JOURNAL

of the

1988 AIAA HOUSTON SECTION

TECHNICAL DELEGATION TO CHINA

An activity of the Houston Section
American Institute of Aeronautics and Astronautics,
In Cooperation with the Chinese Society of Astronautics

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September 9 through September 24, 1988

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(with corrections)

An activity of the Houston Section, American Institute of Aeronautics and Astronautics,
P. O. Box 57524, Webster, Texas 77598-Assembled and Edited by James C. McLane, Jr.-1988

BANQUET WITH THE SHAANXI SOCIETY OF ASTRONAUTICS

L-R: seated: Schultz, Dillinger, Mount, D. McLane, E. Livingston; standing: McCoy, Chen, Liu, Halpin, Bauch, Hsu, J. McLane, Cotch, Wu, Trebes, Li, L. Livingston, Liang.

ACKNOWLEDGEMENTS

The special efforts of the following people who contributed significantly to the success of this project are gratefully acknowledged:

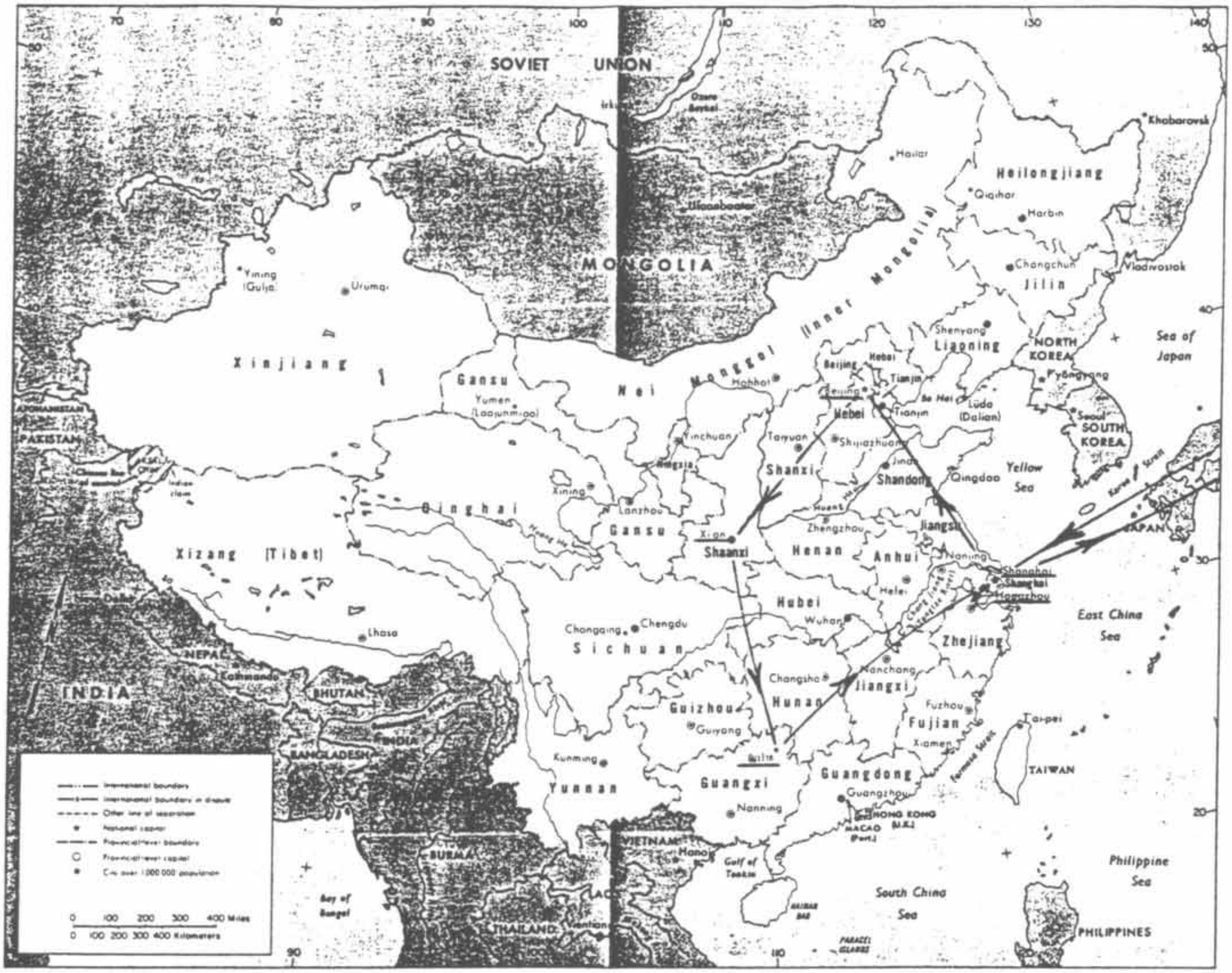
Mr. Chen Rong-ying and Mme. Li Furong, Beijing (Headquarters) office of the CSA: for their effective efforts in planning this visit, and for their unselfish personal attention to the support of the delegates throughout the visit.

Ms. Tia Ling Lee, Unisys Corp., member of the International Space Activities Committee of the Houston Section: for translation and procurement services for delegate's Chinese/English business cards.

Mr. Walter Lueke, NASA JSC, Houston Section Chairman-elect and Chairman during the course of this project: for his unflagging support, and for procuring appropriate tokens to be presented to the Chinese on behalf of Houston Section.

Ms. Debra Nienhaus, LESC, and Ms. Jonette Stecklein, NASA JSC, Houston Section Treasurers: for having flawlessly handled the delegation cash flow through a special account in the Houston Section treasury (not a small task).

Mr. Pat Rawlings,, Eagle Aerospace Company: for providing custom inscribed and autographed lithographs by himself and Eagle artist John Lowery to be presented to Chinese officials at formal receptions.



TRAVEL ROUTE

1988 HOUSTON SECTION
TECHNICAL DELEGATION
TO CHINA

MR. JIM MCLANE

AMERICAN INSTITUTE OF
AERONAUTICS AND ASTRONAUTICS

SAMPLE NAME TAG

AMERICAN INSTITUTE OF
AERONAUTICS AND ASTRONAUTICS

中国宇航

1988 HOUSTON SECTION
TECHNICAL DELEGATION TO CHINA

SAMPLE BAG TAG

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FOREWORD

On September 19, 1987, the Houston Section of the American Institute of Aeronautics and Astronautics (AIAA) and the Shanghai Astronautical Society (SAS), a branch of the Chinese Society of Astronautics (CSA), jointly issued a Proclamation of Sister Section status. The stated purpose of this initiative was "fostering good-will and understanding between their members." Discussions at that time in Shanghai between myself, acting as the Houston Section Emissary, and Dr. Liang Jincai, the Director of SAS, identified activities which might be undertaken to further that purpose. The minutes of that meeting reflect one such option as follows:

"SAS would warmly welcome a delegation from AIAA Houston Section to visit Shanghai and make academic and technical exchange in an appropriate time next year. Houston will investigate the feasibility of such a visit."

Right after that meeting, Mr. Chen Rong-ying, Head of the Office, CSA, offered his help if we wished to form a visiting delegation. He said that his office could organize and conduct the tour for us at a considerable savings over what a comparable tour booked through the China International Travel Service (CITS) would cost. Moreover, they could arrange visits to space related laboratories and facilities, and schedule direct talks with Chinese technical personnel. These visits and meetings could be tailored to the specific technical interests of our delegates. Back at home, after obtaining the approval of the Houston Section Council, I wrote to Mr. Chen in late January, 1988, outlining the requirements for such a visit by a Houston delegation. I requested that he provide a detailed, all inclusive proposal for the project. His response was favorable, and correspondence over the following three months clarified all details to each side's satisfaction.

We announced the plan for the formation of a delegation to visit China in the December, 1987, issue of the Houston Section NEWSLETTER, and asked for expressions of interest from AIAA members who might wish to participate. Publicity was also provided in the NASA/JSC SPACE NEWS ROUNDUP. At the Houston Section Executive Council meeting on March 15, 1988, it was reported that nineteen positive responses had been received. A motion was passed authorizing the formation of the delegation and specifying the conditions of its operation. An ad hoc Steering Committee was established to plan and implement delegation activities on behalf of the Houston Section. By memorandum dated April 25, 1988, Section Chairman Carl Huss made the following committee appointments: Lou Livingston, Chairman; Carolynn Conley; Debra Nienhaus (Section Treasurer, standing member; succeeded by Jonette Stecklein with the change of Officers in June); Walter Lueke, (Section Chairman-elect, standing member), and Jim McLane, administrative support. At the Executive Council meeting on June 14, 1988, after

it was established that no sitting or incoming Chairmen or Vice Chairmen of the Section would be able to join the delegation and serve as its leader, I was appointed to serve in that capacity. Lou Livingston was appointed alternate leader.

As of mid-March, 1988, over thirty AIAA members had expressed bona fide interest in joining the delegation. On that basis the Steering Committee meeting on March 23, 1988, set the delegation maximum size at twenty-four so that flight reservations could be made immediately to obtain the most favorable advanced purchase rates.

A departure date of September 17, 1988, was first proposed for the project to coincide with anticipated optimum weather conditions in China. This was changed to September 10 at the request of the CSA to avoid a conflict with their preparations to attend the October meeting of the International Astronautical Federation (IAF) in Bangalor, India. The final change to September 9 became necessary to accommodate overseas flight schedules. Indeterminates in the date for resumption of NASA Space Shuttle flights caused some of those who had expressed interest in joining the delegation to drop out. As of June 1 when the first cash payment to reserve membership in the delegation became due, only sixteen persons firmly committed. Later, four of those found it necessary to withdraw, leaving the final size of the group at twelve: nine technical delegates and three accompanying spouses.

Only one problem of consequence developed in the dealings with the CSA. When the first cash payment from the delegation to the CSA became due early in June, a check for $3,000 was mailed to them. It turned out that the Bank of China would only pay the check in Renminbi, whereas the CSA suppliers for various services, especially hotels, were demanding payment in Foreign Exchange Certificates (FEC). To solve this dilemma the CSA requested that we send no further advance payment. Instead, we were asked to bring the remaining amount due with us to China in the form of traveler's checks. Once in China, we could cash those in exchange for FEC, and pay the remainder due to the CSA directly in FEC. This we agreed to do, subject to confirmation that this would not be in violation of U.S. or PRC laws or regulations.

The CSA also provided the delegation with an introductory card addressed to overseas offices of the Civil Aviation Administration of China (CAAC), the Chinese national airline. We used this in dealing with their agent in Los Angeles, the U.S. China Travel Service. Thus we obtained the lowest possible airfare between the U.S. and China. We also dealt directly with Continental Airlines to get connecting reservations and the best available group fares between Houston and San Francisco. Tickets for the domestic flights were issued by a local agent, Ruth Hanssen Travel. A group visa was obtained through the Houston PRC Consulate using a telex invitation from the Foreign Affairs Bureau, Ministry of Astronautics.

Information packets designed to prepare the delegates for

the project were assembled with assistance from Ruth Hanssen Travel. Meetings of the delegation were held on June 22, and again on August 27, to go over that material and to answer questions. The Steering Committee also prepared durable, distinctive name tags and luggage tags for each delegate. At each city visited in China, name tags with the designation "Honorary Member" were prepared and given to the staff members who accompanied the delegation, and to the CSA officers and senior officials who attended the official receptions and banquets.

Mr. Chen Rong-ying and Mme. Li Furong of the CSA Headquarters office in Beijing escorted the delegation throughout the time we were in China. In each city visited they were supported by full-time staff of the local branch of the CSA. The associated Institutes, laboratories and factories in each city visited provided drivers and vehicles to transport the delegation when we were in their area. CSA purchased all hotel accommodations, meals, professional sight-seeing guide services, tickets to cultural events, between-meals refreshments, etc., directly. The one exception to this pattern of support was in Guilin, where there is no CSA branch; there the CSA contracted with the CITS for an accommodation and activity package for the group. The delegates were agreed that the arrangements for facility visits and meetings with technical personnel were excellent, as were the hotel accommodations and meals. The most valid general complaint was that too much activity was scheduled into too short a time period, a shortcoming due largely to my own eagerness to have the delegation accomplish as much as possible during our visit.

James C. McLane, Jr.
Delegation Leader

Houston, Texas
October 21, 1988

THE DELEGATES

Biographical Briefs

MR. JAMES C. McLANE, JR.,P.E., DELEGATION LEADER / Consultant.
Self employed, Houston, Texas.
Formerly Chief, Space Environment Test Division, NASA JSC.
BCE Clemson University.
Associate Fellow, AIAA.
Past AIAA activities: Chairman, Houston Section; Director Region IV; National Board of Directors; Chairman Career Environment Committee; Ground Test & Simulation Technical Committee.
Specialization: Design & operation of aerospace ground test facilities, especially thermal/vacuum test chambers.

MR. LOUIS E. LIVINGSTON, ALTERNATE DELEGATION LEADER / Senior Aerospace Engineer.
Advanced Programs Office, NASA Johnson Space Center, Houston, Texas.
BE (CE) Yale Univ., MS (ME) Rice Univ.
Associate Fellow, AIAA.
Past Vice Chairman, Operations, Houston Section AIAA; presently Associate Editor of Houston Section Newsletter.
Specialization: Concept development (solar power satellites, space station, etc.)

Mr. GARLAND T. BAUCH, Technical Management Engineer.
Management Systems, Nat. Space Transportation System Office, NASA Johnson Space Center, Houston, Texas.
BS (ME), MS (ME) Univ. of Texas.
Associate Fellow, AIAA.
Past Houston Section AIAA activities: Chairman, Space Systems Technical Committee; Councilor. Presently German Liaison Group Leader, International Space Activities Committee.
Specialization: Space systems management.

Mr. STEPHEN M. GOTCH, E.I.T., Senior Systems Engineer.
Crew & Thermal Systems Dept., Lockheed Engineering and Sciences Company, Houston, Texas.
BS (AeE) Univ. of Texas, MS (C & SE) Univ. of Houston.
Senior Member, AIAA.
Member Houston Section International Space Activities Committee.
Specialization: Space systems, thermal control.

MR. DENNIS B. HALPIN, P.E., Structural Engineer.
Structures & Mechanics Division, NASA Johnson Space Center, Houston, Texas.
BS (CE) Univ. of Houston, ME Texas A & M Univ.
Senior Member, AIAA.
Chairman-elect, Houston Section Space Systems Technical Committee.
Specialization: Vibration and acoustic testing, modal analysis.

