

Rationale for a Mexican Space Development Program

Recommendations for the new Presidential Administration of President Felipe Calderon and the Mexican Congress LX Legislature

A Paper by the Mexican Space Society (SEM)

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Executive Summary

The **Mexican Space Society (SEM)** is making a number of recommendations to the new President Felipe Calderon Hinojosa administration and Congress that focus attention on the social and economic benefits that Space related technologies can make to Mexico's and the world's future. They involve the establishment of a **Mexican Space Commission** involving many Federal Departments and chaired by the Secretary of Government (SEGOB), the ratification of the **Mexican Space Agency (AEXA)**, a goal long recommended by SEM.^{1,2,3} As part of AEXA's responsibilities we propose the development of a Mexican Office of Manned Space Flight utilizing new commercial space companies to carry out space missions.

We also make a variety of specific recommendations affecting the Mexican Secretariats of Education (SEP), Communications and Transportation (SCT), Foreign Relations (SRE), Tourism and other government departments whose responsibilities involve scientific and technological progress. These recommendations are designed to put a human face to the future of Mexico and to focus the Government's use of its own resources. Our recommendations also advocate the use of Private Sector and commercial resources in achieving these benefits. We have numbered the Recommendations in the Executive Summary as a matter of identifying priorities.

¹ Arturo Carreno, an interview to Jesus Raygoza B., "Sociedad Espacial Mexicana, Otra Opcion – Hace 24 Anos del Gran Salto a la Luna", *Conciencia Publica*, No. 223, 19 Julio 1993, p. 45.

² Declan O'Donnell, (ed.), "USIS Forms Strategic Alliance With Mexican Space Society", *Space Governance Journal*, Vol. 4, No. 1, January 1997, p. 70.

³ Marsha Freeman, "Ibero-America Needs a Space Agency", *21st Century Science & Technology*, Vol. 15, No. 1, Spring 2002, p 46.

The Mexican Space Society (SEM) has focused on the Development of a **Mexican Space Council** and the creation of a **Mexican Astronaut Corps** because we believe that the human face of the space program is most necessary for everything that follows. The Mexican President and Mexican Congress must enjoy the support of the Mexican people and the enthusiasm of its students and young people for its advances in space as they will be the primary recipients and the justification for its creation.

We also discuss other space-related recommendations that will further advance this political and social agenda for the future.

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Report # 2 Report on the Missions of a Mexican Astronaut Corps

Report # 3 Report on Launch Sites Task Force

Report # 4 Develop a Legal, Administrative, and Financial plan for AEXA

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Introduction & Background

Cybernetics Engineer Fernando de la Pena Llaca submitted a proposal to the Mexican House of Representatives' Committee on Science and Technology on October 25, 2005 proposing the establishment of the Mexican Space Agency (AEXA).⁴ Approximately 9 years before, invited by then-Representative (PAN–B.C.S.) Luis Ruan Ruiz, Jesus Raygoza Berrelleza had also proposed a national space agency in Mexico in testimony before the Committee on Science and Technology on April 23, 1997.⁵ Engineer de la Pena, supported by Rep. (PRI–Hidalgo) Moises Jimenez Sanchez, in April 26, 2006 the Mexican House of Representatives approved the formation of AEXA to stimulate Mexico's science, education, technology, and economic development and this bill is now waiting approval by the Mexican Senate.⁶ Although Mexico does not have any indigenous capacity to launch rockets or any indigenous facility in space **the Mexican Space Society (SEM) believes there is a justification for the creation of a Mexican Astronaut Corps and many other useful space related projects with the advent of new commercial space transportation initiatives.**

⁴ Fernando de la Pena Llaca, www.tulancingo.com.mx/delapena/aexa/htm

⁵ Jesus Raygoza B., "International Branch Report: USIS-Mexico", *Space Governance*, Vol. 5, No. 1, January 1998, pp. 31-39.

⁶ Rep. Moises Jimenez Sanchez, www.gaceta.diputados.gob.mx/Gaceta/59/2006/abr/20060426-III.html

Other proposals were submitted between 1997 and 2005. Two of those were done by Telecommunications Engineer Patricio Gonzalez-Quintanilla.^{7,8}

New Commercial Space Initiatives

Several commercial space transportation companies are attempting to provide sub-orbital and orbital transportation services since Burt Rutan won the Ansari X Prize competition with his SpaceShipOne. These include Richard Branson's **Virgin Galactic Company** which is working closely with Burt Rutan's **Scaled Composites** which built and flew SpaceShipOne. This suborbital service should be in operation by 2008. The company's now has thousands of ticket purchasers who are willing to pay \$200,000 for a suborbital ride into space in a vehicle carrying 8 persons. **The U.S. Federal Aviation Administration (FAA)**⁹ has recently published draft regulations for passenger operations.

This initiative will operate from a new spaceport developed near White Sands New Mexico¹⁰ approximately 150 miles north of the Ciudad Juarez/El Paso metropolitan area. Scaled Composites is also working to develop a vehicle, which could provide access to Low Earth Orbit. While they have not publicly committed to a timetable to achieve this goal those close to the company expect them to develop a prototype vehicle by 2010. If they are successful this will also open a low cost door to Low Earth Orbit.

Similar efforts to provide suborbital access to space are being made by the **Blue Origins Company** funded by Jeff Bezos of Amazon.com which is developing its own launch facilities in West Texas approximately 100 miles east of Ciudad Juarez/El Paso metro area.¹¹ **Rocketplane/Kistler** which recently won a \$207,000,000 contract from NASA (COTS) is also working to develop both suborbital and orbital access to the International Space Station by 2008/2009.^{12,13}

Space X Corporation, started by Internet pioneer Elon Musk, has also won a NASA (COTS) contract of \$278,000,000 to develop a launch system to the ISS within the same 2009 timeframe.

¹**Bigelow**¹⁴ is also developing an inflatable habitation module for low earth orbit with technology initially developed by NASA. A _ scale model of this module is currently in

⁷ Patricio Gonzalez-Quintanilla V., "Proyecto de Iniciativa Presidencial para el Establecimiento del Programa Aeroespacial Mexicano", submitted to Vicente Fox Quesada, President of Mexico, Mexico, D.F., September 2001, p. 3.

⁸ _____, "Propuesta para la Reactivacion del Sector Aeroespacial de Interes Publico", submitted to Arq. Pedro Cerisola y Weber, Secretary of Communications and Transportation, Secretariat of Communications and Transportation (SCT), Mexico, D.F., February 2003.

