

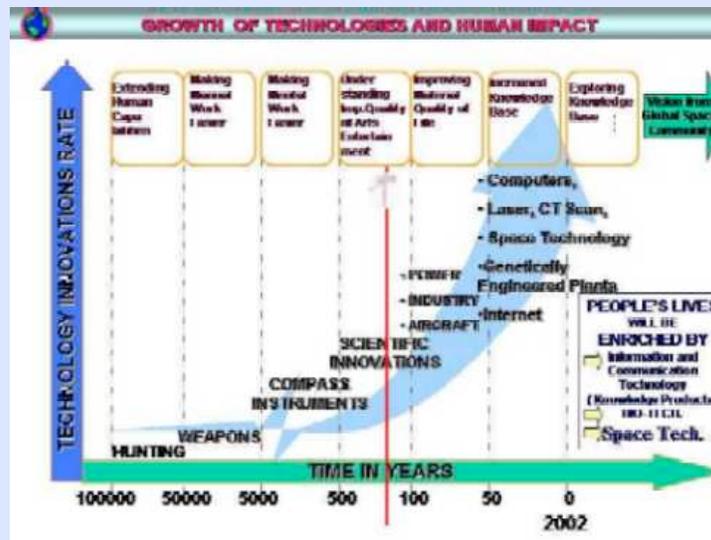
VISION FOR THE GLOBAL SPACE COMMUNITY: PROSPEROUS, HAPPY AND SECURE PLANET EARTH

SPEECH BY DR. A.P.J. ABDUL KALAM, PRESIDENT OF INDIA ON 90th INDIAN SCIENCE CONGRESS

I am indeed delighted to participate in the Space Summit of 90th Session of the Indian Science Congress. As a scientist who has spent major portion of life in building India's first satellite and placing it in orbit, I am glad to see myself among the galaxy of expert scientists from various premier space agencies. Surely, the progress world-over in Space science and technology is amazing and beautiful - a true miracle for all mankind. In this connection I would like to congratulate China for their recent successful launch of SHENZHOU-IV orbiting a recoverable space craft around the earth, moving a step nearer to manned space missions. India have plans for moon mission and reusable launch vehicles.

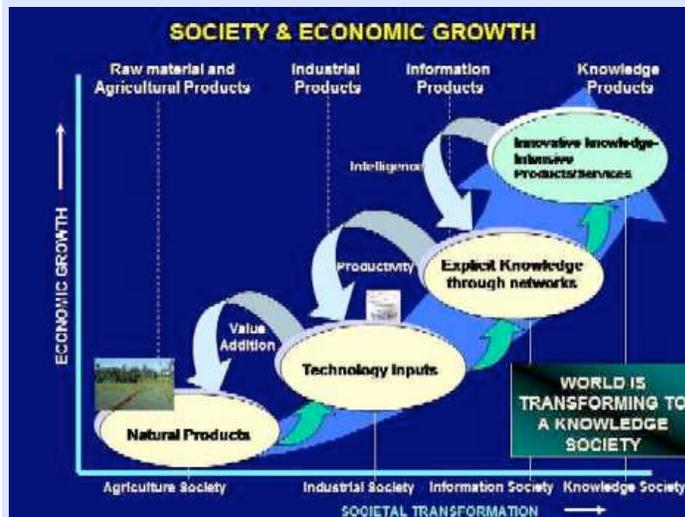
I was asking myself what thoughts I can share with such important space community. As the First Citizen of India, however, I know the dream of my people. I am also aware about their pain and sorrow. We are one sixth of the world's population and at least two thirds of the global population is perhaps going through the same type of crisis and turmoil. How are we going to remove the pain? I have a suggestion to this Space Summit to evolve a vision for a prosperous, happy and secure planet earth. Hence I have selected the topic - **Vision For The Global Space Community: Prosperous, Happy And Secure Planet Earth.** Particularly I would like to highlight the relevance of space technology in providing solutions to the global concerns like energy crisis, water scarcity and mineral exploitation leading to man-planet conflict.

Growth of technologies and human impact



The last century has seen an amazing impact of science and technology on human life and quality of living. From a hunter and gatherer, man has evolved himself through science and technology. People's life will be enriched with knowledge products of information and communication technology, bio-technology and info-space technology.