DR. JAMES E. McCOY, PhD, Physicist.
Space Science Branch, Solar System Exploration Division, NASA Johnson Space Center, Houston, Texas.
BS (Physics) Cal Tech, PhD (Space Physics) Rice Univ.
Senior Member, AIAA
Specialization: Space plasma physics - space particle radiation and fields, ionospheric plasma physics, spacecraft charging and applications of tethers in space.

MRS. FRANCES E. MOUNT, Analysis Manager for Space Human Factors.
Man-Systems Division, NASA Johnson Space Center, Houston, Texas.
BS (Math), BS (Psychology), MA (Psychology), Grad studies in Human Factors Engineering, all at University of Houston.
Member AIAA.
Past member AIAA Career Environment Committee.
Specialization: Man-machine interfaces, human factors engineering and man-systems integration.

MS. JOYCE E. SCHULTZ, Senior Operations Specialist.
G.E. Government Services, Houston, Texas.
BA (Ed) Kansas St. Univ., MS University of Houston
Member AIAA
Specialization: Crew and flight controller training

MR. JOHN M. TREBES, CM, Manager, Space Station Mockup & Trainer Facility.
Man-Systems Division, NASA Johnson Space Center, Houston, Texas.
BS Aeronautics Northrop University.
Member AIAA.
Houston Section AIAA Activities: Councilor; Chairman, Management Technical Committee.
Specialization: Crew training, and training facility management.

The following professional and non-professional members of the delegation accompanied the technical delegates:

MRS. ALYCE E. DILLINGER, Computer Programmer, accompanying her husband, Mr. John M. Trebes.

MRS. C. EDDETTE LIVINGSTON, accompanying Mr. Louis E. Livingston.

MRS. DOROTHY D. McLANE, accompanying Mr. James C. McLane, Jr.

JOURNAL OF PROFESSIONAL ACTIVITIES

SEPTEMBER 9 - 10, 1988

Friday - Saturday

HOUSTON TO BEIJING, CHINA

The delegation assembled at Houston Intercontinental Airport, and departed for San Francisco at 11:20 a.m., c.s.t., on Continental Airlines Flight No. 893, a Boeing 727 airplane. At San Francisco the schedule was disrupted by late arrival of our connecting CAAC Flight No. 984, a Boeing 747 manned by an all-Chinese crew. The one and one-half hour departure delay carried over to our arrival in Beijing (after the scheduled stop in Shanghai). A further delay of about one hour in baggage unloading kept us from meeting our hosts, Mr. Chen Rong-ying and Mme. Li Fu-rong of the Chinese Society of Astronautics, until the wee hours of Sunday morning, September 11 (a day was lost when we crossed the International Date Line). Our sense of time was further tested when we found that China went off daylight saving time on the date of our arrival. Mr. Chen and Mme. Li transported the delegation to the Xiyuan Hotel in Beijing by bus, and it was approximately 3:30 a.m. before we were all comfortably bedded. On the bus, Mme. Li gave each Delegate a "Summer Palace" tote bag containing maps of Beijing and China, and detailed schedules for the activities in Beijing. It was announced that Mr. Chen and Mme. Li, who had also moved into rooms at the Xiyuan Hotel, would both accompany the delegation throughout the time we are in China. We are also to be joined by local Astronautical Society officials at each stop.

Reporter: Mrs. Dot McLane

SEPTEMBER 11, 1988

Sunday

BEIJING

Get-Acquainted Lunch with Aerospace Officials

A few hardy souls rose early enough to beat the 8:30 a.m. close of the breakfast room, but most of us slept late, and came together at lunch (a mini-banquet) at noon in the main dining room of the Xiyuan Hotel. In addition to Mr. Chen and Mme. Li, we were joined for lunch by the following officials:

Mr. Fu Bing-chen, Vice Secretary General of the CSA.

Mr. Xie Haoran, Division Director, Foreign Affairs Bureau, Ministry of Astronautics (New title under the reorganized Ministry of Aeronautical and Astronautical Industry is unknown at this writing).

Prof. Ke Shou-Quan, Director of the Beijing Institute of Environmental Test Engineering (BIETE).

Mr. Jin Xun-shu, Deputy Director of the Science and Technology Committee, BIETE.

Mr. Wang Yue, Director of Foreign Affairs Department, Shanghai Bureau of Astronautics.

Mr. Fu, Mr. Xie and Prof. Ke had visited Houston in April, 1987, for initial negotiations regarding establishment of a "Sister Section" for Houston in China. They also played key roles in the finalization of the Sister Section Proclamation with the Shanghai Astronautical Society in September, 1987, during our (Dot and Jim McLane) visit to China. Mr. Wang was also a principal in that activity last September in Shanghai. He was visiting Beijing at

this time to make a public televised report on the successful launch of China's first meteorological Satellite. Named FENGYUN (Wind and Cloud) No. 1, it was launched into sun-synchronous polar orbit from the new launch site at Taiyuan, Shanxi Province, at 22:30 GMT on Tuesday, September 6, 1988. Mr. Wang said that the mission was successful in every respect, so far, and represented many firsts: new satellite, new orbit, and new launch site. We jokingly suggested that our delegation would be a very appropriate one to be the first foreign group to visit this new launch site, and that we could do so on our way to Xian later in the week. He very seriously replied that we would indeed be an appropriate group, but that no foreigners had been permitted to visit there as yet.

In the afternoon the entire delegation visited Tian An Men Square, and the Palace Museum. Dinner was at the Fangshan (Imperial Kitchen) Restaurant, Yilan (Flashing Ripple) Hall, in Beihai Park.

Reporters: Mrs. Dot McLane and Mr. Jim McLane

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SEPTEMBER 12,1988

Monday

BEIJING

Visit to the Institute of Space Medico-Engineering.

The principal activity of the delegation[1] today was a visit to the

1. Except for Dr. McCoy and Mr. Halpin - see below.

Institute of Space Medico-Engineering (ISME)[1]. On Arrival at the ISME shortly after 9 a.m., we were welcomed by the Director of the Institute, Prof. Wei Jinhe. Following a response by the delegation leader, Jim McLane, three of the delegates made formal technical presentations to the assembled group of about seventy five to one-hundred members of the staff. The subjects of their presentations were as follows:

John M. Trebes - "Man-systems Integration Test Bed Mockups and Trainers at JSC".

Joyce E. Schultz - "Spacelab Life Sciences 1 - Studying the Physiological Effects of Weightlessness".

Frances E. Mount - "Habitability in Long-Term Space Missions".

The accompanying wives spent the morning at the Summer Palace, where they met the ISME group for lunch at the Ting Li Guan restaurant. After lunch, they were taken on a tour of the Fragrant Hills.

In the afternoon, the main group returned to the ISME for a tour of some of their laboratory facilities. The first visit was to the brain function research laboratory. Prof. Mei Lei, Member of the Standing Committee of the Chinese Society of Space Sciences, explained on-going work involving correlation of frequency, location and type of brain waves associated with various physiological conditions, and the effect of administration of drugs such as L-dopa.

Prof. Sun Jin Biao, Director of the Department of Life Support

1. P. O. Box 5104, Beijing, China

System, conducted the group through an area in which several items of life support equipment, including aviator pressure suits and boiler-plate breathing systems, were on display. There was no evidence of work on hardware or suits suitable for manned spaceflight in this museum-like display.

Qian Jinkang, Director of Lab No. 1 of the ISME, explained their 6 X 6 X 4 meter radio frequency anechoic chamber, which is being used to study the effects of microwaves in the 2-10 GHz range on animals in a 20 X 60 cm test area.

Their human centrifuge, which accommodates a single test subject, corresponds to 12 g. Radius was not stated, but the data given imply approximately 12 m. Onset rate is 2g/sec. Drive is by 16 hydraulic motors, which were stated to be smooth and quiet. Data are transmitted by 200 slip rings.

A three degree of freedom rotating chair, used for vestibular function testing, is also hydraulically driven. It was built in Shanghai in 1983. Maximum spin rate is 300 deg/sec in yaw and 35 deg/sec in pitch. Garland Bauch and Joyce Schultz each served as subjects for brief test runs in the chair.

Xu Guo Lin explained their decompression chamber, which can accommodate up to 5 test subjects for extended periods. Durations up to a month have been used.

After a ten minute stop at the hotel, the entire delegation assembled and enjoyed an excellent Peking duck dinner at the Hong Bin Lou restaurant. This was followed by a ballet performance at

the National Culture Palace.

Reporter: Mr. Lou Livingston

Visit to the Beijing Institute of Structure and Environment Engineering (BISEE)

I was met at the Xiyuan Hotel at 8:00 a.m. by Yang Yongxin, Senior Engineer, and Huang Huaide, and was taken to BISEE about 20 km south of the city. There I met Zhou Xiyi, Chief Engineer, Zhou Guoxin, Director of the Laboratory, and Huang Huaiteh, Senior Engineer. We viewed a video tape of test activities at BISEE. The activities were similar to activities held in Buildings 13, 49, and 260 at JSC. Following the video tape, we proceeded to the main computer room from which thermal testing is controlled and data is processed. From there we went to the static test lab where we viewed the static load test equipment, the nose cone of the Long March rocket series, and scale models of the Long March 2E and 3A. In that building we also viewed some vibration test equipment. From there we went to the building which houses the microgravity experiments. These are performed by free-fall dropping down a 45 m tower. I told them about our weightless (manned) methods. From there we went to the lab which contains their 20 ton shaker.

Following lunch, we returned to the lab which houses the 20 ton shaker for a discussion on their testing methods, projects, and future plans versus ours. I told them about how we do vibration testing, and modal analysis testing. I also described the modal

analysis test projects currently underway , and acoustic projects underway.

Of great interest to the Chinese were the control of multi-excitation systems, the capabilities of our equipment, shaking slip tables with 2 and 4 shakers, the computer programs we use in vibration testing, and our testing program in general.

Reporter: Mr. Dennis Halpin

Visit to the Space Center

(Report by Dr. Jim McCoy not available at press time)

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SEPTEMBER 13, 1988

Tuesday

BEIJING

Sightseeing and Cultural Activities

The delegation took the day off to attend cultural activities which consisted of visits to the Great Wall at Ba Da Ling and the Ming Tombs, and attendance at an evening performance by an acrobatic troupe. It was seventy kilometers and took one and one-half hours over a four lane highway to the Great Wall. Our bus driver played "chicken" with oncoming busses. On the way, we noticed along both sides of the highway metal wire fences with metal Mama and Papa panda bears attached every two feet. The Great Wall looked like a giant dragon gamboling over the northern hills. The Chinese people say "Person who goes to the top turret tower is a hero." We had three double heroes who went to the top

on the left of the entrance and to the top tower on the right. They were Dennis Halpin, Jim McCoy and Steve Gotch. Francis Mount and Joyce Shultz were single heroines; they made it to the top right tower. This is quite a feat considering the steep hills and steps between the towers. The wall totals six thousand kilometers and is about five meters wide. It was seen by astronauts circling the earth. The delegation ate lunch at the Great Wall restaurant. We all enjoyed the tasty green vegetables.

The bus driver then proceeded to the Ming Tombs. We rode on a very narrow crooked road, now serving as the return two lanes on the divided four lane highway near Ba Da Ling. As recently as two years ago this two lane segment served as the only road to this busy tourist attraction. The driver stopped before the Tombs for the delegation to walk down the trail of stone animals which were the nine sons of the dragon. We visited the tomb of emperor Wan Li at Ding Ling, the only one of the fourteen tombs which has been fully excavated and the buildings restored. To reach the crypt, it was very steep dark stairs down to see the emperor buried with his two empresses in separate dark wood boxes. At the entrance, our guide pointed out a turtle with a dragon face and obelisk on its back. The obelisk was to record the deeds of the emperor during his reign; however, it was blank because the emperor felt his deeds were beyond words. Our hosts treated us to coconut-flavored ice cream bars enjoyed by all.

Because we were running behind schedule upon our return to the hotel, after a very brief stop the delegation proceeded to an

acrobatic performance at the International Club, then enjoyed an outstanding late dinner at the International Club dining room.

Reporter: Mrs. Liz Dillinger

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SEPTEMBER 14, 1988

Wednesday

BEIJING

Today there were visits to the Chinese Academy of Space Technology (CAST)[1], the Landsat Ground Station, the Beijing University of Aeronautics and Astronautics, and the Beijing Institute of Environmental Test Engineering (BIETE). The evening featured a reception and buffet dinner at the International Hotel. The spouses were escorted on a shopping tour in the morning and joined the main delegation for lunch at the Friendship Hotel. A visit to the Zoo scheduled for them in the afternoon was canceled by mutual consent on account of rain, with additional shopping being substituted.

Visit to CAST.

The entire group of technical Delegates departed the Xiyuan Hotel at 8:32 a.m. to visit CAST. Prof. Wang Xi Ji, Chairman of the Science and Technology Committee of CAST, and five others[2] welcomed us. We were escorted to a conference room where Prof. Wang

1. There are two Chinese organizations which use the acronym "CAST". The most widely known is the China Association for Science and Technology, a non-government organization of approximately 140 member societies and associations, including CSA. The other CAST is the Chinese Academy of Space Technology, which is the one referred to in this narrative, unless otherwise noted.

2. Prof. Sun Jin Biao, Dir. of Dept. of Life Support System, Inst. of Space Medico-engineering; Mr. Jin Feng, Sr. Engr., Inst. of Spacecraft System Engineering; Mr. Yu Shigui, Dir., Science Technology Department, CAST; Prof. Chen Chi, Beijing Inst. of Control Engineering; and Mr. Wu Fengzhi, Engr., Foreign Affairs Office, CAST (Interpreter). With the exception of Wu Fengzhi, this group visited Houston October 4-6, 1987, as a task group investigating alternative space station concepts. In July, 1988, Mr. McLane had requested that this meeting with Prof. Wang be arranged to permit the Delegation to hear about the Chinese Space Station project.

via an interpreter summarized CAST history and activities. Prof. Wang said the Academy was founded in 1968 and is responsible for the development of satellites, especially spacecraft. CAST's first product was a rocket. The first liquid rocket was tested in 1960, and the first satellite launched in 1970. CAST has launched twenty-four satellites since its formation. CAST develops four (4) classes of satellites - 1) scientific experiments, 2) technology experiments, 3) earth observation, and 4) communications. CAST launched their first recoverable satellite in 1975, and in 1981 they launched three (3) satellites with one(1) rocket carrier. In 1984, they successfully launched a geosynchronous satellite, and this month in 1988 (September) CAST launched a satellite into sun-synchronous polar orbit.

