flight of launch vehicle and will benefit in bringing down the cost of access to space, by reducing the need of carrying the oxidizer along with the fuel.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 518

TO BE ANSWERED ON THURSDAY, JULY 21, 2016

DEVELOPMENT OF DATA SATELLITE BY NASA AND ISRO

518. SHRI MOHD. ALI KHAN:

Will the PRIME MINISTER be pleased to state:

(a) whether National Aeronautics and Space Administration (NASA) and Indian Space Research Organisation (ISRO) have joined hands to develop data satellite; and

(b) if so, details thereof and progress made in this regard?

ANSWER

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

(a) ISRO and Jet Propulsion Laboratory(JPL)/ NASA are jointly working on the development of Dual Frequency (L & S band) Synthetic Aperture Radar Imaging Satellite named as NASA-ISRO Synthetic Aperture Radar (NISAR).

(b) In this joint mission, JPL/ NASA will be responsible for design & development of L-band SAR, 12m unfurlable antenna & its deployment elements, GPS system and data recorder. ISRO will be responsible for design & development of S-band SAR, Spacecraft Bus, data transmission system, Spacecraft integration & testing, launch using GSLV and on-orbit operations. The L & S band microwave data obtained from this satellite will be useful for variety of applications, which include natural resources mapping & monitoring; estimating agricultural biomass over full duration of crop cycle; assessing soil moisture; monitoring of floods and oil slicks; coastal erosion, coastline changes and variation of winds in coastal waters; assessment of mangroves; surface deformation studies etc.

ISRO and JPL/ NASA are working towards realisation of this mission by 2021. Both agencies have obtained necessary approvals from respective governments. The joint science observation plan has been documented with the participation of Indian and American scientists. The core science teams of India and USA meet every six months to discuss various observation requirements and strategies of science observation. The technical teams of both the agencies are working towards building the necessary systems.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 519

TO BE ANSWERED ON THURSDAY, JULY 21, 2016

BENEFITS FROM MTCR FOR SPACE PROGRAMME

519. DR. KANWAR DEEP SINGH:

Will the PRIME MINISTER be pleased to state:

(a) whether India joining Missile Technology Control Regime (MTCR) would benefit our space development programme if so, the details thereof; and

(b) what major advantage it would have for India in the comity of nations?

ANSWER

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

(a) Yes Sir. India joining MTCR would benefit our space development programme in -

(i) Strengthening our international cooperation activities in high technology areas with other space faring nations.

(ii) Easing the procurements & supplies of export controlled high/ advanced technology items, components, materials, and equipment from other countries, especially MTCR partner states.

(iii) Enhancing our commercial ventures in terms of export of sub-systems, satellites and commercial launch services etc.

(b) India as a major space faring nation and as a partner state in MTCR could play critical roles in various international fora such as UNCOPUOS, UN Conference on Disarmament (CD) and other space related international fora in major policy decisions relating to space applications, space security topics. India, as a Partner State of MTCR, can take part in the decision making process in ensuring non-proliferation of sensitive space technology related items, which are controlled through a list (*called Technical Annex*) and reviewed & revised annually through Technical Experts Meetings.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 520

TO BE ANSWERED ON THURSDAY, JULY 21, 2016

PROJECTS FOR DEVELOPMENT OF SPACE SCIENCE

520. DR. V. MAITREYAN:

Will the PRIME MINISTER be pleased to state:

(a) whether Government has taken up new innovative projects for the development of space science, space research and satellite technology in the country;

(b) if so, the details of the new space research projects in the last three years, year-wise;

(c) the various steps taken by Government to provide adequate funds for the development of various autonomous institutions and labs of Indian Space Research Organisation (ISRO) in the country; and

(d) the total funds allocated and spent by the Government for the development of various autonomous space research labs in the country in the last three years?

ANSWER

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

(a) Yes Sir.

(b) Innovation is an integral part of Research and Development activities carried out by Indian Space Research Organisation (ISRO) towards the development of Space Science, Space Research and Satellite Technology. The details of the new innovative space research projects undertaken/ realized during the last three years, year-wise is given under:

Year	Project undertaken / realized	Innovation
2013	Indian Regional Navigation Satellite System (IRNSS) (*rechristened as NavIC*)	• Unique constellation design of Geostationary (GEO) and inclined Geo-synchronous (GSO) satellites to ensure 24 x 7 visibility of all the spacecrafts over Indian subcontinent to provide optimal position, navigation & timing services.