Society and economic growth



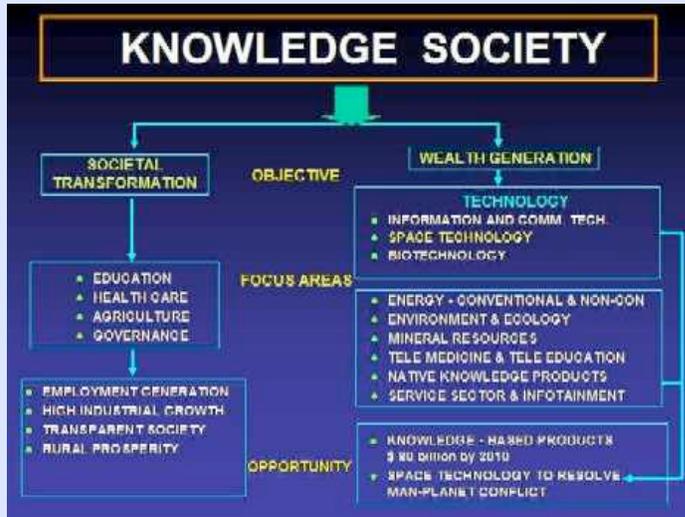
During the last century the world has undergone a change from agriculture society, where manual labour was the critical factor, to industrial society where the management of technology, capital and labour provided the competitive advantage. Then the information era was born, last decade, where connectivity and software products are driving the economy of a few nations. In the 21st century, a new society is emerging where knowledge is the primary production resource instead of capital and labour. Efficient utilisation of this existing knowledge can create comprehensive wealth and also improve the quality of life - in the form of better health, education, infrastructure and other social indicators. Ability to create and maintain the knowledge infrastructure, develop knowledge workers and enhance their productivity through creation, growth and exploitation of new knowledge will be the key factors in deciding the prosperity of this Knowledge Society.

As we progress from one society to another, we have been doing value addition to the processes followed in the previous

societies. Info-space technology can do tremendous value addition in the way we have been doing agriculture, industry, education, health care etc.,

Knowledge Society

In the 21st century, a new society is emerging where knowledge is the primary production resource instead of capital and labour. Efficient utilisation of this existing knowledge can create comprehensive wealth for the nation in the form of better health, education, infrastructure and other social indicators. Such a knowledge society has two very important components driven by societal transformation and wealth generation. The societal transformation has to be through large-scale development in education, healthcare, agriculture and good governance. These in turn will lead to employment generation, high productivity and rural prosperity. Core areas that will spearhead our march towards knowledge society are: Space technology integrated with Information & Communication Technologies which includes generation of conventional & non-conventional energy, environment & ecology protection, mining of new resources from planets, tele-medicine & tele-education, Infotainment.



As society transforms itself through education, health-care, agriculture and good governance, it has now to focus on resolving impending major crisis in the areas of energy, environment, ecology, water and mineral resources. While opportunities exists for markets up to 80 billion dollars by 2010 for knowledge-based products, it is only Space technology that has the capability and capacity to resolve the serious Man-Planet conflict created by severe pollution arising from a fossil fuel based industrial era. The effects of environmental pollution are as dangerous to mankind as the fact that even these resources of oil, gas and coal are not infinite. Fossil fuels will soon be depleted and India with 20% of the world's population and 0.4% of world's oil and gas reserves will have to bear the brunt of the impending crisis. Hence it is in our nation's vital interest, and indeed the interest of all nations that this Space Summit throws light to show the path to liberate the world of the Man-Planet conflict which is now moving from a moderate stage of conflict to a severe stage. Let us not wait for the crisis stage to emerge, when accommodation may not be possible.

Prosperous, happy and secure societies



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Whether a nation has arrived at a stage of knowledge society is judged by the way the country effectively deals with knowledge creation and knowledge deployment in all sectors like IT, Industries, Agriculture, Health Care etc.,