The Academy (CAST) consists of thirteen Institutes and three factories. At this point, Prof. Wang showed us a video tape (with English language narration) about CAST. The video included a short history of the Chinese space program accomplishments and a summary description of each CAST Institute and their products. After the video, the floor was opened for questions.

Mr. McLane asked if Prof. Wang's working group had made any progress on choosing a concept for the Chinese space station since visiting Houston a year ago. He replied that the Chinese must first send men into space before they decide their approach for a space station. Their first step is to think about technology to support man in space. Man is a part of the engineering process going-on. Their space station will not be larger than the U. S. station. He (or the Chinese leaders) feels

that space station is an important step in the development of space technology. Prof. Wang said that they don't think that the Shuttle is the most economical way to send payloads to the space station, implying that expendable or partially expendable launch vehicles are preferred by the Chinese. The main purpose of the space station for the Chinese would be to explore in such areas as microgravity research. They have no military aims in a space station. Last year (1987) and in 1988, they launched many microgravity experiments in recoverable satellites to prepare for a space station. They intend to develop technology necessary to support an eventual space station, and they get good resource support from the government.

I asked Prof. Wang whether the Chinese recognize or have a management integration function which provides the organization and tools to manage a large program effectively. He said that they did, but didn't state where.

Lou Livingston asked about how the Chinese will design to accommodate space station growth. Prof. Wang said they recognize the problem, but didn't say how they would solve it.

There was also some discussion about space debris and its problems.

At this point, Prof. Wang asked about the Space Industrial Facility of Space Industries, Inc.[1] Mr. McLane gave a short news report of recent developments. Prof. Wang said that his associ-

1. Prof. Wang's delegation received a briefing on the Industrial Space Facility from Mr. Olav Smistad of Space Industries while they were in Houston on October 5, 1987.

ate, Prof. Tu Shan-chen, Chairman of the CAST Commission on Science and Technology , had visited Drs. Max Faget and Joe Allen at the end of June, 1988.[1] One of the Chinese group asked how we (the NASA) will resolve the rescue of life in a space station during an emergency. Mr. Livingston explained how NASA arrived at the solution to use the Crew Escape Rescue Vehicle (CERV).

One of our group asked how the Chinese transfer technology to commercial uses. One of the Chinese group mentioned the China Great Wall Industry Corporation was set up to protect interests of corporations and prevent technology transfer when necessary to allow launching of foreign satellites by the Chinese.

One of our group asked about the relation between the Institute of Space Medico-Engineering and CAST. Prof. Wang stated that Space Medico was once a part of CAST, but not now since their goals and purposes diverged from those of CAST. They work closely with CAST to support projects when they both have an interest, as do many other organizations not directly a part of CAST.

Mr. McLane asked Prof. Wang if we (AIAA) could borrow a copy of the CAST video tape to educate the Houston Section members about CAST and the Chinese programs. Prof. Wang said that the version we saw is out of date in some respects. They hope to have a new version ready soon, and when it is ready he will check into the possibility of lending it to us. Mr. John Trebes asked about the Chinese use of oak wood as an ablative material for heat shields, but Prof. Wang didn't tell us much about it beyond stating that

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1. As a result of a referral by Prof. Wang, Mr. McLane had dinner with Prof. Tu and his delegation in Houston on 6/30/88.

it worked very well.

The exchange then ended, and most of the delegates departed at 10:20 a.m. for the LANDSAT Ground Station. Mr. McLane and Mr. Halpin left the group in order to visit the remote station of the Beijing Institute of Environmental Test Engineering (BIETE) (see report below).

Visit to the Remote Sensing Satellite Ground Station of the Space Science and Technology Center of the Chinese Academy of Sciences (LANDSAT Ground Station)[1]

Upon arrival, the group was greeted by Prof. Dai ZiXin, Station Deputy Director and Head of Image Processing Facilities. Prof. Dai explained that the ground station is an independent institute, and the main equipment is imported from the U.S. The station uses only NASA image software systems. The contract was signed in 1982. The station has two (2) VAX 71180 independent computer systems. The station can process four(4) CGT digital images per day. The data is transmitted by log tapes from the receiving site. The station also processes a HDT tape which can be sent to the users who have equipment to produce pictures. The station also has a photo lab for making its own pictures on film. They only have one receiving station in the vicinity of Beijing. This one (1) station gives them 80% coverage of China. They would like two (2) more receiving sites - one in the south and one in the west - to get full coverage of China. The problem of "ground truth" or correlation between the satellite data and actual conditions on the ground is difficult to determine in China

1. 45 Bei San Huan Xi Road (Building North of Friendship Hotel)

(as compared to the U.S.) because the fields and sections are more diversified and/or scattered. For example, China does not have large expanses of one continuous crop, and one small section of a crop may be next to small sections of other crops. The 30 meter resolution of LANDSAT is inadequate for this situation. A side looking aperture radar(SAR) is needed to resolve this problem. The station employs 130-140 people including administrative support. The photo lab includes 15 people. Prof Dai explained the various pictures in the room. One picture showed a river flowing into a delta on the south China coast. China plans to divert this river so that land will "build up" in the water where oil is known to reside underground. This will avoid the need for drilling platforms in the ocean.

The group then departed for the Friendship Hotel (almost next door) to eat lunch. Prof. Dai and Mr. Wu Guiru, Director of the Business and Management Department, accompanied us to lunch.

Visit to the Beijing University of Aeronautics and Astronautics. After lunch, the group arrived at the University about 2:00 p.m. Prof. Feng Wenlan greeted us at the bus and escorted the delegation to a room set with tea. Prof. Cao Chuanjun, a former President of the University, joined us with an interpreter and both groups were introduced. Then Prof. Cao gave a short history about the University. It was founded in 1952. Before 1952, all aeronautical departments in China were separate. Eight (8) departments were merged in 1952 to form the institute (now university). Aeronautical education really only started in 1950 in China. Prof Cao has only 36 years in this profession. The

University includes thirteen (13) departments and three (3) schools. There is the 1) Graduate School, 2)Management School, and 3) Continuing Education School. The thirteen (13) departments are 1) Propulsion, 2) Flight Vehicle Design, 3) Computer, 4) Production, 5) Applied Math, 6) Applied Physics, 7) Electrical, 8) Social Science, 9) Systems Engineering , 10) Manufacturing Engineering, 11) Automatic Control, 12) Material Science, and 13) Mechanical Engineering. The University includes fourteen (14) research institutions and serves eight thousand (8,000) students. Fifteen hundred (1,500) of these are graduate students working on a master's or doctor's degree. An undergraduate degree requires four (4) years, a master's requires two to three (2-3) years, and a doctor's requires two to three (2-3) more years.

Prof. Cao then showed the Delegation a video tape about the University's history, services and accomplishments. One special accomplishment was the design, construction, and testing of a two (2) engine passenger plane by the students.

The professors who teach class also do research. The campus covers eighty-seven (87) hectares. The University has initiated many aerospace projects including the development and building of drones, passenger planes, ultralights, hot gas ships, small jet engines, and flight simulators. The University has also done research in inertial navigation, star tracking, laser gyros, optical fiber communications systems, robotics, SMS material crystals, and CAD-6 degree of freedom. Past President Cao said

that the University provides a post-doctoral program for people from other countries, but does not have an undergraduate program for foreigners. Courses are taught only in Chinese for the undergraduate program. Since the University's formation, twenty-seven thousand (27,000) students have been graduated in space and aeronautical fields. President Cao himself is a rocket engine expert.

Students spend about 40% of their time doing "hands-on" work, design or lab work. The other 60% is spent in class. Students not majoring in computer science spend about two hundred fifty (250) hours with computers such as IBM PC XTs.

At this point the floor was opened for questions. I asked Prof Cao to elaborate on the School of Management. He said that the School of Management includes 1) engineering oriented coordination of technical projects, 2) computerized management, and 3) technical foreign trade. The students in the School of Management must take basic "across the board" technical courses such as physics. The management students must also be good thinkers who are able to express themselves in public, and be willing to develop themselves outside of class.

Reporter: Mr. Garland Bauch

Visit to the Beijing Institute of Environmental Test Engineering

Dennis Halpin and I left the main delegation at the end of the meeting at CAST, and proceeded by van to the remote installation of the Beijing Institute of Environmental Test Engineering

(BIETE). We were accompanied by Mme. Li Fu-Rong and Mr. Jin Xun Shu, Deputy Director of Science and Technology Committee, BIETE. I had last visited this facility in April, 1986, and I was anxious to see if there were any changes that I could notice. The facility is located on the northeast side of the village of Xiazhuang , which is in turn located about 40 km north/northeast of Beijing. The first noticeable change was that the highway to Xiazhuan has been vastly improved. It is still not exactly like I-45, but it had been widened and repaved, some signs had been put up (mainly safety warnings), and our van frequently reached speeds up to 100 km/hr, unusual for China. The reason for this improvement, it turns out, is that an interesting section of the Great Wall, very different from that at Ba Da Ling, is being restored near Xiazhuang, and the highway has been improved in anticipation of heavy (and lucrative) tourist traffic. The local setting of the laboratory itself has been modified by the erection immediately next door of a modest size military compound housing an officer training school. At intervals throughout our visit the air was rent with bugle calls ordering the cadets to some duty or other. Upon arrival at the lab we were joined by Prof. Ke Shou-Quan (the Institute Director), Prof. Huang Ben-Chen[1], and Mr. Ding Zhong-zhu[2]. We first went to lunch, which turned out to be a full-blown banquet, with a centerpiece of most elaborately decorated roast chicken . Conversation during lunch revolved around laboratory activities. BIETE Management seems to

1.Prof. Huang's 1987 business card listed him as BIETE Deputy Director, but the title on his 1988 card is simply "Research Professor".

2. Mr. Ding visited the U.S. in November 1986 to attend the Tri-Society Space Simulation Conference in Baltimore, and then visited Houston with three associates from other laboratories.

be getting serious about acquiring a new 15 m thermal/vacuum chamber. Jin said that they will be sending a team to the U.S. early in 1989 to have a look at the large U.S. chambers before finally deciding on design features (Ke was less committal about this visit). It wasn't clear what their current thinking is regarding a large hi-fi solar array. Ke said that for the next twenty-four months or so they will have a light test load, but they have four new satellite programs requiring T/V tests beginning at the end of that time. They would hope to have the new facility ready to support that surge in work-load.

We went to see the largest of their chambers, a 7 m diameter by 12 m high upright cylinder. This chamber is equipped with a 19-module array of 25 kw xenon lamps mounted in the movable top head. It has a copper LN_2 shroud painted a shiny looking black, and said to have an emmissivity of 0.8. Their preference for copper is because it has high thermal conductivity and is easy to paint.

They claim not to have had any leaks from copper cold-working. I couldn't see that there had been any upgrading on this facility since I first saw it 29 months ago. They had moved their 3.6 m by 7 m chamber into a refurbished high-bay room adjacent to the one housing the larger chamber. It had been modified during the move by adding valved cryopumps. This work was evidently just being completed; some insulating work on the LN_2 piping was still in progress. I remarked to Prof. Ke that it was a surprise to see that most of the laboratory areas are still very dirty, just like on previous visits, and certainly not up to western

standards. It is difficult to see how they manage to do high quality testing in such an environment. He said that I am not alone in that observation; every foreigner who visits the lab says the same thing. We did not have time to look at any other facilities. Mr. Halpin asked about their acoustic and vibration test facilities and was told about the new BIETE vibration facility recently completed at the Beijing site.

Reporter: Mr. Jim McLane

Reception at the International Hotel

The Chinese Society of Astronautics held a formal reception and buffet-style dinner for the delegation at the International Hotel. We arrived there about 6:30 p.m. Mixing informally with our Chinese hosts[1], we sipped drinks while waiting for the formal proceedings to begin. An air of congeniality and personal goodwill pervaded the individual discussions as well as the formal remarks at this meeting. There was ample opportunity for everyone to meet and talk with each of the Chinese officials who were present. The welcoming speech was given by Mr. Ma Ji, Vice President of the CSA and former V.P. of the National Defense Commission for Science and Technology. Mr. Ma began by saying the CSA was happy to have the opportunity to host the AIAA

1.Attendees with previously noted affiliation: Chen Rong-ying, Li Fu-Rong, Fu Binchen, Xie Hoaran, Ke Shou-Quan, Jin Xun Shu, Sun Jin Biao, Wang Xi Ji, and Qi Yan Wen. Others were: Zou Ze Qin, Vice Dir General, Foreign Affairs Bureau, MOA; Liu Guangmei, International Cooperation Bureau, MOAI; Chen Xueming, Proj Mgr, Foreign Affairs Bureau, MOA; Dr. Liang Si-Li, Chief Engr, MOA; Prof Shi Changjie, Standing Member, Science and Technology Commission, MOA; Mo Fan, Foreign Affairs Bureau, Commission of Science, Technology and Industry for National Defence (COSTIND); Xu Hong Ying, Dir of the Office, China Astronautics Asso for International Exchange of Personnel; Chen Guoxing, Dep Dir, Department of International Affairs, China Asso for Science and Technology; Li Shnayan, Liaison Office, The First Academy of MOA; Chen Zhongqing, Sr Engr, MOA; and Wu Fangni, Foreign Affairs Bureau, (COSTIND).

delegation's trip to China. He recalled that ten years ago he was a member of a delegation headed by the President of CSA which went to the U.S.A. to establish contact between the two countries, and they visited JSC to see the facilities. Now he is glad to have a return visit from AIAA. He was happy that President Reagan has approved the " Long March" launch of U.S. Satellites. He felt that after ten years of technical exchange this marks a new phase of cooperation between China and the U.S. Because Houston and Shanghai signed a Sister Section agreement last year, we are no longer just friends, but relatives. He expressed optimism regarding the success of our visit, and offered a toast to continued cooperation between the two countries and the two technical societies. In his response, Jim McLane pointed out that while most technical delegations visiting foreign countries consist of high ranking officials and corporate officers, ours is made up of working level engineers and scientists who are traveling at their own expense on their own vacation time. They have chosen to come to China rather than spend their savings on material things such as new personal computers because they have great curiosity about the Chinese space program and the people who work in it. They will be telling their working associates back home about what they have learned on this visit, and this should pay dividends in the future in the form of increased international understanding and cooperation. Mr. McLane read a letter of greeting to the CSA from Mr. Walter Lueke, Houston Section Chairman. An inscribed Shuttle model was presented to Mr. Ma, and he in turn gave the delegation a copy of an Aeronautical and Astronautical encyclo-

pedia inscribed to the Houston Section. Other individual gifts were exchanged, after which a truly outstanding buffet dinner was served and pictures were taken.

