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# **IBSES: INTERNATIONAL BANK FOR SPACE** **EXPLORATION AND SCIENCES**

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## **ABSTRACT**

The cost of landing man on Mars is estimated to be \$500 billion. This kind of investment is difficult for a single nation. Moreover space exploration involves innumerable aspects of high technical expertise and thus demands sustained international collaboration.

Space exploration projects span many years. It calls for uniformity in policies and reliable funding over long periods of time. Due to the high cost and technical skills involved, poor and developing countries cannot afford space programs.

To address all of these concerns and other related issues we need to establish an entity which can provide solutions to problems involving various aspects (especially economic) of space exploration. This paper proposes the establishment of such an entity, IBSES: International Bank for Space Exploration and Sciences, and evaluates the various factors that can make this possible.

## **INTRODUCTION**

There are several advantages of space research:

1. Space Exploration offers solution to many issues.

Apart from gathering information about outer space, space exploration programs can address some many problems that modern societies face.

Scientists can study the earth's atmosphere and learn to predict weather, climate and natural disasters; we can also look out for planets that can support human life- a solution to the earth's problem of a burgeoning population.

2. It leads to invention and discovery of advanced technology and value addition.

Innovations in space research can also be used in other industries. In fact, they have already led to the development of modern products and gadgets that many of us use. This includes GPS systems (used in many devices), Teflon-coated fiberglass (also used as roofing material), and breast cancer imaging.

3. It generates employment.

Space exploration apart from involving scientists and astronauts, also needs the skills, services and labor of many, mechanics, research assistants, engineers, technicians, doctors and other professionals. If space exploration is discontinued, those involved in space programs would become unemployed, having no means to support their families. Expanding the existing space programs will in fact lead to an increase in employment and job openings.

4. It spreads awareness among people about the universe in which we live. Space exploration provides people a deep insight about the universe and provides them with information about the world they live in. It makes them better prepared for the challenges of life by giving them a larger perspective of the world around them.

The world spends an average of \$ 42 Billion a year on space research <sup>[1]</sup>. The top 10 countries account for 95% of the spending. The List is given below.

<b><u>COUNTRY</u></b>	<b><u>GDP (PPP) [in \$ Trillions]<sup>[2]</sup></u></b>	<b><u>Spending on Space Program [in \$ Billion]</u></b>
<b>United States</b>	<b>19.377</b>	<b>17.8</b>
<b>Russia</b>	<b>3.866</b>	<b>5.6</b>
<b>Europe</b>	<b>20.745</b>	<b>5.51</b>
<b>Japan</b>	<b>5.066</b>	<b>2.46</b>
<b>France</b>	<b>2.833</b>	<b>2.17</b>
<b>Germany</b>	<b>4.122</b>	<b>2</b>
<b>Italy</b>	<b>2.289</b>	<b>1.8</b>
<b>China</b>	<b>23</b>	<b>1.3</b>
<b>India</b>	<b>9.585</b>	<b>1.4</b>
<b>Canada</b>	<b>1.742</b>	<b>0.488</b>
<b>United Kingdom</b>	<b>2.877</b>	<b>0.414</b>

We can observe that nations with a large GDP usually have the resources to spend on space research.

If we examine the list of space faring nations, hardly 8 or 9 nations have the capacity for launching rockets into space <sup>[3]</sup>. All of them have government funded space programs. There are many companies which work with or for space agencies to design satellites or rockets. But only few companies (eg: SPACEX) have independent capabilities to launch vehicles into space. The space industry is a capital intensive industry.

As such most nations find it difficult to invest in space research. Moreover a very high level of skill and technical expertise is necessary for space programs. This results in driving up the overall costs of a space program.

Therefore, only nations with adequate human, material and financial resources coupled with political will are able to afford space programs. Consequently, these nations also benefit the most from such endeavors. On the other hand poor and developing nations cannot afford space program or the benefits accruing from it.