⁹ U.S. Federal Aviation Administration, www.faa.gov/regulations_policies/

¹⁰ www.space.com/missionlaunches/ap_bezos_spaceport_050315.html

¹¹ Blue Origins Company, www.carriedaway.blogs.com

¹² Rocketplane/kistler, www.rocketplane.com/en/company/press/2006/0818a.asp

¹³ Rocketplane/Kistler, www.rocketplanekistler.com/

¹⁴ Bigelow, www.bigelowaerospace.com

orbit having been launched by a Russian rocket. They are working to develop a _ scale module within another two years and look to have a full scale manned facility developed by 2012.

This facility is designed to be a destination for space tourism. Such facilities would provide a relatively low cost access to low earth orbit for large numbers of tourists on a regular basis.¹⁵ These facilities could also greatly reduce the cost of routine government sponsored space operations. By providing a cost competitive option to expand the International Space Station its human capacity also might be affordably expanded.

The **Chinese** have announced their intention to create a manned facility in orbit about 2015. They are also engaging in a wide ranging set of cooperative efforts in space with other countries.¹⁶ They have a similar potential opportunity to expand their planned presence in space through cost effective commercial partnerships.

Significance of Commercial Space Activities to Mexico

Some of these new initiatives are located right on Mexico's door step. These commercial initiatives do not require Mexico to duplicate investments and research in order to place Mexicans in space for a very modest cost.

By creating a Mexican Astronaut Corps the country can signal its intent to be part of this new wave of technology. A Mexican Astronaut Corps can provide a means to reach out to potential international and commercial partners in space exploration, space tourism, scientific, and educational initiatives. Perhaps the greatest significance of a Mexican Astronaut Corps is its impact within the country on the nation's education system and in providing a focus for public attention on how space technology can be used to benefit the nation's economy, protect the nation's natural resources, and shape the nations technology. **A Mexican Astronaut Corps can be a symbol of the government's determination to develop new opportunities for its citizens.**

Potential Launch Sites and Associated Facilities

As the commercial space industry develops internationally Mexico should position itself to take advantage of new opportunities. **Its extensive Pacific West coast has the potential to be the site of launch operations and especially for aircraft style launch systems** such as those planned by Rutan's. Scaled Composites Company. Sites such as Cabo San Lucas, Manzanillo, and Cabo Corrientes near Puerto Vallarta, Mazatlan, and Acapulco with established airports, tourism facilities, and a significant community infrastructure might also with additions serve as spaceports. **Similar opportunities might also exist on the Mayan coast in Quintana Roo near Cancun,** where 40% of Mexico's tourism occurs.¹⁷

¹⁵ www.ameinfo.com/78230.html

¹⁶ China's orbital manned facility, www.space.com/business/technology/060222_techwed/spaceadven

¹⁷ "Cancun: Rebuilt—and going upscale?", *Chicago Tribune*, December 3, 2006, p. 9.

Recommendations

I. Recommendation 1: Create a Mexican Space Council – Page 8

- Report # 1 Inventory all space related activities & resources
- Report # 2 Develop a Legal, Administrative, and Financial plan for AEXA
- Report # 3 Report on the Missions of a Mexican Astronaut Corps
- Report # 4 Report on Launch Sites Task Force
- Report # 5 Develop a Plan for further Development of Space Related Projects
- Report # 6 Provide Prioritized Recommendations For;
 - The President,
 - Congress
 - Federal Departments

A first priority would be to organize a **Mexican Space Council** of Mexican Federal Departments that utilize, plan, space related technologies. This Mexican Space Council should be chaired by the Secretary of Government (SEGOB) so that the importance of its initiation will be clear from the beginning and that this council provides a clear focus for the needs and opportunities of government action and also in support of private commercial initiatives.

Report # 1

The first responsibility of this Council will be to inventory all government space related activities and expenditures with staffing assistance from the Secretariat of Finance and Public Credit (SHCP) and to issue a summary report by the end of 2007.

Report # 2

The Mexican Space Council would be assigned staff members for this administrative responsibility and for the development of an administrative plan and program budget. This Office would be one of the first responsibilities of AEXA.

Report # 3

Specific mission proposals for the Mexican Astronaut Corps should be under development as the third recommendation of the Mexican Space Council. Departmental and Congressional budget approvals for such missions will further define the training requirements, contracts, timetable and financial requirement of the sponsoring government departments and commercial sponsors. The definitions of these missions will create a more forward looking timetable, administrative, legislative and financial plan closely coordinated through the Secretariat of Finance and Public Credit (SHCP), the Secretariat of Economy --, and Secretariat of Social Development (SEDESOL). Many specific ideas and proposals can be expected in the earliest considerations of a Mexican Space Council but they must be refined through the normal legislative and federal administrative departments so mature judgments can be made about priorities, resources, and timetables, and partnerships.

Report # 4

The Launch Site Task Force

The development of spaceports will in the future be as economically significant as airports are today and Mexico cannot fail to be in the forefront of planning and to be competitive in these matters. As part of a Mexican Space Commission initiative the departments of Communications and Transportation (SCT), Secretariat of Tourism, Secretariat of Coast Guard, and Secretariat of National Defense (SEDENA) should create a working task force to identify both Mexican potential launch sites, technical and investment requirements, and also potential limitations and environment issues associated with these type of future developments.

This task force should also be tasked with monitoring other international efforts to develop spaceports and commercial space initiatives internationally as have been announced in Abu Dhabi airport of Ras Al-Khaimah, United Arab Emirates (UAE)¹⁸, and Singapore¹⁹, the United States (Spaceport American in New Mexico and a newly approved spaceport in Oklahoma), and Australia.

Report # 5

The fifth objective would be the development of a plan for further development of space related technologies and activities in Mexico and what national economic, technological, environmental, educational, and social benefits could be gained and what investments will be required. The Mexican Space Council should draw broadly on Mexican Society in public hearings designed to attractive public attention and input. **A key aspect of this report is to identify opportunities and create a supportive climate for a partnership of both public and private investments.** Much of what can be accomplished will be done with entrepreneurial capital and commercial organizations and resources but this will not occur without the advocacy and support of the Mexican government. It is again recommended that this report be prepared with staffing from the Secretariat of Public Credit (SHCP) and Secretariat of Public Operations to identify needed incentives (tax incentives) as well as barriers in regulation and law, operations or facilities to support both public expenditures as well as private investments.

A number of reports have been done on the return on the economic investment that the United States of America has made in its space program, specifically NASA. These analyses have indicated a positive return on this investment and have resulted in not only many scientific discoveries in the exploration of the Moon and the solar system and a great advancement of in astronomy, but also in applied science and engineering. The Mexican government can similarly look at problems facing Mexico, the potential of space related technologies to create national benefits, and the investments needs to realize these benefits. Some investments would be most appropriate for the Mexican government. Others may result from private and commercial investments encouraged by the government. Proposed investments must be analyzed and prioritized

¹⁸ United Arab Emirates, www.ameinfo.com/78230.html

¹⁹ Singapore, www.space.com/business/technology/060222_techwed/spaceadven

Report # 6: Domestic and International Education and Public Outreach Roles

Concurrent in the planning for astronaut training, mission schedules, and specific flight activities would be a schedule of educational, public, and scientific support events and a process of activities designed to inform the Mexican people about the progress and impact of this program.