Reporter: Mr. Garland Bauch

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SEPTEMBER 15, 1988

Thursday

BEIJING

Sightseeing and Departure

After a hearty breakfast buffet in the Western restaurant[1], the delegation departed the Xi Yuan (Western Garden) Hotel at 0843. The first stop, decided by majority vote, was the Mao Zedong mausoleum in Tian An Men square. The group arrived there at 0915 and filed past his crystal coffin in a half hour. A long awaited shopping spree was then accomplished at the Friendship Store. Nearby was located an ancient astronomical observatory. A scrumptious Western-style lunch buffet was enjoyed at the Windows on the World restaurant on the 29th floor of the China International Trust Investment Corporation building. The delegates made a quick exit to catch a 1335 flight to Xian, and arrived at the airport at 1242. Unfortunately the 1335 flight had been canceled, and the next available flight was not scheduled until late in the evening. To pass the time while waiting for the flight, postcard writing, bridge, and napping were the main activities in the VIP lounge. The delegates boarded the much awaited aircraft, a Russian-built TU-154M trijet, at 2045. CAAC (Civil Aviation Adminis-

1. Delegates Mount and Schultz opted for Chinese breakfasts while in Beijing.

tration of China) Flight 2108 then took off at 2115 for Xian. The delegation was accompanied by Mr.Chen Rong-ying and Mme. Li Fu-Rong.

XIAN

Arrival

The flight landed in the 3,000 year old city of Xian at 2243. The delegation was greeted at the airport by Mr. Liu Zhong Ping, Secretary General of the Shaanxi Society of Astronautics; Dr. Yuan-neng Hsu, Director of the Xian Institute of Radio Technology (and Vice President of the Shaanxi Astronautical Society); and Mme. Yan Kai of the Shaanxi Bureau of Astronautical Industry. The delegation arrived at the newly remodeled Renmin (People's) Hotel at midnight.

Reporter: Mr. Stephen Gotch

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SEPTEMBER 16, 1988

Friday

XIAN

Visit to the Satellite Control Center

The delegation visited the Xian Satellite Control Center on 16 September 1988. As usual there was a gathering and exchange of business cards. Tea and soft orange drinks were served by ladies. We did not determine whether they were of the professional or clerical staff. I suspect that they were both. After the introductions we adjourned to the control room, mission control. The room was perhaps larger than our first floor mission control

room that I remember. The floor was level unlike our mission control rooms where the floor is stepped down. There was a large glassed-in VIP viewing room.

There were five viewing screens. Projection of the images was from the front. No systems were operating, a disappointment. This puzzled us as we were used to seeing some activity day and night when a vehicle is on-orbit. Asked about this, they explained that the room was manned only when the satellite makes a pass over their tracking stations which are in China. We were used to activity coming in from our world-wide tracking network. I should add here that their recently launched meteorological satellite was then in orbit. The Chinese explained that the room would be manned in a few hours.

The Flight Director communicates with the Controllers by loudspeakers located at each side of the room. Controllers talk to Controllers by telephone handsets. There are no headsets with blinking light push buttons that we are used to.

In answer to our question on backup systems in the mission control room the reply was that backup was by equipment changeout.

For manned operations they would expand into adjacent rooms.

The Center had a staff of 400 not including launch site and shipboard staffs.

Both civilian and military satellites are controlled from this site. They stated that China has now launched 24 satellites.

Regarding security, they stated that they do not know about the insides of "black boxes".

I asked about the training of Flight Controllers. There were two types of Controllers: network and satellite. The Network Controllers were the easiest to train. Training of the Satellite Controllers presents a challenge. They must learn new systems. A Satellite Trainer is made available to them. They also visit the satellite factory and the R & D Institutes, and also train in the MCC. The Controllers also have early inputs into software and hardware design. Payload customers have a separate console.

We asked the Chinese whether they could give us the latest data on the hurricane in the Gulf of Mexico. At this time in our trip we had 2 or 3 day old information. Unfortunately the meteorological data was processed in Beijing and here we were in Xian. No offer was made to make a call for us. I brought up the subject of space debris as being a concern for all spacefaring nations. Our hosts agreed that this was a concern to them and they were aware of the subject.

Reporter: Mr. John Trebes

Additional Observations at the China Xian Satellite Control Center (XSCC)

Upon arrival at the Center[1] the delegation was met by Mr. Cui Yu, Secretary of Foreign Affairs, and others[2], and taken on a tour of the facility. Cleanliness requirements of the facility required

1. Address: No. 28 Xian Ning Dong Lu Xi'an Shaanxi China.
2. Zhang Feng-Xiang, Chief Engr; Wu Zhi-Zhong, General Engr, Technology Dept; and Wu Hong-Fei, Sr Engr, Technology Dept.

that the delegates remove their shoes and wear sandals. Among the areas viewed, the Delegation was able to see the control center data processing equipment (much of which was U.S. made), the engineers' offices, and the mission control room. One point of interest was that the engineers' offices, though totally enclosed, had one wall completely of glass allowing the interior of the offices and their occupants to be in view at all times. The mission control room was larger than that at the Johnson Space Center in Building 30, and was much less cluttered. Immediately behind the control stations , and in the same room, were two rows of tables with chairs for VIP viewing. A glassed-off viewing area, similar to that in Building 30 at JSC was in the back of the room.

Reporter: Mr. Dennis Halpin

Visit to the Xian Institute of Radio Technology

We were greeted by the staff and began our visit over tea and soft drinks. After the introductions, we visited a laboratory and were shown a boilerplate satellite. Electronic systems were installed about the boilerplate frame. Our hosts explained that this boilerplate was used for system verification of the electronics only. Jim McCoy pointed out traveling wave tubes. We were shown duplexers and multiplexers (4 channel), and wave guides. The next generation system will have 20 channels.

Integration and environmental testing is done in Beijing. West German and HP transponder and computer programmable checkout equipment, was displayed. In other areas we were shown where an

expert system was being developed for sedimentation studies. An image from a NOAA satellite showing the sea, an island, and the mainland (the Los Angeles basin) was being used in the study.

I asked about Ham Radio operations. Were there any Ham Operators about? What kind of Ham radio activity was there in China? No satisfactory answer was given. This seemed to be a touchy subject.

At the Telecommunications, Telemetry and Control Facility we saw an antenna checkout facility. The frequency range available was 0.1 GHz to 12 GHz.

The Chinese TV format is called PAL and is not compatible with the NTSC system used in the States.

Their anechoic chamber was impressive in size. The measurements in meters are 40L X 10H X 10W. The chamber construction began 5 years ago. The spikes had a hard cover over a softer interior material. The female engineer in charge of the chamber briefed us on the details.

A discussion of management problems and challenges ensued. While the Chinese have problems peculiar to their own governmental and societal factors, they also have challenges similar to us in the States.

It seems that CAST (Chinese Academy of Space Technology) was responsible for the satellite after it was developed. For each satellite project a contract is made between the XIRT and CAST.

XIRT must then appoint a project team for each satellite. These teams have problems working with various laboratories as the supervisors of the laboratories are also busy with other projects.

Also involved in the management area was the problem of transferring the R & D efforts into production. Here they let the same R & D team go to the production side of the house. The problems occur when the supervisor of the R & D side of the house goes over to the production side of the Institute and gives direction to the team that is now working for the production people. We know this as matrix management. Additionally, now what happens when the unit goes out of production and there is no immediate R & D task to go back to? We had no answers. All we could do was to humorously commiserate.

At these facilities as well as others I was struck by: the emptiness of the halls, a lack of visual and aural bustle. All offices and labs seemed "information poor". There seemed to be next to no books, journals, reports, wall charts and photos about.

Reporter: Mr. John Trebes

Addit'l Observations at the Xi'an Institute of Radio Technology.

The Xi'an Institute of Radio Technology is one of those unique Chinese Institutions: a complete, self-contained city devoted to the operation and maintenance of a research, development, and manufacturing activity in a specialized area. In this instance, the specialized area is research of space electronic technology.

Their responsibility[1] extends to the development and manufacture of electronic devices for spacecraft, and for tracking, telemetry and control (TTC) systems. Hardware produced by the Institute has included radio beacons, antennas, transponders, responders, remote sensing devices and transmission systems. The Institute is located in the village of Chang An[2], about 20 kilometers south of Xian. At about the half-way point in our bus ride to the Institute we came upon a most interesting structure: a recently completed gigantic broadcast tower. The height of this tower is unknown, but it seemed to be as tall as any I have seen anywhere. It was all the more impressive because of its masonry base, a tiered structure measuring perhaps seventy-five meters or more on each side.

Upon arrival at the Institute, we were greeted by the Director, Dr. Hsu Yuan-neng, who bears responsibility for the eleven laboratories, three shops, and the more than one-thousand employees (and their families) who are employed there. In his role of Vice President of the Shaanxi Astronautical Society, Dr. Hsu was the senior member of the delegation which welcomed us upon our arrival in Xian. Having been educated at the University of Quebec in Canada, he spoke excellent English and communicated enthusiastically in disarmingly candid terms on many subjects. His business card displayed his name in western convention, i.e. given names first and surname last.[3] Dr. Hsu said that he is stepping down from his job as Unit Leader of the Institute to

1. Chinese Academy of Space Technology (CAST) pocket handbook, 1988 Edition.

2. Chang An is the ancient Tang name for Xi'an.

3. Chinese convention is to list surname first; for those few who choose to use Western convention, the given names are usually hyphenated to avoid confusion.

take over the management of a factory in Hong Kong in October. He said that while this represents a much lesser responsibility for him, he thinks it will prove in the long run to have been an opportunity.

Reporter: Mr. Jim McLane

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SEPTEMBER 17, 1988

Saturday

XIAN

Visit to the Terra-Cotta Army of Emperor Qin Shi Huang.

This was a day full from beginning to end with interesting and exciting events.

The van left the hotel with all of the delegates at 8:05 a.m. (only 5 minutes late). Our first stop was to see the Terra-Cotta army of Qin Shi Huang, which some consider to be the Eighth Wonder of the World. This site is situated at the east side of Qin Shi Huang's Mausoleum, 37 km to the east of the City of Xian. The trip to the location took approximately one hour of travel. We stayed one hour at the site going through the various buildings containing displays and the area where the army is being uncovered.

Visit to the Li Shan Micro-electronics Company.

Just a short ten minutes ride from the Terra-Cotta army we arrived at the Li Shan Micro-electronics Company. The technical members of the delegation disembarked from the van, and the rest stayed aboard and went to visit the Regional Province Museum.

The facility we were in seemed to be a whole community; with a quick glance it could be seen that it consisted of: technical buildings, apartment buildings (with laundry over the balconies), dormitories, a play-yard and cafeterias. We were greeted by our hosts and escorted into a sitting room of a building that was a dormitory.

After we were seated, Mr. Wen Ming Xian, Vice President of Li Shan Micro-electronics Company greeted us and gave us a background on the company.

The company was started in Beijing and moved to its present location in 1969. The facility covers 100,000 square meters and has a total staff of 2,000.The engineering staff total 800.

Their main products are integrated circuits and micro-computers. The computers are produced and shipped from this location. The firm enjoys high prestige domestically and has seen some major accomplishments, such as building the first special computer in China in 1970.

There are three categories of computers being produced now:

1. Dedicated space system
2. Industrial control
3. Automatic control for petrochemical engineering

The Marketing Division of the Company is located in Xian. According to Mr. Wen, the characteristics of the Company include: 1) technical strength, 2)exploration of new products, 3)strong scientific research, and 4)perfect measuring and test equipment.

After the short conversation we were taken to another building to see some of the laboratories and technical areas. We had to don full uniforms including head coverings and special shoes because the laboratories in the building were equivalent to a Class 1000 clean room.

We visited a laboratory where minor implantation by plasma bombardment was being done. This implanting beneath the surface is equivalent to chemically diffusing material into the substrate. A second laboratory was using the process of ion machining (etching), that is, eroding away material precisely.

In one laboratory quality control was being carried out. The completed wafers were looked at individually. We were given the opportunity to view the printed circuit boards under a microscope. The chips were being counted and put into a plastic tube for shipment/storage. We were surprised that the employee was not using gloves and was handling the wafers with her bare hand.

The silicon chips that we saw are going to be used in musical instruments such as Casio and Yamaha.

A member of our delegation asked our host if the wafers were all silicon, or were they GaAs (GA). We were informed that GA is in use elsewhere in Chinas, but not in this facility atthis time. We went through one laboratory that was a class 100 clean room. The task in that area was imprinting of wafers. Our delegation was curious about the apparent laxness of control of their class 100 clean room. First, we were surprised to be let in; second, the air flow in the doorway seemed to be inadequate; and third,

the employees were not wearing gloves. he entire building seemed to be less than what we would consider to be a Class 1000 clean room, and this Class 100 clean room seemed to be lax. Upon discussion with our hosts we were told that the entire facility was moving in the future because of dusty climate conditions.[1] After our laboratory tour we returned to the sitting room to wait for the rest of the group. The conversations continued. We were told that they have a Post-graduate Department which is three years in duration. Technicians and engineers get continuous training. They are trying to meet the continuously changing requirements of micro-chip technology.

Mr. Wen explained that the Micro Electronics Society had their headquarters in the Li Shan Micro-electronics Corporation. The Micro Electronics Society is a 'set' of the Chinese Electronic Society (CES). Journals are published and they have an annual meeting each year.

Upon arrival of the 'tourist' part of our group we adjourned to lunch. Lunch was served in a large room down the hall from where we met. It seemed to be a combination dining area, recreation hall and meeting room. We were served a very bountiful, delicious meal. During the meal and in between conversations with our hosts, we watched the opening of the 1988 Olympics live from Korea. At the completion of our meal, we left the facility.

We first proceeded to nearby Hua Qin Hot Springs for a quick walk-through. We departed about 2:40 p.m. for the one hour ride

1. To Shanghai or near there. The move is not final, but in any case the Headquarters will stay in Shaanxi Province.

back to the hotel. On the way we stopped at the Xian Terra Cotta Pottery factory for a quick tour of the factory and the gift shop.