	Realization of INSAT-3D satellite	• First geostationary sounder system over Indian Ocean region for providing vertical profiles of temperature and humidity.
2014	Insertion of Mars Orbiter Mission (MOM) into Martian orbit	• First Indian spacecraft to have on-board autonomy, to manage crucial operations like insertion into the Martian orbit, fault detection, isolation & reconfiguration of systems and operations during non-visibility to earth. • Development of highly sensitive radio receivers, powerful transmitters and antenna system to manage deep space communication up to 400 million km. • Development of Delta-DOR technique to enable accurate navigation modeling.
	Realisation of Crew module Atmospheric Re-entry Experiment (CARE) Mission	• Innovative mission planning in a sub-orbital flight with respect to the launch, controlled re-entry into the atmosphere, splashdown and recovery. • Development of critical technologies for Deceleration system with redundant parachutes in clustered configuration and Indigenous thermal protection system.
2015	Realisation of Astrosat	• Involvement of academia and research institutions in the country for realization of instruments. • Simultaneous multi-wavelength (from Ultraviolet to X-Ray) observations of stars & galaxies from single platform. • Indigenous realization of high resolution ultraviolet mirrors, thin foil X-ray optics, high pressure gas filled detectors
	NASA-ISRO Synthetic Aperture Radar (NISAR)	• Indigenous development of S-band Synthetic Aperture Radar for all weather and day/night imaging.
	ADITYA-L1 - scientific mission for solar studies	• Trajectory to Halo orbit around the Sun-Earth Lagrangian point 1 (L1), which is about 1.5 million kilometre from the Earth to enable continuous viewing of the Sun. • Highly polished primary mirror and spectro-polarimetry using coronagraph payload. • Thermal design and attitude for accurate Sun pointing.

(c) The autonomous institutions/ labs under the administrative control of Department of Space are – (i) Indian Institute of Space Science & Technology, Thiruvananthapuram, (ii) Physical Research Laboratory, Ahmedabad, (iii) North Eastern Space Applications Centre, Shillong, (iv) National Atmospheric Research Laboratory, Gadanki and (v) Semi-conductor Laboratory, Chandigarh. Adequate funds are made available by the government to meet the programmatic requirements of these autonomous institutions/ labs.

(d) The total funds allocated and spent by these autonomous institutions/ labs during the last three years are as under:

(₹ in Crores)

S.N.	Financial Year	Funds Allocated	Spent
1.	2013-2014	263.23	263.23
2.	2014-2015	336.23	332.70
3.	2015-2016	451.98	451.68

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 521

TO BE ANSWERED ON THURSDAY, JULY 21, 2016

TEST FLIGHT OF INDIGENOUSLY DEVELOPED SCRAMJET ENGINE

521. DR. T. SUBBARAMI REDDY:

Will the PRIME MINISTER be pleased to state:

(a) whether test flight of indigenously developed scramjet engine is done or proposed to be done shortly, if so, the details thereof;

(b) the future deployment of scramjet engine in the vehicle and its salient features; and

(c) how far it would boost the space technology for advance development, 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. The testing of sub-scale demonstrator scramjet engine is envisaged as a part of technology demonstration, by mounting it on a two stage solid rocket. This test intends to demonstrate supersonic combustion in flight and evaluate the integrated functioning of the engine. The preparations for carrying out the test are underway and the test is likely to be conducted in the third quarter of 2016.

(b)&(c) Scramjet engine technology is a complex technology which is yet to be fully proven worldwide. It is envisaged for use in launch vehicle, once the technology attains sufficient maturity. The technology will be useful only during the atmospheric phase of the flight of launch vehicle and will benefit in bringing down the cost of access to space, by reducing the amount of the oxidizer to be carried along with the fuel.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 522

TO BE ANSWERED ON THURSDAY, JULY 21, 2016

INDIA'S SHARE IN INTERNATIONAL SATELLITE MARKET

522. SHRI HARIVANSH:

Will the PRIME MINISTER be pleased to state:

(a) whether in view of Indian Space Research Organisation (ISRO) moving towards touching new heights it is a fact that India's share in the international satellite market worth ` 13 lakh crore happens to be only four per cent; and

(b) the steps being taken by Government to increase India's share in the international satellite market and 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) According to the published reports available in the public domain on the international satellite market, the average annual revenue over the last three years, is approximately $200 billion (₹ 13 Lakh Crore), which includes the launch services market (₹ 0.37 Lakh Crore), satellite manufacturing (₹ 1.07 Lakh Crore), ground equipment (₹ 3.85 Lakh Crore) and satellite services (₹ 8.17 Lakh Crore). ISRO is providing the launch capacity, when available, for launching satellites on a commercial basis through Antrix Corporation Limited. During the last year (2015-16), Antrix earned a revenue of approximately ₹ 230 Crore through commercial launch services, which is about 0.6% of the global launch services market.