Initiatives involving other nations are an important part of support that can be provided by the Secretary of Foreign Relations (SRE) which should participate in the Mexican Space Council. As the lead time for international cooperation in space missions can be considerable, the intergovernmental aspects of such cooperation will need to occur early in the efforts of the Mexican Space Council as they consider specific missions purposes and requirements for international partners.

Report # 7

A seventh objective of the Mexican Space Council would be to provide specific recommendations for action to the President, the Congress, and the Federal Departments & the Mexican people. These recommendations would not only guide the charter and development of the new AEXA but would highlight the wide range of efforts across both the Mexican government and commercial sectors. Some actions can be accomplished quickly by Executive Order of the President and by order of Federal Department Secretaries. Other recommendations will require the action of Congress.

It is proposed that this work be completed by December of 2007 with a significant public announcement at the beginning of 2008. A draft timetable is presented in order to suggest a feasible timeline for action as in Appendix I, Page 21.

II. Recommendation 2: AEXA Approval by Senate, House of Representatives, and President – Page

Action Item #1: Mexican Astronaut Corps Development

- A. Astronaut Selection,
- B. Astronaut Sponsorship Training and
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The creation of AEXA would realize the recommendations of the reports of the Mexican Space Council and the action of the President, Congress and the Department Secretaries. Its initiation could begin in 2008. This should coincide with the beginning of commercial suborbital services. The announcement of both government department and commercial sponsors of Mexican astronaut positions would begin the astronaut recruitment process by an Office of Astronaut Services specifically charged with developing this program.

The approval and Development of the Mexican Space Agency (AEXA) is an important step forward for but Mexico' interest in the future and in space activities lies not only in AEXA but in many government departments and commercial organizations coordinated and focused by the Mexican Space Council. AEXA's central role will be to get Mexican in space and conduct space missions. Perhaps its most important impact will be on Mexican young people and in stimulating their interest and knowledge of these opportunities for economic and scientific development and working in close coordination with other governmental departments including an especially close liaison with the Secretary of Public Education (SEP).

Action Item # 1: Mexican Astronaut Corps Development

We would propose an approach to developing a Mexican Astronaut Corps aligned with the new commercial space industry in a way utilizes a blend of both government and commercial financial support.

A. Astronaut Selection

First a Mexican Astronaut Corps should draw on both men and women which represent cross sections of Mexican Society. While astronauts will come from traditional sources such as Air Force pilots, potential recruitment should also be expanded to include Mexican Airlines personnel, and representatives from education, commercial media, medicine, and those concerned with space sciences.

B. Astronaut Sponsorship

As symbols of significance for both commercial and public interest the financial support of Mexican Astronaut positions should be supported by specific sponsors, which reflect the diverse interests and talents of the Astronaut Corps. The role of astronaut should reflect the roles and interest of their sponsoring agencies so they maintain the focus on their sponsor's mission in space and as a spokesperson for their sponsor's activities on Earth.

We propose the Secretariat of Public Education (SEP) should support at least two such positions, Commercial Media two such positions, Commercial Airlines, two such positions, and science related astronauts should simultaneously be supported by departments such as the Secretariat of National Defense (SEDENA), the Secretariat of Energy (SENER), Secretariat of Agriculture, Ranching, Rural Development, Fisheries and Food Supplies (SAGARPA), Secretariat of Environment and Natural Resources (SEMARNAT), and as their science and research needs dictate. The Mexican University community would be closely involved in both science and engineering missions and as a source of identifying astronaut candidates with advanced science credentials.

The greatest significance of the Mexican Astronaut Corps will be their impact on Mexican Society. **They will train and fly in space for a variety of purposes but they also must be chosen for their ability to connect with people and to communicate the purposes and importance of their diverse missions to both the Mexican and international publics.** These Astronauts will also be Mexican ambassadors to other

nations working with government agencies in other nations in scientific and technology initiatives and with commercial partners as well.

The Mexican Space Society expects that many people may question whether a Mexican Astronaut Corps is realistic or even feasible. Malaysia can provide an example for Mexico. Malaysia, a much smaller in population, territory, and its economy than Mexico, (a country with no rockets, launch facilities, or space station) recently announced its intentions to send a Malaysian to the International Space Station (ISS) in 2007.²⁰ It announced a competition for an astronaut position and has signed an agreement with Russian for the training of its astronaut. This has generated great excitement and attention of Malaysian students and drawn attention to Malaysia's ambitions in space and to be an international competitor in space exploration, science and technology. Indeed Malaysia has announced its ambition to go to the Moon.²¹ We admire both the creativity and ambition of the Malaysian government and naturally expect the Mexican government to respond to this competition for the future.

C. Astronaut Training

Development of Training Resources and Programs and Mission Proposals

Aspects of astronaut training might be conducted via contract with the Mexican Air Force, with commercial airline programs, and with providers of both government and commercial space transportation services in foreign countries such as the U.S. or Russia. The Office of Astronaut services will need some time to develop both physical and contracted support of a Mexican Astronaut Corps. It will need to define selection criteria and organize a process for consideration of astronaut candidates from agencies and commercial organizations sponsoring astronaut positions. This process should be completed by the end of 2008

D. Astronaut Missions

Announcements Specific Missions Proposals

Specific mission proposals for the Mexican Astronaut Corps will have been developed in the second report of the Mexican Space Council. Departmental and Congressional review and budget approvals for such missions will further define the training requirements, contracts, timetable and financial requirement of the sponsoring government departments and commercial sponsors. The definitions of these missions will create a more forward looking timetable, administrative, legislative and financial plan for AEXA and closely coordinated through the Secretariat of Finance and Public Credit (SHCP), Secretariat of Economy and Secretary of Social Development (SEDESOL). Many specific ideas and proposals can be expected in the earliest considerations of a Mexican Space Council but they must be refined through the normal legislative and federal administrative departments so mature judgments can be made about priorities, resources, and timetables, and partnerships. All of these considerations will influence the selection of Mexican Astronaut Candidates and of an announcement of Mexican Astronaut Missions. The announcement of Mexican Astronaut Missions would logically coincide with the announcement of the selection of Mexican Astronauts.