Formal banquet with the Shaanxi Society of Astronautics

In the evening we attended a banquet hosted by the Shaanxi Society of Astronautics at the Defachang Restaurant. The Senior official present was Mr. Wu Yu Kun, Vice President of the Shaanxi Bureau of Astronautical Industry[1]. He acted as official host, and spokesman for the Society during the formal exchange of toasts and gifts. This banquet was just fantastic. There were seventeen types of dumplings served. This was in addition to the other dishes, all of which were great. The last dumpling dish was miniature dumplings in a broth. The story says that if one gets three dumplings in his bowl it means good luck. At our table both Dot McLane and Jim McCoy found three in their dish.

Reporter: Mrs. Frances Mount

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SEPTEMBER 18, 1988

Sunday

XIAN to GUILIN

Departure

The delegation was accompanied to the airport in Xian very early in the morning (0610) by Dr. Hsu Yuan-Wen, Mr. Liang Ding-Bang, and Mme. Yan Kai. There we boarded a somewhat shopworn Russian-

1. Others in attendance were: Dr. Hsu Yuan-Weng, V.P. of the Society; Liu Zhong-Ping, Secretary General of the Society; Liang Ding-Bang, Director, Administerial Office, Shaanxi Bureau of Astronautical Industry; Mme. Yan Kai, Shaanxi Bureau of Astronautical Industry; Mr. Chen Rong-ying; and Mme. Li Fu-Rong.

built Ilyushin Il-18 four-engine turboprop airplane for the three hour flight to Guilin. Guilin is situated in the northeast corner of the Guangxi Zhuang autonomous region in southern China. Our fellow passengers consisted of a Chinese General and his aide (newly given rank, and authority to wear the symbols thereof on their uniforms), and tourists of several nationalities. Our longer-legged delegates were quit uncomfortable in the closely-pitched seats.

Guilin Sight-seeing

Upon arrival in Guilin, we were met by a professional guide from the China International Travel Service, who had been retained by Mr. Chen and Mme. Li. We arrived at our hotel, the Rong Hu, before the rooms were ready. The guide suggested that we use this waiting time to become acquainted with the city. Therefore, the delegation climbed Piled Silk Hill for a panoramic view of Guilin. After lunch at the hotel, the delegation toured Reed Flute Cave, and visited a pottery factory. Following dinner at the hotel restaurant, we had the evening free since we had started so early.

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SEPTEMBER 19,1988

Monday

GUILIN

Sightseeing and Departure

Following breakfast, the delegation left on a one hour bus ride to a tourist boat harbor south of the city on the Li river. There, along with about sixty other people, we boarded one of

the fleet of boats for a four hour ride down the river to the town of Yang Shuo. The warm, sunny weather was ideal for this classic tour of world-renown scenery. The noon meal was prepared and served on the boat, taxing table space to the maximum. The return bus ride to Guilin took over two hours on an excellent modern highway, one of the few we saw in China. We had a dinner of local exotic dishes (snake soup, several kinds of game) at our hotel. Then we left for the airport and boarded a Boeing 727 airplane for the flight north-eastward to the port city of Shanghai.

SHANGHAI

Arrival

In Shanghai, we were greeted by members of the Shanghai Bureau of Astronautics (SBA), and our AIAA Sister Section, the Shanghai Astronautical Society (SAS).[1] We were taken by bus to the Peace Hotel, located on the Bund overlooking the Huangpu river, only a block away from the SBA and SAS offices. The Peace Hotel, a Shanghai landmark with its pointed bronze-green roof, was known as the Cathay Hotel when it was built and owned by the British. It still retains the aura of the early twentieth century.

Reporter: Ms. Joyce Schultz

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1. For the SAS: Song Yun Ping, Scy. General; For the SBA: Wang Yue, Dir. of Foreign Affairs Dept.; Mme. Lu Fu-Zhen; Mme. Xia Yuin.

SEPTEMBER 20, 1988

Tuesday

SHANGHAI

Yuang Pu River Cruise, and Visit to the Arts & Crafts Hall

This was our first day in Shanghai. We left early after breakfast in the hotel and took a cruise on the Huang Pu river, which serves as the harbor for Shanghai. The large catamaran cruise boat went from its mooring near the Peace Hotel to where the Hyuang Pu empties into the Yangzi. On the return trip, a show featuring an acrobat and a magician was held in the boat's auditorium, to the delight of about one hundred kindergarten age passengers.

At the end of the boat ride we were taken by bus to the Yang Zhou Restaurant for lunch.

After lunch we rode to the Shanghai Arts and Crafts Exhibition Hall. Actually, it was no different than a friendship store. As we were turning into the parking lot of this Hall, the bus hit a taxi (just a slight crush). Because of this little accident we missed the second half of the planned afternoon activity (a visit to the Old City of Shanghai and the Yu-Yuan Garden). The spouses took that excursion the following day (Wednesday) while the delegates were at the rocket factory.

Reception and Banquet

In the evening a formal reception and banquet was held in our honor by the Shanghai Bureau of Astronautics at the Jin An Guest House. Mr. Shi Jin Miao, Deputy Director of the SBA served as

host.[1] After the customary exchange of opening remarks and toasts, Mr. McLane presented a Space Shuttle model with brass plaque inscribed from the Houston Section to the SAS to Dr. Liang Jincai, Director of SAS. Eagle Engineering Company and NASA drawings were presented to most of the Chinese officials present. The Chinese, in turn, presented souvenir gifts to each delegate.

Reporter: Mrs. Frances Mount

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SEPTEMBER 21, 1988

Wednesday

SHANGHAI

Visit to the Xin Zhong Hua Machinery Factory

The technical delegates and Mrs. Eddette Livingston set out from the hotel at 0730 bound for the Xin Zhong Hua Machinery Factory, assembly plant for the Long March (Chang Zhen, i.e. CZ-) series launch vehicles. The factory is located south-east of down-town Shanghai at 100 Hua Yin Road, Min Hang District. It took us nearly two hours in slow-going traffic to reach there. We were escorted to a conference room in an office complex along one side of the main factory building high bay. On the way into the building we passed a very large emergency-type electric power generator which was operating in support of activities in the factory. We also passed a string of sleeper-type railway cars parked on a siding just outside the building. We were told that

1. Others in attendance were: Xu Chunyin, Dir of the Astronautical Society of China; Song Yun Peng, Scy-Gen SAS; Chen Pei Jing, Dep Dir, Intl Academic Exch Dept, Shanghai Asso for Science & Tech; Li Xiang Rang, Vice-Dir, Astronautics Bureau 805 Research Inst; Yu Fuyuan, Vice Dir, Shanghai Inst of Satellite Engr; Huang Guo Lin, Administrator of SBA; Mme. Hwang Lu, Foreign Affairs Dept, SBA; Wang Yue, SBA; Chen Rong Ying, CSA; Li Furong, CSA; Lu Fu-Zhen, SBA; and Xia Xiou-Yuin, SBA.

these are for transporting the assembly and checkout crew from the factory to the launch site and return. The factory crew goes with each vehicle, erecting and servicing it through the launch phase.

We were greeted by Dr. Li Xiang Rang, Vice Director of Astronautic Bureau 805 Research Institute, which operates the factory. Dr. Li said that Dr. Sun Jin Liang had asked him to express his regrets at being out of town on business and not being there to meet us. Dr. Sun is the Chief Designer of the CZ-4, and was featured in a recent biographical sketch printed in the Houston Section Newsletter. Dr. Sun also serves as Chief Engineer of this Bureau. We were briefed by Dr. Xu Xin Hua, Director of the System Laboratory. The installation has a working staff of twenty-five hundred, factory and research Institute combined. The factory and the institute have a common Head (Dr. Sun). They are primarily involved in the design and manufacture of launch vehicles, and in the management of the Shanghai Bureau of Astronautics. Of the staff of twenty-five hundred, fifty have the rank of Senior Engineer and six hundred are qualified as Engineer. It was explained that Senior Engineers are the equivalent of full University Professors, while Engineers might be compared to Associate Professors and Lecturers, depending upon experience.

There are five laboratories in the Institute: 1) Systems Engineering, 2) Dynamics and Structures, 3) Telemetry, 4) Ground Support Facilities, and 5) Information. There is also a paint workshop, and a Management Department which includes such func-

tions as quality control. Work in the factory now is mainly concerned with the CZ-3 and CZ-4, although new programs are under development. These include the CZ-3a with a new cryogenic upper stage giving it the capability to lift 2.5 tons to geosynchronous transfer orbit (GTO), and the CZ-2e with four liquid strap-ons providing a low earth orbit lift capability of 8.8 tons. There will also be a new version of the CZ-1, but it was not described to us.

In addition to assembly work, the CZ-3 1st, 2nd, and some of the 3rd stage is designed and manufactured here. The platform computer and similar items are by others. Systems Engineering of the CZ-3 is carried out in Beijing. The train trip for a launch vehicle and its accompanying team from the factory takes three days to travel to the Xichang launch site in Sichuan Province, or five days to reach the Jiuqan site in Gansu Province. We were shown an English language video about the CZ-3. As we had done when viewing similar tapes at other Chinese installations, we requested the loan of this one to show our AIAA members in Houston. They promised to look into it.

After viewing the tape, we donned clean-room coveralls and went into the high-bay to have a look at the CZ-3 which was undergoing final assembly and checkout. From all that was discussed and seen, it is fair to say that the Chinese launch vehicle program is an evolutionary one, with changes being made very reluctantly and cautiously. The adage "if it ain't broke, don't fix it" obviously applies here. For example, they said that the CZ-3 third stage uses the same engine as is used with its first stage

(presumably with a nozzle extension) even though it is not efficient in that application. This penalty is far outweighed, they said, by the demonstrated reliability of the engine. I understood them to say that a columbium nozzle extension had been put on the CZ-4 third stage giving it a T/E ratio of 1:50. In answer to a question, I was told that they do have ground test facilities (located elsewhere) for development and check-out of their rocket engines under altitude conditions using steam ejectors and exhaust diffusers for pumping the test chamber. Our hosts seemed to be very open in showing and explaining details of the hardware we saw, and answered virtually every question put to them. The design and fabrication features of the CZ-3 we saw have been widely reported, and I will only add that the quality of workmanship appeared to be excellent.

Visit to the Shanghai Satellite Engineering Institute

It was only a short ride of a few kilometers from the Xin Zhong Hua machinery factory to the Shanghai Institute of Satellite Engineering at 251 Hua Yin Road, Min Hang District. We were about thirty minutes late arriving for a visit which already had insufficient time allowed in the schedule. This laboratory is housed in older (20 - 30 years or more) buildings along tree-lined streets reminiscent of the original NACA Langley labs of the middle to late 1940's. We were greeted by two Vice-Directors of the Institute, Lu Zi-Li and Yu Fu-Yuan, and Engineer Huang Han-Wen. Zhu Wei-Guo of the Institute's Liaison Office served as interpreter. We received a briefing on the activities

and achievements of the Institute, which had recently been crowned with the successful launch of the FENGYUN-1 meteorological satellite. This has been their baby from beginning to end, including design, manufacture, test and checkout. The only significant work by others was the integrated thermal/vacuum test, which was performed at BIETE in Beijing because, they said, "LN_2 is cheaper there." After the briefing, there was time only for a quick look into one of the high bay areas where engineering models of several Chinese satellites were on display. We were required to don clean-room garb for the tour. The return ride to Shanghai took another hour. We arrived late at the Shi Chuan Restaurant where we found the spouses waiting for us for lunch. They had spent the morning shopping and sightseeing in the Old City of Shanghai and at the Yu-Yuan Garden. After lunch, the delegation was divided into four separate groups for technical discussions.

Reporter: Mr. Jim McLane

Meeting of Working Group No. 1

The technical discussion with the topic "research, planning and management of Space System development programs" was held in the Peace Hotel, room 782. The attendees were Mr. Garland T. Bauch, Mr. Louis E. Livingston, Mr. Huang Xue-xin, Mr. Gu Xuan-rao, Mr. Yan Jin-Guo, Mr. Zhang Xiang-gen, and Mr. Gu Xue-Fang. Dr. Li Xiang Rang also joined us later. Dr. Huang and others of his colleagues wanted to know how the National STS is managed.

Garland Bauch led off with an explanation of the program requirements control board (PRCB) system. Then, Mr. Livingston explained the Phase A, B, and C/D approach. The Chinese leader asked how many facilities NASA has, and Lou gave a description of each NASA field site. The Chinese also asked about competition between JSC and MSFC,. Mr. Livingston answered that this competition is less now than in former years. The Chinese were also interested in how NASA publicized results of new technology. Mr. Livingston described the NASA publications system but said that most specific knowledge is shared by "working" members of the NASA team on a daily basis throughout the network. Toward the end of the meeting, Mr. Bauch asked the Chinese how they manage their programs such as "Long March". That is, how are the design requirements compiled and is there a competitive process. Basically, the Chinese said that the program/project requirement is "handed-down" by the government in Beijing and a particular office is asked to respond with a design approach/concept to meet these requirements. The government then decides whether the response is OK, and the work proceeds. It appears not unlike our system, but there is much less competition between government centers for the work, thus simplifying the task. Of course there is no contractor bid process with the accompanying protest to complicate matters.

The meeting ended promptly at 4:30 p.m. in a cordial manner. A group picture was taken by Mr. Bauch.

Reporter: Mr. Garland Bauch

Meeting of Working Group No. 2/3

The SAS had scheduled concurrent meetings of five separate technical working groups. This spread our nine technical delegates pretty thin; moreover, they had one or two of our people assigned to groups outside their disciplines. To correct this, we combined Groups 2 and 3 into one titled "Structure design and test, and ground environmental test." The AIAA was represented by Dennis Halpin, Steve Gotch, and Jim McLane. There was a large contingent of Chinese, a mixture of structures, ground test, and propulsion people.[1] These latter had no counterparts on our side, since there were no propulsion people in our delegation. We met in a conference room on the second floor of the old French bank building which serves as Headquarters for the SBA at 15 Zhong Shan Road E1 (the Bund).