(b) In order to meet the enhanced national requirements for launching satellites for earth observation, communication & navigation, ISRO is taking steps to increase the launch capacity. ISRO will continue to provide the launch capacity, when available, for commercial launch services. Towards stepping up the launch capacity, ISRO is in the process of exploring the possibility of enhanced involvement of Indian industry. Besides meeting the national demand, the industry can explore the opportunities for commercial launch services.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 1203

TO BE ANSWERED ON THURSDAY, JULY 28, 2016

LAUNCHING OF EARTH OBSERVATION SATELLITE

1203. SHRI MOHD. ALI KHAN:

Will the PRIME MINISTER be pleased to state whether Indian Space Research Organisation (ISRO) launched earth observation satellite, if so, the details thereof, and the objectives thereof?

ANSWER

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

Yes Sir. Indian Space Research Organisation (ISRO) has successfully launched an earth observation satellite namely CARTOSAT-2 series satellite onboard Polar Satellite Launch Vehicle 'PSLV-C34' on June 22, 2016 from Satish Dhawan Space Centre, Sriharikota. The CARTOSAT-2 series of satellite, weighing 727 kg, is placed in a sun synchronous orbit with a designed mission life of 5 years. The main objective of this satellite is to provide high resolution images of earth's surface at sub-meter resolution (Black & White image) and at 2 meter resolution (4-band coloured image).

The images obtained from Cartosat-2 series satellite will be useful in variety of applications requiring high resolution images, which include cartography, infrastructure planning, urban & rural development, utility management, natural resources inventory & management and disaster management.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 1302

TO BE ANSWERED ON THURSDAY, JULY 28, 2016

BENEFITS FROM LAUNCHING OF FOREIGN SATELLITE

1302. SHRI ANIL DESAI:

Will the PRIME MINISTER be pleased to state:

(a) whether Indian Space Research Organisation (ISRO) has launched twenty foreign satellites, if so, the details thereof;

(b) how much it would benefit Government;

(c) whether ISRO is also planning to set up space station; and

(d) if so, the details thereof and probable year of its launching?

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) has successfully launched 20 satellites in a single launch mission onboard Polar Satellite Launch Vehicle 'PSLV-C34' on June 22, 2016 from Satish Dhawan Space Centre, Sriharikota. In this mission, 17 foreign satellites (total weighing 555 kg) from 4 countries viz. Indonesia, Germany, Canada and USA were launched as co-passenger along with Indian primary payload CARTOSAT-2 series of satellite (weighing 727 kg) and 2 University/academic institute's satellites (weighing 2.5 kg) namely SWAYAM (College of Engineering, Pune) & SATHYABAMASAT (Sathyabama University, Chennai) as co-passenger.

(b) In this launch mission, the primary objective was to launch Indian CARTOSAT-2 series of satellite (weighing 727 kg) and the spare capacity available on launch vehicle was used to launch 17 foreign satellites (total weighing 555 kg) on a commercial basis. This has benefited the government in reducing the cost of launching Indian satellite.

(c) As of now, there are no approved programmes leading to space station activities.

(d) Does not arise.

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GOVERNMENT OF INDIA
DEPARTMENT OF SPACE

RAJYA SABHA
UNSTARRED QUESTION NO. 1303

TO BE ANSWERED ON THURSDAY, JULY 28, 2016

INDIGENOUSLY MADE SATELLITES

1303. SHRIMATI SAROJINI HEMBRAM:

Will the PRIME MINISTER be pleased to state:

(a) how many indigenously made satellites have been launched during the last two years; and

(b) whether there is any plan of launching more such satellites in the near future, 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) During the last two years i.e. since April 2014 to June 2016, India has launched thirteen indigenously made satellites. These satellites include 6 navigational satellites, 3 communication satellites, 1 earth observation satellite, 1 space science satellite and 2 University/academic institute's satellites.

(b) Yes Sir. Indian Space Research Organisation (ISRO) has planned to launch ten indigenously made satellites in near future. These satellites include 7 communication satellites and 3 earth observation satellites.

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