²⁰ Malaysian space plans, www.space.com/news/ap-050823_malaysia_astronaut.html

²¹ Malaysian lunar plans, <http://news.bbc.co.uk/2/hi/asia-pacific/4192166.stm>

Concurrent in announcement of astronaut selection, and scheduled missions, would be a schedule of educational, public, and scientific support events and a process of activities and international partnerships designed to inform the Mexican people about the progress and impact of this program (consistent with the Reports #3 #5 of the Mexican Space Commission). The role of the Secretary of Foreign Relations as a member of the Mexican Space Council will be critical because the lead time for international cooperation in space missions can be considerable. The intergovernmental aspects of such cooperation will need to occur early in the efforts of the Mexican Space Council and in close coordination with the planning activities of AEXA as they consider specific missions purposes and requirements for international partners.

Astronaut training would be conducted in 2010 with suborbital flights beginning in the later part of that year. A more extensive timetable of specific missions will flow from the administrative work and report of the Mexican Space Council and AEXA This timetable will instruct the training schedule, contracts, and project flight schedule.

Beginning with the accomplishment of suborbital flights in 2010 the Mexican Astronaut Corps will be ready to initiate missions into Low Earth Orbit as those opportunities are developed through agreements concerning the operations of the International Space Station (ISS), commercial Space Tourism orbital facilities, and/or the development of a Chinese manned lab/space station in 2015.

Action Item # 2: Development of a Mexican Spaceport Authority

In follow-up to Report 4 of the Mexican Space Commission AEXA should establish a Mexican Spaceport Authority to both support and regulate the activities of pertaining to the access to space from Mexican land, air, and sea space. All launch and safety responsibilities should be coordinated through this office which should also work closely with the Secretary of Defense.

Action Item # 3: Launch Facility Development for Sounding Rockets & Balloons

It is also recommended that Mexico initiate a sounding rocket facility for the purposes of supporting Mexican higher education and research on the West Coast at sites such as Cabo San Lucas or Cabo Corrientes. This facility would also be designed to support a program of scientific balloon activities as a means of supporting low coast upper atmosphere and space observation activities and the use of rocket/balloon rockets launched from balloons to inexpensively achieve suborbital flights of great altitude. It could also serve as a venue for student based and tourist based sport rocket activities and encourage teams of student participation in the preparation and launch of rockets and scientific payloads. Hands-on experience is a necessary and powerful means of training young engineers and scientists and this facility would strengthen Mexico's science and engineering infrastructure.

Action Item # 4: New Aircraft Launched Spacecraft facilities

Aircraft launched space missions as being developed by Scaled Composites would have the advantage of utilizing existing airport infrastructure. These facilities would need to

have the capabilities of tracking, range safety requirements, and emergency response and rescue. AEXA should anticipate such requirements and provide for the potential of Mexico becoming a launch site for such missions. Initial missions are anticipated immediately north of the Chihuahua border from Spaceport America in New Mexico.

Action Item # 5: Support of Space Related Entrepreneurship

The commercialization of space related technology and research can be an important mission of AEXA. University researchers and commercial firms can benefit from research and development funds, which are necessary to take research ideas and to develop services and products, which can add value to the national economy. These funds should encourage student entrepreneurship and application of fresh ideas that can bring youthful energies into the market.

III. Recommendation 3: Planning for the next generation of geosynchronous Platforms:

Planning for growth in the telecommunications and data exchange needs of both North and South America with advanced geosynchronous platforms.

Mexico's three geo-synchronous orbital slots provide an unparalleled national asset in the expansion of commercial communications to the richest telecommunications markets in the world in North American and in the rapidly growing community of Mercosur nations that are integrating their economies in South American.

Both the growth in these markets and the absolute requirement for reliability present a challenge and opportunity for geosynchronous commercial satellites. The number of orbital slots is limited and the necessity to use these orbital slots to accommodate growing demand is something that must be planned. Currently geosynchronous satellites are single satellites that function with a planned and limited life span. There is a need to plan for systems that can repair and replace obsolete geosynchronous elements as part of larger telecommunications platforms that are constructed and serviceable by remotely operated robotic systems.

The new commercial space companies that will lower the cost of access to low earth orbit will also create an opportunities for the development of an infrastructure of more capable and reliable platforms in Geosynchronous Earth Orbit (GEO) than those of the present. Mexico can be a pioneer in meeting the rapidly expanding requirements of communications. It can plan for the use of its three geostationary orbital slots in partnership with the growing community of space capable nations and potential commercial firms. This design and planning starting point for expanded GEO relevant infrastructure is both a financial and technological frontier opportunity for Mexico. **Under the leadership of the Secretariat of Communications & Transportation (SCT) pioneering efforts in this area will open up the whole area GEO operations for further growth and permit Mexico to make further advances in this growth market where mature and reliable tele-robotic systems will be essential.**

The design, testing, and long term utilization of these tele-robotic technologies in Low-Earth Orbit (LEO) will develop confidence in their effectiveness in the GEO environment building GEO platforms and repairing and replacing elements of those platforms. With the retirement of the U.S. Space Shuttle system there will not be any other similarly capable system that can rendezvous with an orbiting structure, deliver new equipment, repair and replace large structure using a Canada Arm type crane in combination with astronaut Extra Vehicular Activities (EVAs). A new architecture of space tugs, rocket rendezvous and docking, grappling and crane systems and tele-robots providing virtual presence for human operators will need development in LEO. When proven these systems will enable operations in GEO and in cislunar space including the lunar surface.

Satellite Development

The beginning of low cost access to Low Earth Orbit may also provide opportunities for the launch of mini satellites developed and built by Mexican Universities or Commercial Organizations pertaining to communications, Earth observation and other scientific or military purposes under the auspices of the Secretariat of Communications & Transportation (SCT). The Secretariat of Environment and Natural Resources (SEMARNAT), and the Secretariat of Energy (SENER), or the Secretariat of National Defense (SEDENA).

While many of these potential missions may not require manned operations the personnel contacts and institutional liaison of AEXA and the Mexican Astronaut Corps Office can be strategic assets in broadening Mexican space initiatives. These efforts would begin with the Mexican Space Council and develop as financial, technological, and commercial requirements become better defined, as sponsorship commitments of Mexican astronaut slots are made, and a list of mission commitments is made by various Federal Departments or commercial sponsors.

Mexican Astronauts function as science and technology ambassadors for their sponsoring Department, explaining and presenting the missions and their purposes and technology to both the educational and general publics. They will be an important means of creating awareness of these progressive national initiatives and how these future oriented investments bring public benefits and economic progress.

While the public has been quick to embrace the immediate results of the infrastructure of communication satellites they are not well informed about the infrastructure. These satellite based initiatives in support of Earth observation and environmental protection, the identification and use of natural resources, and of geographic location, and national.