Dennis Halpin was suffering from a bad cold with fever. We devoted the first part of our discussion to vibration and acoustic ground test so that after leading that segment, he could leave the meeting early. The discussion began with questions from the Chinese concerning dynamic structural analysis and tests of the space shuttle. Mr. Halpin reviewed in broad terms the current and past programs carried out in the Johnson Space Center facilities. He also explained the modal inspection program to be implemented in the near future. He also described

1.Representing the SAS were: Huang Han-Wen, Shanghai Inst of Satellite Engr (SISE); Zang Jia Liang, Dep Dir 801 Res Inst, SBA; Deng Conggu, Dir of Science & Tech Comm, Xin Zhong Mach Plant; Ju Dian Jia, SBA Planning Dept; Xia Fuan,Xin Yue Instrument Factory; Xu Xin Hua, Dir of System Lab, Shanghai Astronautics Bureau 805 Research Inst; Zhang Wenxiang, China Great Wall Industry Corp, Xin Zhonghua Mach Fac (who acted as interpreter for the group); Wei Zhong-Chuan, Vice Dir Satellite Res Inst; Li Bi-Guang, Xin Zhonghua Mach Fac; Hua Shou-Lian, Elastic Mechanics; Chen Zhen-Huang, Flight Mechanics;Zhang Wen-xiang, Resp for Structural testing, Zhong Hua Mach Fac; Xu Chun-yin, Res Fellow, Struct Test, SBA; and Wang Yue, SBA.

the environmental vibration testing of components flown on the shuttle. In answer to questions, the Chinese said that they use standardized vibration and acoustic specifications for both qualification and acceptance testing in their programs. These specs are reconfirmed and updated through review of telemetry flight data. There was a general discussion of the different levels of structural testing, and it was learned that both groups engaged in similar programs.

After Mr. Halpin left the group, the discussion turned to thermal/vacuum testing. Responding to a question, Mr. McLane discussed the general evolution of major thermal/vacuum tests on NASA manned spacecraft programs. We gained the impression that, relative to U.S. programs, the Chinese depend more on test than upon analysis. It is tempting to speculate that this may be due to limitations on their computer resources. Answering a question, they said that they do normally perform deployment tests on light-weight space structures in thermal/vacuum environments.

Reporters: Mr. Dennis Halpin and Mr. Jim McLane

Meeting of Working Group No. 4

Working Group No. 4 was given the topic, "Experimental measurement of ionospheric plasmas." The AIAA was represented by Dr. Jim McCoy. Shanghai Bureau of Astronautics representatives were Mr. Zong Ru-hou, Sr. Engineer, and Dr. Pan Chin-wei, both from the Post & Telecommunications Institute, and Prof. Wang Duan-xiang, of the Jiao Tong University.

Meeting of Working Group No. 5

The topic for Working Group No. 5 was "Space Life Science and Astronaut Training. Mrs. Frances Mount, Ms. Joyce Shultz, and Mr. John Trebes represented AIAA. SAS participants were: Dr. Liu Cheng-xian and Mr. Gu Rui-Qi, both Associate Professors at the Shanghai Institute of Plant Physiology, Academia Sinica, and Professor Zi-Xian Lu, Shanghai Institute of Biochemistry, Chinese Academy of Sciences. Prof. Lu (he uses the Western name convention on his business card) is President of the Shanghai Society of Biochemistry. He had been with the delegation headed by Prof. Tu Shan-cheng when it visited Houston on June 30, 1988.

Evening Activities

Following dinner at the Peace Hotel, the Delegation attended a performance by the Shanghai Acrobatic Troop held in their unique, especially designed circular performance hall (a miniature Astrodome)! In addition to skilled acrobats in several age and gender groups, there were many trained animals. These included both the Giant and Lesser Pandas. I especially enjoyed the Chinese band and orchestral music which accompanied the performance.

Reported by: Mr. Jim McLane

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SEPTEMBER 22, 1988

Thursday

SHANGHAI TO HANGZHOU

Today the delegation got another early start. We left the Peace Hotel at 4:50 a.m. to go to the new Shanghai Railway Station to catch Train No. 95 to Hangzhou. It was an overcast, drizzly day—the only rain we experienced in China, save one brief morning shower in Beijing. The four hour train ride was via "hard seat" coach, the best that our diligent hosts could arrange in light of an extremely busy season on an over-crowded route. The ride took us south of Shanghai to the ancient capital city which Marco Polo described as "the most beautiful place on earth." We were met at the station by Mr. Lu Gengrong, of the China National Aero-Technology Import & Export Corporation. He made all arrangements for us, and served as our guide. In addition to Chin Rong-Ying and Li Fu-Rong, Mr. Song Yun-Peng and Mme. Lu Fu-Zhen from the SBA accompanied us on this excursion. Mr. Lu had persuaded the management of the Hangzhou Shangri-La Hotel to turn over their separate VIP quarters, Building No. 1, to the delegation, and the rooms were unusually large and well appointed.

After checking into the Hotel, the delegation braved the showers to visit the Ling Yin Buddhist Temple. After lunch at the Hotel, the rainy weather discouraged us from taking some of the usual Hangzhou excursions involving a lot of outdoor climbing; instead we opted for some time to rest from our early morning start, and then visited a silk factory. A free evening followed dinner at

the Hotel.

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SEPTEMBER 23, 1988

Friday

HANGZHOU TO SHANGHAI

Our Friday weather was like Thursday's—overcast and drizzly. After a buffet breakfast, the group left for a boat ride on West Lake. We visited the island "Three Pools Mirroring the Sun", and Huagang Park. Everywhere the tree trunks were wrapped with heavy rope, and held erect by stout bamboo props. These repairs were made over a period of two or three weeks by a large contingent of Army troops in the wake of a vicious typhoon which struck on August 6, 1988, which was described as "the worse catastrophe in modern times" for Hangzhou. Lunch was at the Louwailou Restaurant overlooking West Lake in Zhongshan Park. After a visit to the Hangzhou Friendship Store, we caught train No. 96 at about 4:00 p.m. for the trip back to Shanghai. This time we rode "soft seat". We shared the railway car with a group of Taiwanese tourists, a very visible sign of changing relations between the PRC and the ROC. It was well into the evening when we again checked into the Peace Hotel for our last night in China. Dinner for those not too tired to eat was in the hotel dining room.

Reporter: Ms. Joyce Schultz

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SEPTEMBER 24, 1988

Saturday

SHANGHAI

Meeting with SAS to review Sister Section matters

After breakfast at the Hotel, we[1] met with officers of our Sister Section, the Shanghai Astronautical Society (SAS),[2] to review progress of the relationship, established almost exactly one year earlier, and to discuss plans for activities during the coming year. The discussions took place in the top floor business suite of the Peace Hotel. The jarring baritone blasts of ocean vessel horns coming through windows opened to a beautiful early fall day, mixed with street sounds from the busy Bund eleven stories below, served to emphasize the international flavor of the meeting. The two sides reviewed the very friendly contacts between the two Sister Societies since the establishment of the relationship last year. SAS has received many issues of newsletters and other magazines and photos concerning activities of the Houston Section, and in return Houston Section had received copies of SPACE FLIGHT magazine, SAS activity reports, and biographical sketches of prominent SAS members. Each side has selectively put in press the other side's information in its own publication, introducing their counterparts activity to their own members. It was agreed that this kind of material exchange had contributed significantly to mutual understanding and friendship. The two sides expressed their satisfaction with

1.Houston was represented by delegation leader Jim McLane, Lou Livingston, Garland Bauch, Dennis Halpin, Jim McCoy, Frances Mount and John Trebes.

2.SAS was represented by Director Liang Jincai, Song Yun-Peng, Xu Chunyin, Chen Rong-Ying, Li Fu-Rong, Wang Yue, and Hwang Lu.

achievements made, and their hope that the exchange content will be more wide-ranging, and the form be more diversified hereafter. The following proposals for future activities were put forward during the discussion:

1. Exchange of publications should continue as in the past with the following modifications: In order to limit the considerable mailing expense, duplicate mailings of publications to the CSA Beijing office will be discontinued - SAS will make copies and send to Beijing as appropriate. The magazine SPACE FLIGHT has not been very useful to the Houston Section since it consists mainly of reprints of foreign (non-Chinese) space news items. Houston would prefer direct news of Chinese space activity, like clippings from the English language edition of CHINA DAILY.

2. The two sides can produce and exchange some video tapes portraying the life and work of their members, and their space research and production facilities so that the members can get to know each other more vividly. Questions of recording and playback format compatibility need to be investigated and resolved. The AIAA delegation noted that during their visits throughout China many space laboratories and organizations had shown English language video productions describing their functions, facilities and activities. They suggested that these tapes, if loaned to Houston, would be a very good start at familiarizing Houston members with the Chinese Space program. The possibility of such loans will be investigated by CSA.

3. Promote academic exchange via mutual introduction of

Chinese and American experts and their achievements, and increasing direct letter communication among them.

4. The two sides showed great interest in having a real-time conversation via international communications satellite. Houston Section proposed that for planning purposes this would be in the context of a one hour joint session during the Houston Section annual technical symposium in May, 1989. There are many questions concerning technical and economic feasibility. Each side will analyze its own conditions to determine feasibility. All details will be decided after further investigation.

5. The possibility of introducing a plan to match a small number of Chinese and American students with senior engineers of the other country who are working in the same engineering or scientific discipline was briefly discussed. The purpose of this pairing would be to encourage contacts which would contribute to the students' professional growth, and to the engineers' general understanding of the educational process and programs in the opposite country.

The Houston delegation thanked their Chinese hosts for the hospitality shown them during their visit, and expressed the hope that a reciprocal visit by the Chinese to the U.S.A. would soon take place.

SHANGHAI to HOUSTON

At 11:30 a.m. we departed the Peace Hotel for the Shanghai International Airport. Since there was no time for lunch before checking in at the airport, our hosts surprised us by passing out hamburgers on the bus. They said that this was their way of easing us back into the American culture. Our flight to San Francisco, CAAC No. 981, was aboard a Boeing 747 airplane. Most of us were a bit surprised that the movie on this flight was "Good Morning Viet Nam", with only minor editing. We arrived in San Francisco slightly ahead of schedule. After promptly clearing customs, most of the delegates chose to accept standby status on an early flight to Houston, arriving home at about 6:30 p.m. on Continental flight No. 488. The others reached Houston about 8:00 p.m. as originally planned on Continental flight No. 100.

Reporter: Mr. Jim McLane

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THE END

APPENDIX A

PERSONAL OBSERVATIONS & IMPRESSIONS

GARLAND T. BAUCH

PERSONAL OBSERVATIONS & IMPRESSIONS

Revelations

The Chinese are presently in the technology building phase of their aerospace program as revealed by the discussions and visits to facilities. While they have made great strides in designing, building and operating satellites and expendable launch vehicles, the Chinese are still acquiring technology for reusable manned launch vehicles and space stations. The Chinese do not believe the space shuttle is economical with present technology and therefore have emphasized the expendable launch vehicle approach while developing technologies which could be utilized for economical operation of manned space stations and launch vehicles.

The design approach utilized by the Chinese on their "Long March" launch vehicle is clearly one of design simplicity and hardware reliability. For example, the cryogenic 3rd stage main engine of the Long March is fixed and three (3) small vernier engines which move on one axis were used for steering during launch. These same engines are used for on-orbit maneuvering. The engine welds are very solid and the hardware design was one of clean flowing non-convoluted lines which could result in metal fatigue failures.

The Chinese school system as witnessed at Beijing University of Aeronautics and Astronautics is offering a balanced curricula of basic science and engineering courses combined with "hands-on" training. The "hands-on" training is probably necessary since their aerospace industry is not yet fully developed. This training approach is bound to pay off for them very quickly and apparently already has in the commercial aircraft world. The Chinese have also included undergraduate management in their engineering curricula and this recognizes a severe industry problem that we never have properly addressed in this country. The problem is that we make "generalist" managers out of "specialist" engineers. This usually ruins "super" engineers and results in managers who spend too much time on the technical aspects of the job and not enough time facilitating the work of engineers under their care.

The Chinese contract management system is very simple. For example, a program requirement is "handed-down" from Beijing to a particular bureau and this bureau responds with a proposal. There is no competition or duplication of effort which drives the cost up. The bureau simply studies the various options and replies with the best approach. Beijing approves and off they go. Central planning and integration is apparently done in Beijing. Thus, politics is taken out of the technical arena and the simplest most reliable hardware can be produced at minimal cost. However, there is a down side to this approach which I will address next.

The apparent lack of competition and "top-down" approach of the Chinese management system is not conducive to the development of

advanced technology. There is almost no "grass roots" technological effort in China because the system does not reward initiative, good work, or private enterprise on a large scale as yet. This is evidenced by paint on public buildings and projects. Almost never is the paint on the object to be painted. For example, a metal fence in Shanghai had paint on the surrounding shrub and concrete anchor. Paint for a wood trim in the Institute of Space Medicine in Beijing was smeared on the adjacent wall. Also, the buildings are dirty in general. The Chinese do recognize this problem and are taking steps to change the environment to reward competence and good work. Should the Chinese acquire the technology base, as we have developed it with the private enterprise system, they would be well on their way to solving their many service related problems mentioned in the next paragraph.

The basic impedance to Chinese progress in aerospace is the need to build the basic foundation of their society like roads, communications, water, and services upon which all other successes are built. They see space as a means to thrust themselves into the 20th century and build a better life for their people. Their basic approach appears to be somewhat similar to the Russian approach of "build at the top" and let the results filter to the broad population. The "grass roots" approach which builds from the bottom and lets the fruits surface to the top is perhaps better for the general populace. There are signs that the Chinese realize this and are making corrections to encourage private enterprise or "grass roots" building by their people.

Beijing and Xian appear to have a great deal of both "man-made" and natural pollution of air and water. For example, the dust is a real problem in northern China and many Chinese (and visitors) suffer respiratory problems. Also, the Chinese are too crowded and compete for limited resources. Water and energy is limited as evidenced by the low water pressure and cold water in showers and by the lack of city lighting especially in northern China. Obviously these problems are being addressed, but slowly.

Landsat is being used to help the Chinese with resource location and management problems. There are signs that the Chinese are developing an energy industry. For example, one Landsat picture addressed a study to divert a river and build a river delta upon which oil rigs could be set for drilling instead of on ocean platforms. Also, Landsat is used to locate forest fires and check for crop problems. "Truth sites" are hard to determine in China because the crops are so diverse and in such small plots compared to the U.S.

Sister Section Outlook

The Chinese Society of Astronautics (CSA) appears to have the backing of the Chinese government with respect to both funding and policy. The AIAA Delegation trip was obviously subsidized by the Chinese government because the monies paid could not possibly have paid for all the special treatment and facilities we uti-

lized. The government was also behind our trip arrangements and ensuring everything went smooth at the airports and train stations except in the case where our plane was seven hours late. Obviously, the Chinese government wants to do everything possible to encourage cooperation with us and has tasked the CSA to work with the AIAA in this endeavor. The only negative aspect of this cooperation from the Chinese side is their overriding desire to not be entirely open and candid about their plans, progress or technology. The discussions about their programs were not at all revealing, and they didn't allow picture taking for even the simplest and seemingly "unclassified" displays or hardware. I am not sure whether their driving desire was to protect their secrets or because they weren't proud of their progress/product as compared to progress in other countries and didn't want to be embarrassed in the eyes of the world.

