

1. EXECUTIVE SUMMARY

- The "Information Age" has brought us the digital Internet world, introducing high potential technologies that promise to revolutionize many aspects of our society. The new and emerging areas of applications in distance learning, disaster relief and telemedicine, are expected to change old paradigms especially in developed countries. Worldwide, except for the G8 countries, the healthcare and educational system suffers from lack of professional resources, availability of supplies and information infrastructure.. Lack of access to medical information will further widen the health care gap between those who "have" and those who "do not have" the updated medicine knowledge. Improvements in these areas are critical for developing countries in the new Millennium.
- In the foreseeable future expanding cable (fiber optic) network will not provide access to the most needy in remote areas, especially in developing countries outside of major urban areas. The most affordable and efficient approach can be provided by using the Space Telecommunications. Satellites are the enabling tools capable to reach beyond the geographic and economic boundaries. Furthermore, satellites offer the most efficient means of broadcasting that is delivering information from one point to multiple points.
- We envision MEDSAT as specially tailored telecommunication system for Telemedicine, Disaster Relief, and Distance Learning in the Developing World. The system will consist of two small satellites placed on the geostationary orbit above the Atlantic and Indian Oceans. First satellite will provide services for South and Central America and part of Africa. It will cover also the East Coast of the USA and part of Europe. The second satellite will cover all Asian regions, part of East Africa, as well as Japan and Australia (the examples of communication zones see in section "Description of Technology").
- The creation of informational network between developing countries and the USA is extremely important for all participants. The potential for rapid spread of infectious diseases, due poor sanitation, natural disasters, and local conflicts worldwide, especially in Africa are directly connected with national health security of the USA.
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- The technical aspects of the project have been carefully studied and developed by an international team of experts from the USA and FSU, assembled by EWSSC of the University of Maryland. EWSSC of UMD has strong experience in intercultural international programs for education of foreign students in telemedicine as well as establishing telecommunication links and teleconferences using Internet protocols. In addition, EWSSC developed new software for ballistic evaluations for GEO satellites. The technical feasibility study of the MEDSAT project was supported by NASA.
- For healthcare, MEDSAT telecommunication systems will provide remote access to diagnostic and treatment protocols and health maintenance and public health management interactive databases on pharmacology, epidemiology, geographical distribution of diseases, and treatment modality. It will bring competent medical advice in cases of emergency, training courses for healthcare professionals and continuing education to planning future medical services.

For education, this project would provide multimedia computer-based programming to allow self-paced learning by students (particularly important in multi-grade environments often found in rural schools), access to supplementary teaching materials, access to Web-based library materials, opportunities to exchange lesson plans and experiences with administrative management systems in their native languages. The availability of these elements is critical to improving the quality and productivity of education in an era of teacher and funding shortages (details in section

Distance Learning).

The same system can provide immediate access to telecommunication services for disaster relief operations. We believe that there will be many opportunities to provide services to a variety of customers. The U.N. Secretary General Mr. Kofu Annan proposes, "to harness new Technology to the United Nations humanitarian purposes, with plans to distribute medical information via the Internet to poor countries." He promises a U.N. Information Technology Service to train groups in the developing world in the uses and opportunities of information technology. This proposal is complimentary to a UN plan to provide 10,000 Developing World hospitals with access to up-to-date medical information via the Internet. MEDSAT project will allow for philosophical approach of 'thinking globally but acting locally' in health care.

The proposed baseline configuration for the MEDSAT project consists of small satellites in GEO assumptions with the following:

- The smaller the satellite (six to eight transponders) the easier to place it in GEO orbital slot with co-location will a regular satellite.
- The critically innovative technological step for the MEDSAT project is the use of a plasma propulsion module in order to replace the Apogee Kick Motor (AKM) for delivering the satellite from Geo-transfer to Geo-stationary orbit. The use of plasma thrusters serves for substantial mass saving and, reduces the delivery cost per transponder by up to 50%.
- Small (lighter) satellites, utilizing mass saving plasma propulsion do not need heavy dedicated launchers for insertion into orbit. The launch to GEO accounts for approximately 50% of the entire cost of a current satellite. MEDSAT satellites can be delivered in orbit as secondary payload piggyback on heavy launchers. Another option is to utilize a whole new class of smaller to medium size rockets that are substantially less expensive. The use of plasma thrusters, in replacing or decreasing the size of the AKM brings another advantage. Satellites can be launched from sites far from the equator, such as existing sub-Arctic Russian launch sites. Here plasma propulsion would compensate for the large amount of fuel needed in order to change the orbital plane. Therefore, the plasma propulsion is an operationally acceptable technology.

In the development of the MEDSAT concept, the East-West Space Science Center has received encouragement, support and sponsorship from

- Dr. Franklin Chang-Diaz, Astronaut, and Director of Advanced Space Propulsion Laboratory (ASPL) in JSC NASA has provided invaluable support to the EWSSC both through financial support and through pledges for organizing ground telemedicine infrastructure support in Central and South American States, especially Costa Rica, through contacts with former President Fueres.
- Finally, the MEDSAT project would not have been possible without the support of Dr. Arnauld E. Nicogossian, MD, Associate Administrator Office of Life and Microgravity Sciences and Applications (NASA).

All aspects of the proposed scenario - technical, organizational and financial - are based on a detailed feasibility study. The Project team completed the evaluation of the plasma propulsion technology and existing thrusters, available from different manufacturers. A number of topical workshops on the design of small satellites and their integration with plasma thrusters have been emulated. The technical analysis carried by the East-West Space Science Center (EWSSC) showed compatibility of MEDSAT with a number of launchers.