Insuring both the personnel and the facilities to undertake such projects are important elements in, scientific, and technological base of the national and the Mexican government must support such programs to keep pace with other countries. NASA's partnership with the Jet Propulsion Laboratory (JPL) at the California Institute of Technology is an instructive model of Federal and University partnerships in space engineering and mission development for AEXA and SCT and other Departments.

IV. Recommendation 4: Educational Modernization

Mexico can utilize its new space program to energize its educational systems and facilitate the new knowledge based economy. Several initiatives are listed which do not exhaust the possibilities and potential of Mexican Space educational activities.^{22,23,24,25}

A. National Science and Math Curricula Distribution

Mexico should set a goal for the uniform availability of Internet service to all its students from kindergarten through University systems. While University systems lead the way it is important to make computer and internet literacy a part of the education of every child. Every school (especially including those in remote rural locations) not currently having Internet and computer resources could receive a satellite dish that would enable it to receive a daily 15 minutes educational TV broadcast from the MexSat VII. Satellite dish distribution and reception of important curriculum information, lesson plans, news, and science and technology activities can be an efficient means of creating equal access to high quality educational curricula and reduce the digital divide separating families with the resources for such equipment from those who lack these resources. A parallel effort to provide low cost (\$100) laptop computers (as being developed by the Massachusetts Institute of Technology) for the schools is also essential for Mexico's teachers and students. Production facilities for these low cost computers should be established in Mexico so that, students can truly participate in the space age education. In the 21st century proposing this effort is similar to proposing that all schools in the 19th century have paper and pencils.

B. GIS (Geographic Information Systems) Education Applications

The growth of GIS systems applications are playing a growing and increasingly economically important role in the global economy. Students should be prepared to understand how these systems work and how they can create opportunities for jobs and economic benefits to their communities.

C. Teacher Training and Resources Distribution K-12

Teacher training and sharing teaching resources can also be facilitated by satellite distribution of information, and the provision of educational materials supported on laptops computers and the growing sophistication of educational technologies.

D. University Space Grants

²² Carlos Niederstrasser, "NSS Chapter of the Month: Sociedad Espacial Mexicana", *Ad Astra*, Vol. 3, No. 7, September 1991, p. 37.

²³ Arturo Carreno, entrevista a Jesus Raygoza B., "Sociedad Espacial Mexicana, Otra Opcion – Hace 24 Anos del Gran Salto a la Luna", *Conciencia Publica*, No. 223, 19 Julio 1993, p. 45.

²⁴ Gabriel Basurto, entrevista a Jesus Raygoza B., "El Espacio: La Nueva Frontera", *Diario de Burgos*, Burgos, Spain, 20 June, 1999, pp. 4-5.

²⁵ Jesus Raygoza B., "Why Mexico Needs a National Space Agency", submitted during the Proceedings of the 2003, Conference of the United Societies in Space (USIS) and Affiliate Authorities, Trusts, and Associates, Denver, August 3, 2003, p. 5.

The Mexican Space Agency should also establish support of University level institutions through grants in support of specific facilities, specific faculty expertise, and specific areas of research, and of scholarships for undergraduate, graduate, and post doctoral studies.

E. National science, engineering, and design competitions and sports

Student and teacher interests can be captured by science, engineering and design contests which challenge their imaginations and their hands-on ability to create what they conceive.

Students' robotics contest should be supported so that this expertise is supported. Similar initiatives in math, computer science, electrical and chemical and mechanical engineering are also needed. Such science and engineering "sports" are no less important than soccer as a means of engaging both the interest and competitive spirit of young people.

Here again both government and commercial sponsorship of such contests should be encouraged by the government including AEXA. The Secretariat of Public Education (SEP), the Secretariat of National Defense (SEDENA), Secretariat of Communication and Transportation (SCT), Secretariat of Natural Resources (SEMARNAT), Secretariat of Energy (SENER), and Secretariat of Health (SSA). Such competitions should be encouraged through trophies and awards to individuals and teams, and awards of equipment to schools, scholarships, trips to Mexican government space and aeronautics installations, to Mexico's new Space Camp, and public recognition of team success through similar innovations.

What "success" means to young people is a big deal. This public climate of important and constructive competition must be created in Mexico for it to succeed in international scientific and economic competitiveness. Many of our greatest moments of fun are those enjoyed in school sports competitions. Mexico cannot afford to miss out on the "fun" of scientific and engineering sports competitions as an engine of popular progress

F. Recommendation: Launch Facilities

Students should be encouraged to design and build high power rockets and to utilize balloon systems, which can carry student designed and built payloads and experiments. As mentioned above under AEXA Action Item #3, a sounding rocket and scientific balloon launch facility might be established might be established at Cabo Corrientes or Cabo San Lucas to enable both professional and student launches and payloads.

These activities will create a focus for mechanical and electrical engineering skills and an exciting means of realizing the achievement of challenges in experimentation and design. This is also a means of studying the upper atmosphere and understanding meteorology, and remote sensing, and aeronautical systems of recovery. **A National Science and Education Launching Laboratory could be an important in drawing national student interest and participation in the development of hands-on scientific and engineering skills.** It would create a unique tool in involving both secondary and university level students and faculty in "cutting edge" education. It should also be a

facility designed to gain revenue from international educational tourism and collaboration in sounding rocket and balloon projects from participants from other countries.

G. Recommendation: Mexican Space Camp

A Mexican Space camp facility would also draw attention and student and family participation where established tourism and resort facilities are located. These programs have been very successful in both Huntsville and Cape Canaveral in the United States. A modernized program in Mexico could be a special resource for educating Mexican youth and their families and creating strong interest in both the Mexican Astronaut programs and a more wide ranging range of space, science and technology activities including those of Mexico's competitor space faring nations. The continuing exploration of the solar system including, Mars, Minor planets such as Ceres and Pluto, and the return to the Moon and the creation of the Earth/ Moon economy would be a major focus for this facility.

V. Recommendation 5: Earth Observation and Environmental Monitoring

A "Green" Mexico initiative should be initiated to emphasize the protection of the Mexican environment through Earth Observation systems and the importance of understanding and applying this technology to local problems and the local environment by students and local and state government agencies. Water Resources Management, Agriculture, Forestry, and Fisheries Application are all areas where great environmental and economic benefits can be realized by the constantly improving resolution of remote sensing satellites. The understanding and application of such information to local problem should be a primary education outreach of the Secretary of Natural Resources (SEMARNAT) and Secretary of Agriculture, Ranching, Rural Development, Fisheries, and Food Supplies (SAGARPA) with curricula, grants, outreach personnel, and contests for student participation and achievement. Though supported at the Federal level this program should also encourage the active leadership and participation of state and local government in these activities for schools and students so that they will acquire the understanding and skills needed to benefit from improved information.