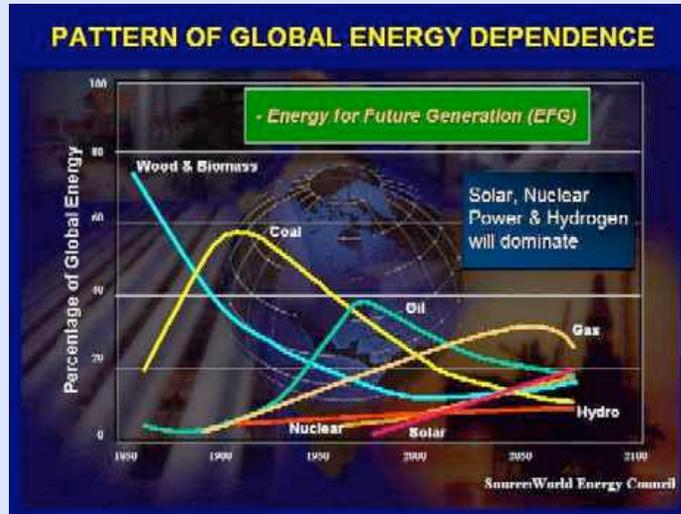
Dynamics of terrorism and violence





World over, poverty, illiteracy and un-employment are driving forward the forces of anger and violence. These forces link themselves to historical enmity, tyranny and injustice, ethnic issues and religious fundamentalism flowing into an outburst of terrorism worldwide. Those who claim to love the Creator but hate His creation are indeed living in self deception. But, society which includes you and me, have to address ourselves to the root causes of such phenomena which are poverty, illiteracy and unemployment.

Energy for future generations



The era of wood and bio-mass is almost neared its end. So to the age of oil and natural gas would soon be over even within the next few decades. Massive burning of the remaining reserves of coal would surely lead the world in ecological disaster. Nuclear power especially a breakthrough in nuclear fusion may be a path. But sustainable economic development and perennial sources of clean energy which would then heal the wounded planet earth's environment and ecology is the only massive use of the solar energy.

Water for future generations

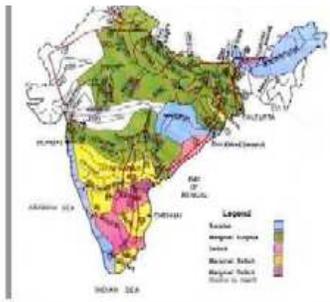
More than 70% of earth surface is having water; but only one percent is available as fresh water for drinking purposes. Currently, more than half of the world's six billion population is without access to safe drinking water and sanitation. Twenty thousand children are dying every day due to polluted drinking water more than the total mortality due to cancer, aids, wars and accidents. By the year 2025 when the world population touches eight billion, as many as seven billion will be living under conditions moderate, high and extreme water scarcity. There is a four-fold path towards safe, fresh drinking water. The first is to re-distribute water supply; the second is to seek new sources; the third is to save and reduce demand for water; and the fourth is to recycle used water supplies.



River Networking



Space science and technology can surely find sustainable regional solutions for abundant and perennial supply of fresh drinking water. In our country, redistribution of water supply through networking of rivers



- HIGH TECHNOLOGY DEPLOYMENT**
1. Increased Cultivation Land
 2. Increased Power Generation
 3. Flood & Drought Control
 4. Drinking Water Availability
 5. Goods Navigation & Transportation
 6. Employment Potential in the above areas
 7. Environmental Improvements
 8. Integration of carbon

is now being taken up as a critical mission. Remote sensing to survey and evolve optimum water routes, environmental mapping and afforestation requirements, and continuous monitoring of the networked water flow through all seasons and at all times may require a dedicated satellite constellation for our networked river systems.

Space technologies for new sources of fresh water

Seeking new water supply sources may also be yet another thrust area for space science and technologies. Reverse osmosis technologies for sea water desalination in new energy efficient manner is rapidly evolving.

- Remote Sensing to survey and evolve Optimum Water Flow Route
- Environmental Mapping - afforestation requirements
- Dedicated Satellite Constellation for Networked River Systems

Space based solar power stations have six to fifteen times greater capital utilization than equivalent sized ground solar stations. Linking Space solar power to reverse osmosis technology for large-scale drinking water supplies to coastal cities is thus yet another major contribution which could be made by space technologies for sustainable economic development through regional solutions for the impending drinking water crisis.