The AIAA-Houston Section's ability to contribute to the sister section's goals/objectives is a bit more uncertain, I believe. While AIAA-Houston Section local officers are behind the concept, I do not think we have the monetary support of either the section, the U.S. government or NASA behind us. Thus the Houston Section is at quite a disadvantage relative to the Chinese in keeping up their end of the bargain. While I applaud the work and risks that Mr. McLane and our small group have taken at our own expense, it appears that our "small seed" cannot grow within the AIAA without proper funding and backing. Also, a trend within the Houston Section for the last eight years appears to be an increase in the number of "young" active members. However, "senior members" are usually synonymous with money, support, and resources in general. To succeed, our May symposium satellite link project with the Chinese needs the support of the "senior" members who control the "purse strings" and resources in NASA and industry. Another obstacle (and the Chinese are faced with it too) is there will always be individuals who do not appreciate the motivations behind such endeavors and who will not support such cooperative projects. Hopefully, understanding and wisdom will prevail on both sides and all "humankind" will benefit. I found our Chinese hosts to be very diligent in their desire to serve the AIAA delegates' needs and keep us safe during the trip. And in China, where there is no water fountain on every corner and the services have not "caught-up" with the tourists yet, one cannot be too complimentary of our CSA hosts and guides, Mr. Chen and Madame Li, and the many others in China who served us. For my own part, I am happy that I experienced this trip and hope to use this knowledge for the benefit of others as time moves on.

G.T.B.

STEPHEN M. GOTCH

PERSONAL OBSERVATIONS & IMPRESSIONS

It was very interesting to visit and observe the Chinese space industries and facilities. There was some very advanced engineering and scientific work being done in their facilities. Some of their buildings were not very modern, and could have been better constructed to limit outside air and contaminants; but, on the whole, the progress they have made is commendable. It was an interesting combination of new technology with old technology. As Jim McLane pointed out during some of our facility tours, I too thought that more attention is needed in the areas of materials selection and wiring insulation in some of the vacuum chambers and test facilities. China is still playing catch-up to the US and USSR, but seems poised to be one of the future leading countries in space and engineering.

I had my first exposure to some engineering areas during the visit—such as the Beijing Institute of Space Medico-Engineering (centrifuge), Xian Institute of Radio Engineering (anechoic chamber) and the Xian Satellite Control Center (satellite control room). I would like to have seen the satellite control room in operation since my experience is mostly in the flight design/mission operations area. This, and seeing a Long March launch would be my top desires for a second visit. Considering the size and voluntary nature of our delegation, we seemed to have a broad base of experience. At times though, the Chinese would have liked to talk with someone in areas of expertise we did not have represented, such as propulsion.

The Chinese engineers I encountered were just as curious about us, as we were of them. The people were much friendlier and happier than I had envisioned before my trip. The Chinese definitely do not match any typical stereotype I had of a communist society. I feel this delegation accomplished progress not only in our engineering contacts, but in our people-to-people communications as well.

S.M.G.

JAMES C. McLANE, JR

PERSONAL OBSERVATIONS & IMPRESSIONS

Expectations

I began this third visit with aerospace colleagues in China determined to learn more about the Chinese space program. A brief initial exposure twenty-nine months previously had aroused my curiosity. I hoped to find out more about how high-tech enterprise could be carried on in a society only recently emerged from a long period of severe intellectual repression. Their relative isolation from the on-going technical progress enjoyed by the industrialized nations added intrigue to the subject. I was also eager to see first-hand evidence of changes which were bound to have taken place even in the short interval since my last visit. I hoped that the prior experience would help me view the technical activity in a more objective way; that is, without the bias that comes from first seeing familiar things in an exotic foreign setting (Is it possible that a successful satellite could be built in a laboratory with lavatories in *that* condition?) To a degree these ambitious expectations were met, although once again, the time spent at each Chinese space related activity was much too short to feel completely comfortable with all of my personal conclusions.

The juxtaposition of the new and the old which adversely impresses many technical visitors to China is not so bothersome to me as it is to most younger engineers. In modern times, Westerners have come to associate science and high technology with well maintained, clean, well lit, air conditioned offices and laboratories. The Chinese facilities generally fail to meet these criteria; however, when visiting many of them, I am reminded of nothing more than the appearance and creature comforts of facilities in which I worked in the late 1940's at the Langley laboratory of the NACA. Certainly the day will come in China, as it did in this country, when resource allocation to improve conditions in the workplace will be recognized as a cost effective adjunct to improved productivity. In the meantime, we should be careful not to let that factor lull us into misgauging technical progress in the Chinese space effort.

A few new signs of encroaching western culture observed during this visit include:

1. The proliferation of neon and other garish western style advertising signs on businesses everywhere. These were virtually unknown three years ago.

2. In the cities, the transition from blue and gray Mao jackets, and traditional pajama suits, to western style attire (still not complete).

3. Zip codes added to some business card addresses.

4. Serious warnings from our hosts to be on the alert against petty thievery. Anecdotes about muggings. A petty thief being chased near mid-day by police and others.

The Chinese Space Program

The Chinese space program is a combined military/civilian effort. We were told that virtually all space missions have dual military/civilian objectives. The apportionment between the two was not disclosed, indeed, we avoided all discussion of the military aspects of our respective space programs. Their space effort is an outgrowth of the military rocket program nursed to fruition through the trauma of the cultural revolution. This remarkable achievement (shielding the activity from the destructive forces of the Red Guard) was apparently guided by the same cadre of military technocrats who developed China's nuclear physics industry and produced a hydrogen bomb in this same time frame.[1] This group, the Commission for Science, Technology and Industry for National Defence (sic) (COSTIND), was not mentioned in any briefings during our visit; however, at the reception given in our honor in Beijing the ranking official, Ma Ji, was a former Vice President of COSTIND, and is currently Vice President of the CSA. Other staff from COSTIND were also present. Mr. Ma was treated with great respect and deference by all of the distinguished space officials present, with most of them asking to have their photograph taken with him, individually. From this meager evidence, it is easy to speculate that even though the laboratories, factories and institutes we visited were managed by civilians and offered to us no military face at all, it seems likely that the space program direction and advocacy at the highest level probably resides with this military committee.

I am still confused about the organization of the Chinese space effort. The Chinese Academy of Space Technology (CAST), with its fourteen institutes and factories, acknowledges in the handbook given us being tasked only to "take part" in the planning for space development. Its Beijing Institute of Spacecraft System Engineering claims responsibility for technical coordination among systems of the "satellite, launch vehicle and TT&C earth stations"; however, launch vehicle design, development, manufacture and operation is clearly not under the CAST organization, and neither are the TT&C functions. Apparently CAST manages the development of recoverable satellites (such a recovery is illustrated in their handbook) yet the laboratory apparently taking the lead role in Chinese reentry materials development is the Beijing Institute of Structure and Environment Engineering which is not under the CAST umbrella. During his briefing to us, I asked Professor Wang if the Chinese Academy of Space Technology with its many member Institutes could be likened to our NASA. He was emphatic in denying similarity, but he didn't get specific in identifying areas where the analogy fell short. I would guess that the bottom line is that there is no comparable civilian

1. Jonathan D. Pollack, *Science* 241 pp.1691-1692.

space agency, and that a number of the key organizations in the space program with responsibility for such areas as rocket development and manufacture still owe primary allegiance to military applications such as ballistic missiles and surveillance.

Regardless of who provides the overall direction, it is obvious that the Chinese space program enjoys excellent, priority support from the government. Discussion with Chinese officials leads me to believe that this is due to the following factors (military aspects aside):

1. There are immediate domestic benefits to be derived from some space projects which are especially important to the Chinese. At the top of this list is the activation of communications satellites, which will meet a pressing demand for expansion of television and telephone channels over the vast reaches of this country. Some other industries are looking to communications improvements brought by the space program to help solve their problems, such as the sorry state of air traffic control. The experience gained through downlinking and processing images from the US Landsat satellite has been convincing as to the value of earth resources projects to China. The Chinese are active in sensor development, and plan to continue their series of earth resources missions.

2. They are in dire need of hard currency foreign exchange. Their launch capability, which comes in sizes to meet a variety of demands, is a very marketable commodity. They seemed almost ecstatic over the decision announced by President Reagan shortly before our visit to permit US commercial users to employ Chinese launch vehicles (in specific cases). They also market payload space on satellites with soft return to earth after several days in orbit. They are the only country besides the US and the USSR who have this capability, and it too is very marketable.

3. The Chinese are anxious to join the industrialized nations on an equal technological basis. Indeed, their current policies have been criticized by some as being too dependent upon technology for improvements in the standard of living for the general population, with inadequate attention being given to the essential roles of economic, social and political reform.[1] Be that as it may, the space program provides very visible evidence, both at home and abroad, of technological achievement. (CAST has been given the responsibility for transferring space technology to various departments and organizations of the national economy.) Successful space missions are widely publicized throughout the country, and serve as a source of national pride, especially to students and younger people. Thus the program garners priority support because of the favorable light cast on Chinese technology both at home and abroad.

One major change to the Chinese space bureaucracy which was made shortly before we visited was a consolidation of the Ministry of

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1. Nicholas Lardy, *Science* 239, 79.

Aeronautics and the Ministry of Astronautics into a new Ministry of Aerospace Industry. (Whether this resolves some of the dilemma regarding organizational separation of major elements of the program, as discussed above, was not made clear to us.) Throughout the visit I asked different people about the expected effect of this change, and they universally said that it meant very little. The past Minister of the old Astronautics Ministry is now the Deputy Minister of the new Ministry, and is still in charge of the same elements of the combined organization. A few people said that this change makes sense because it associates pools of like technical specialists, and makes it easier to involve them as needed across organizational lines. I noticed that Senior Engineer Boa Keming, one of seven Vice Ministers of the old MOA had been moved to a new job, Governor of the island of Hainan. Mr. Boa has been a supporter of Houston's "Sister Section" initiative, and Mrs. McLane and I dined with him twice when we visited Beijing in 1987. It is probably coincidence that his new posting at Hainan is the site of rocket launchings reported recently by the international press.

Following my visit to China in 1987 I was convinced that there would be a manned Chinese presence in space in the early 1990's. After this visit I am no longer sure. For one thing, we saw absolutely no visible evidence of any work on modern EVA suit technology, and very little to commend itself in the area of cabin environmental control system development. It is possible that such work is being carried on somewhere other than where I expected to see it (the Institute of Space Medico-engineering), or that they were withholding that work from us. This latter possibility is uncharacteristic of the Chinese, and the evidence points toward there not being very much going on in this disciplinary area. In spite of the preoccupation of virtually all visiting Chinese groups in recent years with the JSC Weightless Environment Training Facility, there was no mention of construction of such a facility in China as yet. Conversation led me to believe that the tremendous cost differential in moving from unmanned to manned programs is only now beginning to be appreciated, and that this has tempered plans for early manned flights. It seems to me that the only way the Chinese are likely to have manned programs of their own any time soon is if they are given the necessary technology by the US or the USSR in some diplomatic maneuver. They don't seem to be on the way to getting it for themselves, in spite of what we were told by some of our hosts.

One characteristic of the Chinese aerospace industry which appears to me to be an impediment, is the lack of job mobility for scientists and engineers. I discussed this with several people in the course of our visit, pointing out the advantages which accrue in the American system, where most engineers make several radical job moves during the course of their careers. This results in dissemination of experience through the industry, and rejuvenation of productivity of individuals through change in work environment. Those I talked to all agreed that this is a problem, and claimed to be taking steps to correct it, but the examples they sited all involved moving high echelon people, only.

The Chinese Society of Astronautics

My attempts over the last couple of years to compare the Chinese Society of Astronautics[1] to the AIAA (or to any US professional technical society, for that matter) have been disappointing. The problem is that the US organizations are, for the most part, made up of voluntary participants who pay for the privilege of participation. Under current conditions in China, a professional organization funded to any significant degree by its individual members, and essentially operating upon the collective democratic initiative of its members, simply cannot be comprehended. First of all, the meager pay of aerospace professionals (which at the present time is being eroded further as a result of heavy inflation) is too low to permit the assumption of professional society dues. Thus all expenses for society operations must be borne by the employer, that is, the Government. During the 1987 negotiations in Shanghai leading to our Sister Section agreement, the dependency of the Shanghai Astronautical Society (SAS) upon the parent body, the CSA, for funding for that activity was very openly discussed. They stated quit bluntly that "we have no funds of our own," and that for matters involving expenditure of funds the CSA in Beijing "held the purse-strings." The CSA itself functions under the direction and budget of the Ministry of Astronautics (now the Ministry of Aerospace Industry.)

Secondly, the idea of members independently engaging in professional activity outside the workplace, which seems to me to be the essence of American technical societies, is unthinkable in China. There, virtually all technical goals and programs are set at the very top of the political hierarchy (actually in considerable detail in their fifteen year plans.) Professional activity outside the official programs would probably be viewed as unauthorized and undesirable deviation from state planning.

The CSA and its subservient organizations have adopted the general form, and many of the stated objectives of foreign professional organizations. Where they fall short is in the area of self directed member activities. Local meetings and symposia are infrequent and irregular. Those that have been reported to us resemble employer in-house training programs and gatherings more than open, voluntary meetings, and attendance would appear to be limited to a select few. Even though our CSA hosts were very much aware of our desire to attend general meetings of local branches during our visit, no such meetings were actually arranged. There was no mention of any professional activities open to the average engineer outside the workplace. Instead of being taken to regular meetings of the general membership, we were treated to receptions and banquets attended only by society officers (invariably high ranking aerospace officials and leaders), other space luminaries, and full-time society staff—no rank-and-file engineers and scientists. Successful international technical meetings sponsored by CSA have been held in China, but they appear to be

1. See Appendix C for information about the CSA provided by the Chinese.

the product of central government planning and resource allocation, as opposed to activities generated by the membership.

I asked a number of society members the question, "What does the typical Chinese engineer think of his professional society, and what does the society do for him?" One respondent probably summed it up best when he said without a moment of hesitation that these are very easy questions to answer, and the answers are, "not much, and nothing." If there is indeed a participating active body of rank-and-file membership it is not much in evidence. Briefings and literature provided describe a structure of technical committees along the lines of those in AIAA, but the responsibilities of these committees are vague, and I have yet to observe a concrete example of a committee activity or achievement. The group technical discussions scheduled into our activities in Shanghai on the afternoon of September 21 were sponsored and arranged by the SAS, but the participants were a mixed bag, heavy toward the senior engineer end. These group discussions didn't much resemble the joint technical meeting envisioned in the written proposal which I sent to the SAS Director, Dr. Liang, in advance of our visit.