India has provided a positive example of space technology leadership with its Indian Space Research Organization (ISRO) development of increasingly high resolution Earth Observation Satellites and a program of effectively utilizing this information for its national development. Within 5 years it expects its remote sensing satellites to provide an resolution of .1 meter which approaches that of military spy satellites. The ISRO indicates that with about 5 years of applying information to the problems of a specific village that it can double the economic productivity of the village.²⁶ Dr Rao's lecture at University of North Dakota.

India's ISRO has a distinguished history of developing its Earth Observation satellite program in the service of national development goals. Its former Director has recently predicted the ability to develop Earth Observation satellites with a resolution of .1 meter. This capabilities rivals those of advanced spy satellites and will provide unrivaled ability to observe national territory and resources, protect the environment, observe agricultural

²⁶ ISRO spaceports, <http://spaceports.blogspot.com/2006/08/communication-in-india.html>

production and water resources, and increase use of limited resources. Mexico might investigate collaboration with ISRO in these advanced initiatives with domestic application and utilization.

VI. Recommendation #5: Astronomy and Space Observations

Mexico in partnership with the U.S. is now developing the premier sub-millimeter radio telescope in Mt. Sierra Madre near Puebla. This addition to the crown jewels of Mexico's scientific research facilities should be completed within the next two years. All necessary resources should be devoted to insure the completion of this facility at the forefront of radio astronomy. Other opportunities for expansion may also be attractive to Mexico in the future.

In the 1960's NASA created a deep space network in order to track and communicate with space mission sent out into the solar system. This system is largely saturated with the high level of information coming from current deep space missions. AEXA and SCT should collaborate with other space faring nations to create a second deep space network to increase the global capacity to monitor and communicate with space missions. This type of collaboration will assist Mexico to further develop its own space related infrastructure, to gain revenue from tracking foreign satellites and space missions, and provide new facilities created by Mexico's electrical, mechanical, and computer engineers. Similar efforts have been made by South Africa.²⁷

The identification and tracking of Earth orbit crossing asteroids is a significant goal for the protection of the Earth from collisions such as the Chicxolub impact resulting in the extinction event at the end of the Cretaceous period. A radar dish providing these capabilities would be most appropriate in contributing to this task of protection and located in the area of Mexico directly impacted by this large object.

As indicated above the first priority for funding is to complete the facility under construction. Other projects that can expand Mexico's capabilities and leadership should also be within its vision especially in areas where radio emissions and light pollution do not limit observations.

VII. Recommendation # 7: Create a Tourism Driven Space Science Research and Development Park

Mexico's vast experience in international tourism can provide a mechanism for the creation of an Edu-entertainment, Space Science; Research and Development Park that serves the national and international tourist trade but also provides a commercially supported venue for Mexico's future.

This facility can be developed as commercial venture utilizing a development team of

²⁷ South Africa space program, www.spacedaily.com/news/dsn-05b.html

Space Scientists and engineers, architects, and commercial real estate developers, and commercial resort operators to create a synergistic blend of activities and exhibits which both entertain and educate both national and international tourists and provide a venue for the research and development of technologies that have both Earth and Space relevance.

Tourist Driven Edu-entertainment Facilities

The initiative is in the historic tradition of Walt Disney who initiated Disney World in Florida in the 1950's as the **Experimental Prototype City of Tomorrow** better known as **EPCOT Center**. His vision evolved into one of the most successful tourism enterprises in history. Although his untimely early death limited his focus on cutting edge technology by his corporate successors. The development of the Earth/ Moon economy can be the context of a more modern tourism venue in Mexico which addresses not only space related technologies and futures but their applications and impact on Earth.

This major initiative should be initiated along the Mayan Coast where 40% of Mexico's tourists arrive. This location makes this investment the most likely to generate a favorable return on investment and where transportation and support infrastructure also facilitate development.

Research Facilities

It is an advantage that this facility should not be located directly on the coast, but rather that it is situated on a large in-land parcel, well-protected from hurricane impacts and with easy access to tourists visiting the Cancun/Cozumel coastal area. The construction and development of such a complex will provide many opportunities for Mexican companies and Universities to make both creative and technology contributions to the development team of this project and to create new products and services that serve broader national and international markets.

World Fairs have long served as a means of creating local infrastructure while showcasing the products and contributions of nations around the entire world. A major Edu-entertainment facility in Mexico's Mayan Coast region can serve to draw additional international tourism, and to create a unique Mexican techno-educational facility, which continually grows and showcases advanced space exploration and technology. This project provides a national venue that creates jobs, showcases technological developments and products, and creates a location where advanced technology research can be presented to the national and international publics.

A "Green Ethic" of Development and Environment Protection

As a major long term undertaking this would require both the support of governmental institutions and planning in order to protect the environment and develop in an ecologically responsible way that is consistent with a "Green Mexico" initiative. While we can look at the commercial success and design innovations of Disney World/EPCOT Center in its time we can also better understand that the surrounding sprawl generated by the economic stimulus provided is an example to avoid when planning a venue of this magnitude. This can also be an example of Mexican leadership in understanding and

creating a design philosophy that is beautiful, profitable, entertaining, informative, and consistent with the carrying capacity and the rich biodiversity of the supporting environment.

Mex-LunarHab (MLH): A Commercial Analogue Moon Base & Space Science & Settlement Initiative

The attractions of simulating a Moon Base are many. They include demonstrating the creation of a closed system environment with a high standard of living and comfort. They include advanced human robotic systems that extend human presence and ability to operate and experience hostile and dangerous environments.²⁸ The development of sources of "clean" energy from space solar power and developing Helium-3 (He-3) fusion technologies are important enabling technologies for the Earth. The growth of food in highly automated tele-robotic run green houses will demonstrate advanced controlled agriculture. Telemedicine systems will permit assessment, diagnosis, and treatment of medical conditions of patients remote from their physicians in space but also support the growth of medical tourism in Mexico. Research on the processing of in situ materials on the Moon and asteroids will showcase work that promises to reduce destructive mining on Earth and open up a fuel cells and a hydrogen economy on Earth and supply vast quantities of engineering metals for the economic development of Earth.²⁹

The initial development of Mex-LunarHab Analogue Moon Base project has been previously described by Jesus Raygoza^{30,31,32,33,34} of the Mexican Space Society (SEM). This paper is attached as Appendix II. The Project Mex-LunarHab has been also been **promoted to be supporting the existence of a national space agency in Mexico**³⁵, and it has been published and/or mentioned in specialized papers and magazines.^{36,37,38}

²⁸ Peter Kokh and David A. Dunlop, "What a Lunar Analog Research Station Should Attempt to Demonstrate", *Moon Miners' Manifesto & The Moon Society Journal*, No. 195, May 2006, pp. 5-8.