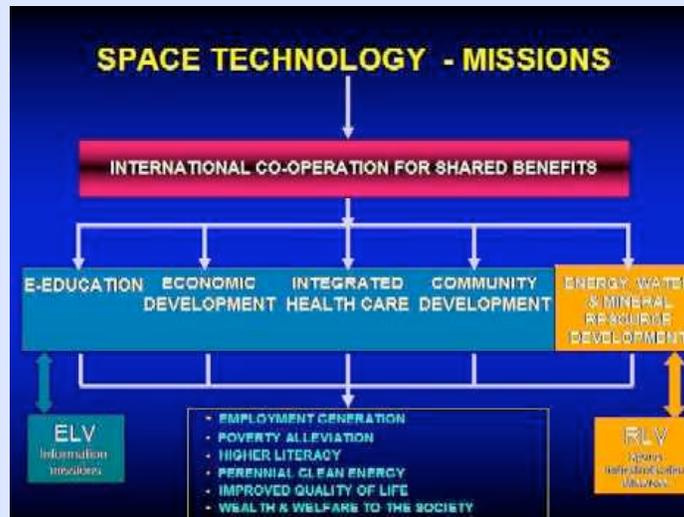
Potentially Dangerous Asteroids

Space community has to keep monitoring the dynamics of all potentially dangerous asteroids. Asteroid 1950DA's rendezvous with earth is predicted to be on Mar 16, 2880. Presently it is about 7.8 millions kilometers away. The impact probability calculations indicate a serious condition of 1 in 300. In such a crucial condition, we should aim to deflect or destroy this asteroid with technology available with mankind. Definitely this problem belongs to space technology community. It needs political support and international cop-operation to destroy such asteroids.

Societal transformation

Can Space technology provide solutions to these fundamental problems of man and society? Surely, it has already begun to do so. The social values added and enhanced social productivity is largely due to satellite imagery for land and water management. It is also due to satellite based e-education and connectivity to community activities for sustainable economic development. But, this is just a beginning and the tip of the iceberg.

Space technology - missions

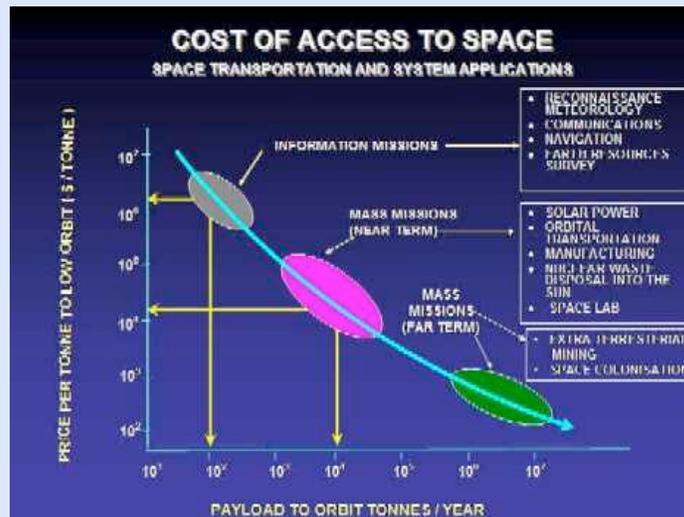


It is only international cooperation that can yield shared benefits beyond expendable launch vehicles and spacecraft for information missions in the areas of tele-communications and imagery. Solutions to the Man-Planet conflict for energy, water and mineral resources may be discovered in a new 21st century Space era of low cost access to space with re-usable launch vehicles.

Commercialisation of Space

The global space industry has had a forty year period of unprecedented growth and prosperity. But as would be seen from the trends, global space markets are declining. The market is rapid shrinking for information satellites. The geo-stationary orbit is nearly full, and new earth orbits need study and exploration, especially use of small satellites in equatorial low earth orbit. Currently, global space industry has a capacity to launch over 200 tonnes of satellites every year. However, the forecast demand will consume less than half of this established capacity. A bitter price war is on to capture this limited market. New space missions for the benefit of all mankind are yet to be formulated. Space launch vehicles which are now in use are just an out-cropping of ballistic missiles proliferated by geo-political rivalry. The cost of access to space forbids further expansion of space activities. No exit strategy is possible for such a vast and prestigious industry. Hence, the global space industry is in a state of disequilibrium being unable to move either forward or exit from the market.

Cost of access to Space



This state of disequilibrium is only a temporary stage. Further expansion of man's activities in Space can and must take place only in a global cooperative manner that will integrate all nations' Space capabilities to reduce Man-Planet conflict patterns. This calls for reduction of cost of access to space by several orders of magnitude to enable the global space community move out of the era of information missions into an era of mass missions and find solutions for energy, water and mineral crises which is soon to engulf mankind.

Cost reduction strategies

It may be interesting to this space community to know that you are in Bangalore just 200 kms away from Srirangapatana, the birthplace of world's first war rocket. In 1792, Tippu Sultan, the ruler of Mysore State, in the war against the



British, used war rockets against the cavalries and defeated the British force. He was the first in the world to introduce rocket forte in the Army. Though India was a latecomer in the modern space activities, it is one of the five nations today placed its own satellite using indigenous GSLV.

