

Horizons

Houston, Texas

November 1994

Chairman's Corner

Dr. George C. Nield
Chairman

Well, the Section year is now well under way. We've got a good team in place and many interesting events have been planned for the year. If you haven't been participating, please consider doing so in the future—we've had a number of excellent programs already. We're doing our best to get the word out through the newsletter, flyers, and electronic mail, but if you are not finding out about things in time, let me know and we'll make sure you get a special invitation for our upcoming activities.

Last month in this column I talked about how our AIAA Council had spent some time discussing our "products" and "customers." We first listed all of the activities that the Section was involved in, and then tried to identify the "target audience:" who the intended beneficiary was for that particular activity. We then attempted to identify those activities which were "most important" for the Section and its members. My goal in this exercise was to focus on our primary activities and make sure they were meeting the needs of our members. What I'd like to do at this point is to see if we can come up with a Section Mission Statement that would put down in black and white what we as an organization are trying to accomplish—our "reason for being" if you will.

After looking at what other organizations have done, talking to a number of people, and giving it a lot of thought, I've drafted a potential mission statement for the Section that I would like to share with you. Ideally, the mission statement would be general enough to cover the various aspects of the Section and its activities while highlighting the key areas in which we hope to make a difference. Here's what I came up with:

AIAA Houston Section
Mission Statement
- draft -

The mission of the Houston Section of the AIAA is to promote the advancement of the aerospace profession, with special emphasis on the following tasks:

- *To provide the membership with opportunities for continuing education, professional growth, and recognition for their accomplishments.*
- *To facilitate the exchange of information within the technical community.*
- *To provide support and encouragement for students in learning math, science, and engineering.*
- *To assist the general public in understanding the benefits of aerospace systems and technology.*

The opening statement is intended to provide a top-level summary of what we are hoping to accomplish, and "advancing the aerospace profession" seemed like a reasonable way to describe it. For all of its ups and downs, challenges, and frustrations, most of us feel that there is something special about the world of aerospace. Many of us have dedicated years of our lives to the aerospace profession, and we sincerely believe in it.

(see MISSION STATEMENT, page 2)

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MISSION STATEMENT (from page 1)

The opening statement is followed by four specific areas in which the local Section is trying to make an impact. The first task acknowledges the many ways in which we can help the individual member to learn, grow, and feel good about their work, such as through courses, seminars, leadership opportunities, and honors and awards.

The second task calls out one of our organization's potential strengths: the exchange of technical information. We can do this through dinner meetings, lunch and learns, newsletters, and technical conferences.

The third task refers to our efforts to support education, such as through science fairs, the student paper competition, and scholarships.

The final task refers to an area in which we could probably use some additional work: improving our image with the general public by helping them to understand what it is that we do and why we think it is so important.

So, what do you think? Have we come close to capturing the essence of what AIAA should be doing locally? Do you have some suggested changes? Are there any master wordsmiths out there who can lend us a hand? If you have any comments, please let me know. Give me a call at (713) 483-1364, or send me an e-mail note to gniel@jscprofs.nasa.gov. I'd love to hear from you! ♣

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Committee News

Career Enhancement Seminars Set

Jayant Ramakrishnan
Education/Career Enhancement Chairman

THE EDUCATION AND CAREER ENHANCEMENT Committee had its first meeting in September. Issues that were discussed included coming up with events and presentations that will best serve the membership. The following members serve on the committee: Nazareth Bedrossian, Draper Labs; John Sunkel, JSC; Steven King, Lockheed; Jeff Tave, Lockheed; Bill Best, Rockwell; and Steve Zobal, McDonnell Douglas.

The following seminars have been scheduled:

- "Financial Management," by Charles Schwab & Co., October 20 at LPI.
- "Internet," by NEOSOFT, November 8 at LPI.

Dr. Naz Bedrossian has been working very hard at arranging the Internet seminar and a seminar in January 1995 by Dale Carnegie Associates. The January seminar will be on "Public Speaking" or "Interviewing Skills."

Members have been checking out the audio tapes from our Section library. We are also in the process of getting new material from AIAA National. We will write a synopsis and review of the available cassettes for the December *Horizons*. Please send your suggestions to any of our committee members or to me at

jayant@dynacs.jsc.nasa.gov ♣

GN&C Plans Year

Jayant Ramakrishnan
Guidance, Navigation & Control TC Chairman

THE GUIDANCE & CONTROL TC met in September to plan events for the 1994-95 year. The TC is composed of the following members: David Zimmerman, UH (Main Campus); Sandeep Chojar, LESC; David Forrest, Rockwell; and Larry Friesen, Houston Community College. Suggestions ranged from Lunch & Learn programs to control classes on

video for AIAA members. It was suggested that we show the video lectures at the Gilruth Center over a one-week or two-week period.