²⁹ Brad R. Blair, "The Commercial Development of Lunar Mineral Resources", *Earth Space Review*, Vol. 10, No. 1, 2000, p. 82.

³⁰ Jesus Raygoza B., "Mex-LunarHab", *Space Governance Journal*, Double Volume, Numbers 7 & 8, 2000 & 2001/2002, pp. 94-99.

³¹ Peter Kokh, www.lunar-reclamation.org/mmm_samples/mmm161_Dec2002.pdf

³² The SpaceShow, www.thespace.com/detail.asp?q=86

³³ Jesus Raygoza B., "Designing the Mex-LunarHab (MLH): Application of Correct Methodology", International Lunar Exploration Working Group 5 (ILEWG 5), International Lunar Conference 2003 (ILC-2003), Waikoloa Marriot Beach Hotel, Kohala Coast, Hawai'i Island, November 17, 2003. www.spaceagepub.com/pdfs/Raygoza.pdf

³⁴ _____, "Designing the Mex-LunarHab (MLH): Application of Correct Methodology", in Steve M. Durst, C. T. Bohannon, C. G. Thomason, M. R. Cerney, and L. Yuen, eds., *Science and Technology Series*, Vol. 108, AAS 03-704, American Astronautical Society, Univelt, San Diego, CA, 2004, pp. 43-56.

³⁵ Steve M. Durst, ed., "Highlights of Mex-LunarHab Project", *Lunar Enterprise Daily*, 4 August, 2003. www.spaceagepub.com/suscribers/LD20030804.html

³⁶ Tom Wray and Gary "Rod" Rodriguez, "Using Spent Fuel Tanks as Habitats", *Space Resources Roundtable VI*, Colorado School of Mines, Golden, CO, October 2004, p. 1.

³⁷ Gail B. Leatherwood, "Chapter Projects", *Ad Astra*, Vol. 16, No. 4, Winter 2005, p. 41.

³⁸ Peter Kokh, "The Mex-LunarHab Project", *Moon Miners' Manifesto & The Moon Society Journal*, No. 201, December 2006, p. 10.

The adventure and challenges of exploring Mars, Ceres, and other minor planets would also be development themes. Exhibition prototypes would be developed as new space missions are planned and new information and technology is developed.

This initiative would demand a large book of its own describing in great detail how such a facility would be planned, financed, developed, and operated.. A full explanation and treatment is beyond the scope of these recommendations and would constitute a more convention business development plan. This project would come primarily from private sector capital and development initiatives but require Federal and State support as a major and unique tourism, education, and research initiative. Mex-LunarHab is described as appendix II.

Summary

The Mexican Space Society (SEM) is making a number of recommendations to the new Calderon administration and the Mexican Congress that focus attention on the social and economic benefits that space related technologies can make to Mexico's future. They involve the establishment of Mexican Space Commission involving many Federal Departments and chaired by the Secretary of Government, and the creation of the Mexican Space Agency (AEXA). We propose the development of a Mexican Office of Manned Space Flight and the development of an Astronaut Corps utilizing new commercial space companies to carry out space missions.

We also make and a variety of specific recommendations affecting Mexican education and other government departments whose responsibilities involve scientific and technological progress. These recommendations are designed to put a human face to the future of Mexico and to assist the government to use not only its own resources but also engage private and commercial sector resources in achieving these benefits.

APPENDIX I

A Draft Timetable for Recommendations and Actions

2007

The Mexican Space Society (SEM) first advocates the ratification by the Mexican Senate of the Mexican Space Agency (AEXA).

Recommendation 1: Create a Mexican Space Council

One of its first responsibilities would be to organize a Mexican Space Council of other Mexican Departments that utilize, plan, space related technologies. This Mexican Space Council should be chaired by the Secretary of Government (SEGOB) so that the

importance of its initiation will be clear from the beginning. As outlined above the Council would be charged with a number of Report responsibilities.

A number of reports have been done on the return on the economic investment that the United States of America has made in its space program, specifically NASA.^{1,2} These analyses have indicated a positive return on this investment and have resulted in not only many scientific discoveries in the exploration of the Moon and the Solar System and a great advancement of in astronomy, but also in applied science and engineering. The Mexican government can similarly look at problems facing Mexico, the potential of space related technologies to create national benefits, and the investments needs to realize these benefits. Some investments would be most appropriate for the Mexican government. Others may result from private and commercial investments encouraged by the government. Proposed investments must be analyzed and prioritized

While James E. Beggs was a NASA Administrator, he described the aerospace agency as an "investment strategy" for the development of new technology³—producing a greater dollar-value return than they cost.⁴

Lori Garver, during her management of the National Space Society (NSS), she stated that "If the United States and humanity are to ever expand into the solar system, it will most likely be in partnership with other spacefaring nations. The experience in working together on the Space Station will create problems in everything from incompatible technical standards and logistic support to cultural misunderstandings and legal disputes... But in the process of overcoming these problems together, we will be creating the strong foundations for a truly spacefaring civilization".⁵

The Mexican Space Council would be to provide specific recommendations for action to the President, the Mexican Congress, and the Mexican people. It would not only guide the charter and development of the new AEXA but would highlight the wide range of efforts across both the Mexican government and commercial sectors. It is proposed that this work be completed by December of 2007 with significant public announcements at the beginning of 2008.

Satellite Development

¹ Michael K. Evans, "The Economic Impact of NASA R&D Spending", NASA Contract NASW-3341, Chase Econometrics Associates, Inc., Philadelphia, April 1976.

² David M. Cross, "The Economic Impact of NASA R&D Spending", updated, prepared under NASA Contract 3345, Chase Econometrics Associates, Philadelphia, March 1980.

³ James E. Beggs, "Technology, Imagination, and Faith", in *Space Station: An Idea Whose Time Has Come*, Theodore Simpson, Institute of Electrical and Electronics Engineers, New York, 1984, pp. 89-94.

⁴ _____, *International Space Station Fact Book*, National Aeronautics and Space Administration (NASA), Washington, D.C., April 1997.

⁵ Lori Garver, Executive Director, National Space Society (NSS), before the U.S. Senate Commerce, Science, and Transportation Committee, Subcommittee on Science, Technology, and Space, United States Senate, Washington, D. C., 26 March, 1996, p. 4.

The beginning of low cost access to Low Earth Orbit may also provide opportunities for the launch of mini satellites developed and built by Mexican Universities or Commercial Organizations pertaining to communications, Earth observation and other scientific or military purposes. Under the leadership of the Secretary of Communications and Transport the development of indigenous capabilities for satellite development should be studied and recommendations for strengthening these capabilities should be made where such satellites can provide economic benefits.