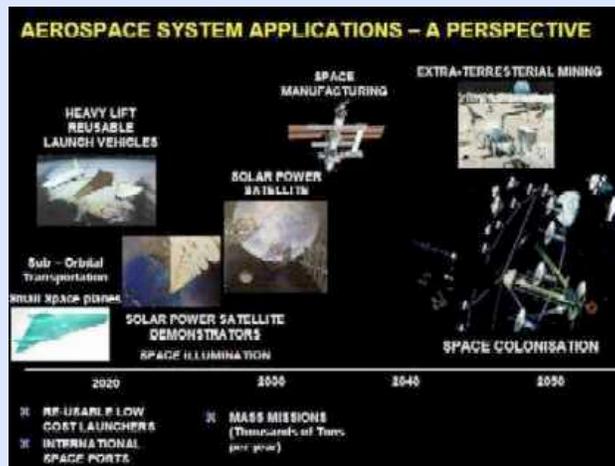
In the past, countries which participated in the industrial revolution became developed countries due to economic strength and took the lead in space activities also. But today, having crossed the industrial age, we are in the knowledge age. India is a country, which has tremendous capabilities to be one a leading country in information technology. Space technology combined with information and communication technologies will provide greater opportunities for India to be one among the lead countries for future space activities.



The Indian concept of hyper-plane, a fully re-useable system is an innovation in rocketry providing a payload fraction of 15%, drastically reducing the launch cost to 1/50 of the current cost elsewhere. Therefore, it is an opportune moment for countries to join together with India and launch major universal missions to share the benefit of space to the whole mankind, rather than commercial competition. This will enable narrowing the difference between developing and developed nations. The key to new opportunities for the global space community lies in the creation of new markets arising from mankind's determination to reduce the Man-Planet conflict and embark on solutions for facing the impending crises for energy, water and mineral resources. Typically, solutions for energy and water for India have been briefly presented.

Formulating of such new missions would thus lead to better capacity utilization, and the creation of low cost space transportation. India is already working to evolve innovative design concepts for both small as well as large payloads into space. Both single and two-stage to orbit RLV concepts are being examined. The goal here is to reduce the cost of access to Space by one and two orders of magnitude. Even a small scientific breakthrough, for example, in air breathing propulsion systems may lead to a Space transportation revolution. The world Space community has a huge stake in such breakthrough research in advanced inter-disciplinary and inter-institutional collaboration. A global effort is thus needed to quickly demonstrate at least on a small scale the technology for low cost access to Space.

Aerospace system applications - a perspective



The Space Summit may therefore, have a long-term 50-year perspective from small scale technology demonstrations of re-usable launch vehicles through small solar power satellite demonstrations and small satellite constellations to heavy lift RLVs for large scale solar power satellites, space manufacturing and ultimately to space colonization and extra terrestrial mining.

Space technology and integrated strength



India, with its large population and depleting natural resources of energy, water and minerals may collaborate with the world Space community to win the battle, and move forward to resolve the Man-Planet conflict. In the global Space community, there are over one million scientists, engineers and technicians; huge investments in infrastructure and a strong mission management culture which can lay the foundation for long-term partnership and international cooperation including the commercialization of Space and targeting to move towards a 100 billion dollar space industry business in the coming years. India has established core competence with talented manpower and can build reusable launch vehicles in a cost effective manner. India is thus a strong contender for the



consortia of space agencies for future mission. India also has considerable infrastructure and experience in the use of space for sustainable economic development. This experience can be used by other nations for their socio economic development under common global missions.

Space technology and socio-economic development



It would thus be seen that space technology is central to and enjoys special links with major aspects socio-economic development. This includes information technology, infrastructure including electric power, education and health-care, agriculture and agro food processing, strategic industries and geo-strategic initiatives. All this is bound to lead to rapid economic growth and a high level social security.

Conclusion

In conclusion, the Space Summit thus needs to address itself as to how we may initiate a movement towards a **Common Minimum Global Space Mission**, to address the impending human crises for energy, water and minerals. Such a mission needs to have a 50-year perspective for international cooperation, but more importantly the Summit may identify an immediate strategy for change and an action plan to move forward.

Above all, we must recognize the necessity for the world's Space community to avoid terrestrial geo-political conflict to be drawn into outer space, thus threatening the space assets belonging to all mankind. This leads on to the need for an International Space Force made up of all nations willing to participate and contribute to protect world space assets in a manner which will enable peaceful use of space on a global cooperative basis without the looming threat of conflict on earth. I am sure, India would contribute its best to the creation and sustenance of such an International Space Force.

The advantage of space science and technology today is its highly inter-disciplinary nature, cutting across institutional boundaries. My suggestion to the global space community is: "if you have knowledge, let others light their candles at it...." And thus share the goodness of life and mind across all mankind.

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