If it is true that the rank-and-file membership has only a minor role in the activities of the Chinese Astronautical Society one might ask just why there is such an organization. There seem to be two very important and necessary functions that the Society performs. First, their sponsoring Ministry has assigned them the primary responsibility of "popularizing" the space program. This involves far ranging activities, from publishing a monthly magazine aimed at youth, to sponsoring competition for student participation in China's Space Shuttle "Getaway Special" projects. Secondly, the organization serves to function as the official interface between Chinese space organizations and foreign space officials and organizations. The Beijing office performs the continuing administrative functions for China's active membership in the International Astronautical Federation (IAF) (AIAA performs the same function for the USA). They act as the interface for invited foreign technical experts and groups visiting China, as they did for me last year, and for our delegation this year. They provide a focus for organizing international space related technical meetings and conferences, and provide the administrative support to these activities. Except for publishing the monthly Journal of the Chinese Society of Astronautics, I didn't see anything they are doing which could be called "member services".

Learning that there are significant differences between the way in which we (the AIAA) view the objectives of our society, and the methodology we use to achieve them, as opposed to that employed by the Chinese, should come as no surprise. Our Sister Section Proclamation of 1987 pledged friendship and cooperation between the two societies based on common professional interests and goals which transcend national boundaries. The Proclamation was not contingent upon finding that the two societies employed similar methods to achieve these higher goals. Indeed, it was

intended that the relationship would involve identifying both the differences and similarities of the Sister Sections, thus fostering goodwill and understanding between their members. We should not be too concerned that our "sister" has a different genetic structure than our own; rather, we should recognize the relationship as an adoptive one, and strive for its success in spite of differences as they are identified.

We grow professionally when we learn as much as we can about foreign space programs, and about our professional counterparts who spend their lives working in them. Our Sister Section relationship has opened the doors to this information, and although the activity has not fully matured, a great potential for further development exists.

It is Chinese government policy to "absorb other nations' heritages and advanced ideological, cultural, and scientific and technological achievements. Then, by combining them with the Chinese national tradition, the nation will be able to create a socialist culture with Chinese characteristics ..."[1] The prospect of our Houston Section of AIAA providing a model to be emulated in this process rather appeals to me.

JCM

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1. Zhu Houze, head of the Propaganda Department of the Communist Party's Central Committee, in a speech reported in China Daily April 22, 1986.

APPENDIX B

OUR SISTER SECTION

A PROCLAMATION

issued jointly by the

SHANGHAI ASTRONAUTICAL SOCIETY
CHINESE SOCIETY OF ASTRONAUTICS

and the

HOUSTON SECTION
AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

WHEREAS both the Chinese Society of Astronautics (CSA) and the American Institute of Aeronautics and Astronautics (AIAA) are organizations of learned scientists and engineers working in their respective countries to advance the arts, sciences and technology of astronautics and related fields, and

WHEREAS members of the Shanghai Astronautical Society of the CSA and those of the Houston Section of the AIAA share many technical interests, particularly those closely associated with the study of space sciences, the exploration of space, and its development to the benefit of mankind, and

WHEREAS it is the desire of the members of the Shanghai Astronautical Society and the Houston Section to establish and recognize a special relationship for the purpose of fostering good-will and understanding between their members,

NOW, THEREFORE do they declare themselves to be

SISTER SECTIONS

and do extend to each other the hand of friendship, and the pledge of cooperation in all things as befits this special relationship.

梁晋才

Chairman
Shanghai Astronautical Society, CSA

Carl R. Hurst AUG. 27, 1987

Chairman
Houston Section, AIAA

American Institute of Aeronautics and Astronautics
Houston Section
September 1988

To the Shanghai Astronautical Society:

Greetings and best wishes from the 950 members of the AIAA Houston Section to the chairman, officers and members of the Shanghai Astronautical Society hosting this visiting delegation of the AIAA Houston Section.

As set forth in the joint proclamation of 1987, the Shanghai Astronautical Society is the "Sister Section" of the AIAA Houston Section. In that proclamation, the two sections pledge a special relationship. May the occaision of this visit serve as a milestone toward the successful achievement of the goals of that special relationship - "fostering goodwill and understanding" between the members of the two "Sister Sections".

Walter J. Lueke

Walter J. Lueke, Chairman, 1988-89
AIAA Houston Section

James C. McLane, Jr.
Professional Engineer

1702 Fairwind Road
Houston, Texas 77062
Telephone (713) 488-0312

October 13, 1988

Dr. Liang Jin-cai
Director, Shanghai Astronautical Society
15 Zhong Shan Road E1
Shanghai, China

Dear Dr. Liang,

On behalf of our 1988 AIAA Houston Section Delegation to China I want to express our sincere thanks to you and the members of your organization whose extraordinary efforts made our visit to Shanghai so enjoyable and worthwhile. I will not try to mention them all, but of course special thanks must go to Mr. Song Yun Peng and Mr. Wang Yue for the excellent preparations made for our visit, as well as for their outstanding assistance throughout our stay. My only regret is that we did not allow as much time as we should have for visits to the area technical facilities, and for the technical discussions with your members. I am more to blame for that than anyone else, though, as I insisted that Mr. Chen and Mme. Li schedule more activities into the time we had available than was realistically possible. Even with this shortcoming, we all consider the trip to have met all of our major objectives, and to have been highly successful. Certainly all of us learned a great deal about the Chinese space program, and more importantly, gained a better appreciation of the interests we share with our Chinese professional counterparts.

One of the things that was left open when we adjourned our last meeting for lack of time was the joint signing of our "SUMMARY" statement. I have made a few modifications to your original draft in light of the discussions which took place on the morning of September 24. Two copies of this modified "SUMMARY" are enclosed. If this draft meets with your approval, please sign both copies and return one to me. If you wish to make corrections, just mark on the copy you return to me, and we will consider that to be final.

We will be contacting you or other designated individuals in your organization concerning the open items referred to in the attached "SUMMARY" of our meeting as these matters are developed. My personal feelings are that we are progressing very well toward meeting the objectives of our Sister Section proclamation, and we have every reason to expect even more significant accomplishments in the second year of this undertaking.

Thank you again for your hospitality. I hope we will have an opportunity to reciprocate in Houston before too long.

Sincerely,

Jim McLane

Enclosure

APPENDIX C

THE CHINESE SOCIETY OF ASTRONAUTICS

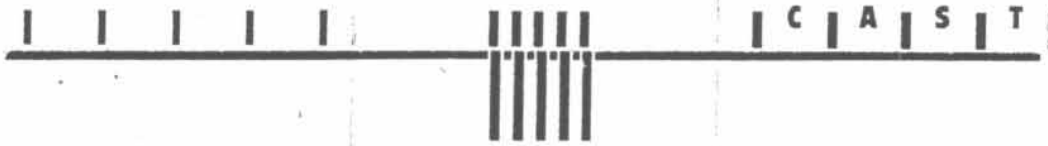
CAS
LEAFLET

Side 1

The China Association for Science and Technology, with its 139 national member societies and associations, organizes various academic activities each year, including over 1,000 domestic conferences and symposia. Members of this nongovernmental organization share a common interest in promoting the development of science and technology in the fields of basic sciences, engineering, agriculture, medicine and general studies.

THE
CHINA
ASSOCIATION
FOR SCIENCE
AND TECHNOLOGY

Chinese
Society
of
Astronautics



Side 2

The Chinese Society of Astronautics is an academic organization of astronautical scientists, engineers and technicians. Its members are affiliated with the China Association for Science and Technology.

Purpose

The Chinese Society of Astronautics was established to develop and maintain activities in the field. Members are also united for the purpose of contributing to the modernization of the field.

History

The preparation for setting up the Chinese Society of Astronautics began in 1977, and two years later it was formally established. Since its establishment, the Society has joined the International Astronautical Federation. It has also developed international connections with astronautical communities in more than twenty countries.

Activities

The major tasks of the Chinese Society of Astronautics are to organize academic activities, participate in international exchanges, publish scientific journals, and popularize the knowledge of space science.

Supervisory Council

The following principal council members manage the Chinese Society of Astronautics:

Honorary President: Qian Xuesen
President: Ren Xinmin *(pictured)*
Vice Presidents: Bao Kemin,
Sun Jiadong, Ma Jie, Gu Yijian
Vice Secretary General: Fu Bingchen

Branch Societies/Committees

Local branches of the Society have been established in the provinces of Hunan, Shanxi, Heilongjiang and Sichuan. A municipal society in Shanghai has also been set up to conduct academic activities.

The Chinese Society of Astronautics is divided into twenty-four professional committees, including the following:

Liquid Rocket Propulsion
Solid Rocket Propulsion
Telemetry
Launching Test
Recovery and Reentry
Space Energy
Robotics
Space Control Technology
Special Equipment
Space Launching System

Membership

The Chinese Society of Astronautics has over 5,600 professionals engaged in its academic and research activities.

Publications

The Chinese Society of Astronautics has set up a standing organization to edit and publish the periodicals *Journal of the Chinese Society of Astronautics* and *Space Flight*.

For Further Information, Please Contact:

Chen Rongying
Head of Office
Chinese Society of Astronautics
P.O. Box 838
Beijing, China
Telephone 894602
Telex 20026 MOAFA CN

A SUMMARY OF NOTES TAKEN DURING A BRIEFING BY
VICE SECRETARY GENERAL FU BINGCHEN
CHINESE SOCIETY OF ASTRONAUTICS
SYMPOSIUM HALL OF THE FRIENDSHIP HOTEL COMPLEX, BEIJING, CHINA
SEPTEMBER 10, 1987

The Chinese Society of Astronautics (CSA) is an academic organization like the AIAA. It is attached to the China Association for Science and Technology (CAST), one of many national societies so affiliated. CSA functions under the leadership of the Ministry of Astronautics (MOA), and the MOA is its main supporter. Efforts to establish the CSA began in 1977, and formal establishment came in 1979. There are 24 technical committees. There are 10 local Sections, with others in preparation.The largest Sections are in Shanghai (1200 members), Hunan (600+), and Xian. (It was not clear from the briefing, but it seems that the Beijing organization is undergoing reorganization, perhaps similar to what has just been completed in Shanghai to separate out the aeronautical activities.) There are a total of about 6000 members. There are two membership grades: 1) engineer, and 2) student. They are also beginning to accept "corresponding" (foreign) members.The CSA also has "Institutional" members.

The scope of activities of the CSA is similar to the AIAA. Each year they sponsor 30 to 40 technical symposia, the size, scope, and content of which varies. Some are for technical discussion and some are for training. Some of the multi-disciplinary meetings, organized by more than one technical committee are very large. The CSA has established relationships with more than 10 technical societies abroad. They hold a voting membership in the International Astronautical Federation (IAF). Last June they sponsored the Pacific Basin Conference in Beijing, and there were 36 US and 56 Japanese papers presented. They have a major responsibility in popularizing space with the youth of their country. They have very good US cooperation with the Get-a-way Special they have sponsored. They have established contacts with the American Young Astronaut Association (YAA). In July, 1987, the Vice Chairman of the American Science Teachers Association (ASTA) and the President of YAA visited Beijing; both sides had cordial talks on future cooperation. ASTA invited CSA to attend a meeting in the USA in September 1988, expenses to be borne by ASTA, demonstrating support of their work with young people. CSA is also responsible for organizing reports on space popularization. The CSA has two major repetitive publications. There is the JOURNAL OF THE CHINESE SOCIETY OF ASTRONAUTICS for engineers and other professionals, and the magazine SPACE FLIGHT for University and High School students.

Engineers must apply for membership in the CSA. They must be nominated by two members, and a Board reviews and approves the applications. There are no individual member dues; fees are paid by institutional members.

Jim McLane 10/19/87

AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

HOUSTON SECTION P.O. BOX 57524 WEBSTER, TEXAS 77598

October 13, 1988

Mr. Chen Rong-ying
Head of the Office
Chinese Society of Astronautics
P. O. Box 838
Beijing, China

Dear Mr. Chen,

On behalf of the 1988 AIAA Houston Section Technical Delegation to China I want to thank you and your staff for having arranged and conducted a truly memorable visit for us. The accommodations were outstanding, the meals were superb, and the arrangements for visiting a wide variety of space-related facilities were all that we had hoped for. Most important of all were the opportunities you provided for our delegates to meet and talk with professional counterparts in a number of appropriate settings. We also very much appreciate the special arrangements you made for the non-technical aspects of our visit. This provided our delegates, who for the most part were first-time visitors to China, with an interesting introduction to Chinese history and culture while still focusing on our main objective of technical exchange.

We also thank you and your staff for the effort which went into the enjoyable special programs for accompanying spouses.

We have all come away with a clearer understanding of China's remarkable space program, and a great respect for the engineers and scientists who have brought this program to its current advanced state in such a short time. Our face-to-face meetings with the members of our Sister Section, the Shanghai Astronautical Society, have inspired us all to work diligently toward meeting the objectives of that relationship.

Please express our thanks to the members of the CAS staff in Beijing, and your associates in Xian and Shanghai who worked so hard to make our trip a success. I hesitate to start naming individuals, for the list would be a very long one, but a special acknowledgment must be reserved for Mme. Li Fu-Rong; her efforts on our behalf were truly extraordinary.

We hope that both you and Mme. Li Fu-Rong will have an opportunity to visit Houston in the not-too-distant future, and give us a chance to return your hospitality. In the meantime, thank you again for everything.

Sincerely,

James C. McLane, Jr.
Delegation Leader

麥克萊恩·詹

American Institute of Aeronautics and Astronautics
Houston Section
September 1988

To the Chinese Society of Astronautics:

Greetings and best wishes from the 950 members of the AIAA Houston Section to the officers and members of the Chinese Society of Astronautics hosting this visiting delegation of the AIAA Houston Section.

Walter J. Lueke

Walter J. Lueke, Chairman, 1988-89
AIAA Houston Section

American Institute of Aeronautics and Astronautics
Houston Section
September 1988

To the Shaanxi Astronautical Society:

Greetings and best wishes from the 950 members of the AIAA Houston Section to the chairman, officers and members of the Shaanxi Astronautical Society hosting this visiting delegation of the AIAA Houston Section.

Walter J. Lueke

Walter J. Lueke, Chairman, 1988-89
AIAA Houston Section