Similarly the more ambitious goal of creating more sophisticated geosynchronous platforms should be studied by the SCT as a goal for creating more capacity and growth from Mexico's strategic geosynchronous orbital slots in partnership with other space faring nations.

Interest in the development of an **Edu-entertainment and Research Park** along the Mayan Coast on the part of private could be explored as part of the Mexican Space Commission's deliberations under the leadership of the Secretary of Tourism

2008

The Mexican Space Council would recommend leaders for the AEXA administrative responsibility and the development of an administrative plan and program budget. This Office would be one of the first responsibilities of the newly established AEXA.

The Development of a Mexican Astronaut Corps should be well aligned with the recommendations of the reports of the Mexican Space Council and its initiation could begin in 2008 as part of a New Mexican Space initiative. This should coincide with the beginning of commercial suborbital services. The announcement of both government department and commercial sponsors of Mexican astronaut positions would begin the astronaut recruitment process by an Office of Astronaut Services specifically charged with developing this program.

Development of Training Resources and Programs and Mission Proposals

Aspects of astronaut training might be conducted via contract with the Mexican Air Force, with commercial airline programs, and with providers of space transportation services in foreign countries such as the U.S. or Russia. The Office of Astronaut services will need some time to develop both physical and contracted support of a Mexican Astronaut Corps. It will need to define selection criteria and organize a process for consideration of astronaut candidates. This process should be completed by the end of 2008

A Mexican Spaceport Authority Office should be established under AEXA to regulate and plan the development of access to space in Mexico for both vertical and aircraft based launch systems.

With significant interest on the part of commercial interest a proposal and initial plan for the development of an **Edu-entertainment and Research Park** would receive planning

support from both the Secretary of Tourism and the Secretary of Environment and Natural Resources.

The Secretariat of Education (SEP) begins providing satellites dishes to Mexican schools in order to provide equal access to science, math and engineering curricula and teacher training materials for schools where no internet access has been established.

Development of an initiative to produce low cost laptop computers for Mexico's school should be started.

2009

Astronaut Selection and Mission Announcement

The process of screening and selecting Mexican Astronauts should be completed within 2009 with their public announcement as an event of national significance no later than the end of 2009. A list of beginning missions should also be identified so that the announcement of astronauts and their missions will demonstrate a broad connection to the future interests of the country.

A Sounding rocket and scientific balloon launch facility should be established on the West Coast of Mexico at locations such as Cabo San Lucas or Cabo Corrientes. **A National Science and Education Launch Laboratory** would be established in order to create both scientific and educational opportunities for Mexican and international organizations. This facility would provide a location where hand-on engineering skills can be acquired from projects ranging from small sports rockets to professional sounding rockets and from small weather balloons to large scientific balloons which carry student developed payloads. Both AEXA and the Secretary of Education would develop science and engineering competitions, which would utilize the National Science and Education Launching Laboratory. This science, engineering and educational Launch Laboratory would also provide a site for teacher training and math and science curricula development.

This three, AEXA, SEP, and SCT would support this facility and its services and opportunities would also be promoted by the Secretariat of Tourism for the promotion of Science Tourism in Mexico. Security and range safety support would be developed by the Mexican Coast Guard and Department of Defense, which could also use this resource for the education and training of its personnel.

A Mexican Space Camp facility could also be established at this location and its facilities and programs would complement those of the National Science and Education Launching Laboratory. Both facilities would have the goal of energizing science and engineering and mathematics education in Mexico and providing direct experience utilizing these skills in practical projects developed by the students themselves in **developing science, math, and engineering sports competitions.**

Satellite Development

As AEXA, Educational, and SCT studies are completed new satellite initiatives would be undertaken. Satellite projects especially in the area of Earth Observation and Remote

Sensing might also be undertaken with international partners as part of a "**Green Mexico initiative**."

The preliminary plan for the development of an **Edu-entertainment and Research Park** would receive appropriate reviews from the appropriate Federal Departments in collaboration with the State of Quintana Roo. With appropriate modifications and demonstration of appropriate financial resources approvals would be given for the construction of these facilities.

2010

Astronaut training would be conducted in 2010 with suborbital flights beginning in the later part of that year. A more extensive **time table of specific missions** will flow from the administrative work and report of the Mexican Space Council and AEXA. This timetable will instruct the training schedule, contracts, and project flight schedule.

Beginning with the accomplishment of **suborbital flights in 2010** the Mexican Astronaut Corps will be ready **to initiate missions into Low Earth Orbit by 2012** as those opportunities are developed through agreements concerning the operations of the International Space Station (ISS), commercial Space Tourism orbital facilities, and/or the development of a Chinese manned lab/space station in 2015.

A National Science and Education Launch Laboratory would become operational.

Construction of an **Edu-entertainment and Research Park** would begin.

2011-2112

Construction of an **Edu-entertainment and Research Park** would continue with a projected opening of this facility before the end of 2012. All Mexican schools without prior access to the Internet will receive satellite dishes and equipment to enable them to have equal access to educational resources. Production of low cost laptop computers will begin with widespread distribution throughout Mexican educational institutions.

By the end of the Calderon Administration in 2012 the Mexican government should have created a vigorous national space agency (AEXA) with an active Mexican Corps of Astronauts and a program of space missions and activities that embrace the full spectrum of the Mexican government departments and the private commercial sector. Its political legacy will be the stimulus to the Mexican nation's leadership and scientific and economic competitiveness.

The Mexican Space Society (SEM) has focused on the Development of a Mexican Space Council and the creation of a Mexican Astronaut Corps because we believe that the human face of the space program is most necessary for everything that follows. The Mexican President and Mexican Congress must enjoy the support of the Mexican people and the enthusiasm of its students and young people for its advances in space as they will be the primary recipients and the justification for its creation.

We wish to discuss other space related proposals that will further advance this political and social agenda for the future.

Appendix II Mex-LunarHab

This material is well known to you already and constitutes a 25 page section.

Appendix III

Thematic Components of a Space Edu-entertainment & Research Park

- 1. Space in the Movies, TV, & Science Fiction**
- 2. The History of the U.S./Soviet Race to the Moon**
- 3. The World of Satellites – Looking at a Blue/Green Planet**
 - Spy Satellites
 - Earth Observation
 - Telecommunications & Data Exchange
- 4. The New Players in Commercial Space**
 - Blue Origins
 - Bigelow
 - Rocket Plane/Kistler
 - Scaled Composites
 - Space X
 - Virgin Galactic

This is the very briefest sketch of the elements of a larger commercial venture but an important starting point. In our estimation the greatest probability of creating an analog lunar base facility would be through the development of a Edu-entertainment Research Park.