And one of the major hurdles, as we have seen is the lack of capital. If there is adequate capital, every nation can afford to have a space program of its own, as money can buy other resources. Due to a lack of capital, not only poor and developing nations, but also mid-level companies and start-ups cannot launch their own satellites or do space research.

In 1694 The Bank of England was established by an act of the British Parliament for the express (major) purpose of funding the British armed forces (especially the Navy) and enable England to fight wars. Wars were (and still are) a costly proposition and hence needed a lot of resources.

Consequent to the establishment of the Bank of England, the British Navy received funds for modernization. The British Navy then went on to dominate the oceans and enabled the creation and sustenance of a large British empire.

A similar situation is to be found today but of a vastly different nature. 'Waging war' is replaced by Space Research-another costly proposition. Nations of the world are trying to increase their ability to do space research. But due to the high costs involved, many countries and companies are unable to do it.

For the benefit of developing nations, enterprises and to bridge the funds gap, we need to create an International Bank for Space Exploration and Research (IBSES).

By creating such an entity, we will be able to provide adequate funding or at least bridge the funding gap that many nations and companies face in space research.

IBSES will be an exclusive international funding agency (like World Bank, IMF etc) with the express mandate of providing capital for space research. IBSES will do what any central bank/commercial bank does (except issue currency) but at the international level. It will provide loans, take deposits, provide credit ratings of entities involved in space research, provide project specific bonds, raise capital for listed companies (akin to a space stock exchange) through IPOs and ICOs (Initial Coin Offerings using Blockchains and Cryptocurrencies<sup>[4]</sup>) etc.

The actual cost of sending humans to Mars is estimated to be \$500 billion<sup>[5]</sup>. This is greater than the nominal GDP of majority of the world's nations.

Therefore, we need an entity similar to the Bank of England which made British colonization of faraway lands possible.

The cost of manned moon mission was \$25 billion in 1973 <sup>[6]</sup> and \$150 billion in today's terms. NASA in 2005 estimated that it will cost \$10 billion to return to the moon. The cost of a manned mission to outer space and colonization of space bodies thus appears prohibitive. But if an entity like IBSES is established, channelizing resources and funding for the program can be provided.

IBSES can be established by an agreement between nations with a \$100 billion seed fund.

### **IBSES WILL FULFIL FOLLOWING FUNCTIONS:**

(1) It will provide loans to governments for space projects at certain pre-determined interest rates.

(2) It will fund space experiments and explore ways to make the end-products commercially viable.

(3) It will provide funds to poor and developing nations to develop satellite communication and build technical expertise in space exploration.

(4) It will act as international financial adviser to space companies and governments to advise on financial feasibility of space exploration.

(5) It will act as a credit rating agency for space companies and government space programs using which people can invest in space research and exploration.

(6) For specific space projects, for e.g.: launching a constellation of satellites, IBSES will float public bonds which the people can buy and thus invest in the project.

(7) Depending on MOUs drawn up with space powers, IBSES can be a custodian of all space assets (like extra-terrestrial bodies) which can be commercialized on exploration.

(8) It can be lender of last resort to space companies. For eg: a space company wants to conduct commercial mining operations on the moon. IBSES will provide loan to that effect subject to payment of a portion of proceeds of the mining.

(9) IBSES can have a share in intellectual property created as a result of its funding. This will lead to huge revenues for IBSES which will in turn make the institution sustainable.

(10) IBSES will maintain a running account of lending by nations for space explorations on lines of SDR by IMF. Countries can lend or loan money for space research through IBSES.

(11) In case of certain dual use technologies, IBSES will act as an enforcer of extant international law in that area. It will accomplish this through its credit rating systems.

### **ADVANTAGES OF IBSES:**

(1) There is a section of public opinion that questions the huge investments of public money into space programs. Instead, it is advised that governments can use that money for social schemes and poverty alleviation. If IBSES is set up, space agencies need not depend only on government grants. Governments may then need to pay for only the operational or current expense of their space agencies.

The space agencies can, based on their capability, loan money from IBSES. This will also provide better flexibility and autonomy to space agencies within the broad framework of their national laws.



(2) Space exploration can be commercialized.

Various economic sectors in space will open up for commercialization. Space tourism mining, advertisements etc. can be commercialized as the space companies and agencies will be under loan obligation from IBSES. This will improve space awareness among public as companies will spend money to take space related sectors to the public.

(3) More money flowing into space sector will lead to economies of scale. This will happen due to improvement in materials and processes because of enhanced funding into research.

(4) Continued funding of fundamental research on commercial basis. This can be achieved by a fundamental space research endowment (FRE) - A certain percentage of the cost of bonds and loans issued by IBSES (say 2.5%) will be earmarked for fundamental research. For e.g.:- If a space company desires to study the atmosphere of Titan (Saturn's moon), then it can avail funds from FRE. This is because Titan's atmosphere, as of now holds little significance from commercial point of view but its study can greatly enhance our understanding of Extra-terrestrial atmospheres.

(5) Generally, space research projects have long gestation periods. As a result, the payback time will also be long. Colonization of Extra-Terrestrial bodies will take even longer. Here, we are thinking of timeframes longer than 50 years. In such a situation, it might be difficult for governments to have a stable outer space policy or reliable funding for space research. The onus will then be on IBSES. Due to its international nature and total focus on Space Research, it can afford to have uniform policies for extended periods of time.

(6) IBSES will facilitate international collaboration in space research. The funding, manpower and expertise needed in outer space research is of great magnitude. Except one or two countries, it will not be possible for other nations to have viable crewed space exploration programs. Even the one or two exceptional nations will be needing assistance in space exploration areas.

This is due to the vast diversity of technical specialties that are involved in outer space exploration. An international body is very much necessary to co-ordinate the financial and funding aspects of such an ambitious undertaking. IBSES will be to Space Research, what CERN is to Theoretical Physics

(7) IBSES will fund the outer space needs of developing countries who cannot afford outer space research. Many poor and developing countries in Africa, Asia and Latin America have hardly any access to satellite communication or space based resources.

This is partly due to the costly nature of outer space resources. Such a situation prevents the commercialization and optimum usage of the nation's resources. IBSES can provide inexpensive or soft loans to such nations which they can use to buy or lease outer space resources of other countries or develop space capabilities of their own. IBSES can become a partner and earn revenue when such ventures become profitable.

(8) What applies to nations will also apply to space companies which want to commercialize space exploration.

(9) Development of a viable outer space exploration economic ecosystem. A platform is created where many companies and opportunities will open up in the area of space exploration. This will

provide employment to a large amount of youth. Space based economic activity will get a huge boost in the open market.

There is some ambiguity when it comes to various rights regarding outer space. By establishing IBSES we can make a beginning where mankind as a whole will have a working stake in outer space.

In future, international governance is sure to evolve (probably on the lines of the Antarctic treaty). IBSES can be the economic arm of such an Outerspace Governance Regime (OGR). The EU began as an economic entity. i.e. economic activity brought together all European nations on a common platform. IBSES can be one such platform where countries of the world can come together to interact on space related issues.

## **CONCLUSION**

Due to the huge costs involved in various aspects of space exploration, we need to establish an entity which will provide a one-point economic interface and support to space exploration and sciences. IBSES is such an entity, on the lines of a central bank, but fully focused on space exploration and sciences. This has several added benefits. The most important is a uniformity of policies over long periods of time, better commercial exploitation of space resources and boost to fundamental space research.

In the future, international governance is sure to evolve and encompass outer space also. IBSES can be the economic arm of such an Outerspace Governance Regime (OGR). By establishing IBSES we can make a beginning where mankind as a whole (and not any one particular nation) will have a functional stake in outer space.

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