The first Lunch & Learn program of the year, on Orbital Debris, was held on October 6 at Lockheed. Dr. Larry Friesen presented this very interesting lecture, with slides of the projected debris concentrations through the year 2010, and a thorough description of the sources and sinks for orbital debris.

We have a series of excellent tapes and study material on control systems in our archives and members have been borrowing these tapes. We have contacted the AIAA Western Office and have a catalog of recent tapes and videos that are available for checkout. We will be getting these tapes from AIAA National for use by our members every month. Watch this column for the latest in video and audio tapes.

"The Mathworks" in Natick, Massachusetts, have agreed in principle to offer a day-long course in Houston on MATLAB and its control system toolboxes. This event is being co-sponsored by the Houston Section Education & Career Enhancement Committee. We are in the process of getting the JSC Guidance & Control Division to co-sponsor this event. The one-day course will be held in January or February 1995.

The GN&C Committee hopes to get feedback (no pun intended) from the members on the nature and content of programs you would like to see. Please call any of our committee members or send me e-mail at jayant@dynacs.jsc.nasa.gov with your input.

GN&C Lunch & Learn

Dave Zimmerman
GN&C Committee

THE SECOND GN&C LUNCH & LEARN was held at the JSC Gilruth Center October 13. Professor Karolos Grigoriadis presented an overview of "Alternating Projection Techniques for Multiobjective Control Design" with particular application to dual structure/control design. The overview discussed

advancements which improve the convergence rate of the alternating projection technique (which has previously seen extensive usage in the signal processing community), as well as its application to control problems which have multiple performance objectives. A redesign effort for the Hubble Space Telescope Attitude Control System was presented as a particular application of the approach.

Professor Grigoriadis recently joined the Department of Mechanical Engineering at the University of Houston after completing his advanced studies at Purdue University and Virginia Polytechnic Institute & State University. Additional technical information is available upon request from Professor Grigoriadis (karolos@uh.edu).

Space Transportation TC Kick-Off

Charles Teixeira
Space Transportation TC Chairman

COME AND PARTICIPATE in the formation of a Space Transportation TC (ST-TC) which would mirror the Space Transportation TC at the national level. The kick-off meeting will be held in JSC Bldg. 17, room 143, November 17, 1994, from 11:30 to 12:00. The ST-TC objectives would be to:

- provide a focus for discussion of transportation related issues, systems, and analysis capabilities
- provide information on current transportation efforts at other NASA centers and industry (need industry participation for the latter)
- provide a conduit for inputs to the national committee on issues important to future directions in space transportation
- provide a forum for exchange of tools and data bases applicable to the practice of transportation systems design, analysis, and operations
- sponsor lunch & learn sessions during the year with presentations/discussions on space transportation related topics

For more information, call Charles Teixeira at 483-4647. Otherwise, bring your lunch and join us on the 17th.

AIAA Member Survey on the Use of E-Mail and Internet

James Oberg
Councillor

To help serve you better, the Houston Section would like to know how you feel about e-mail. For simplicity in responding, please key your answers to the question numbers below. If you would like an e-mail form to fill out, call Jim Oberg at 282-4351 (office) or 337-2838 (home). Please send your responses to jamesoberg@AOL.COM.

1. Name
2. Office phone
3. Home phone
4. Office e-mail address
5. Home e-mail address
6. Can you use your e-mail address to receive messages for a nearby colleague and/or another AIAA member who does not use e-mail?
7. If so, who?
8. Would you like to receive announcements of AIAA activities via e-mail?
9. Would you like to receive the Houston Section newsletter via e-mail?
10. What other sorts of aerospace-related information are you currently receiving via e-mail?
11. Would you be able to respond to student questions on your professional specialty via e-mail?
12. Do you have on-line access to the Internet?
13. If so, how? (office hard-wired; office dial-up; home dial-up)
14. Are you a member of an on-line information service such as Compuserve, America Online, etc?
15. Do you currently read or post messages to any electronic bulletin boards?
16. If so, which?
17. Would you use an AIAA-sponsored bulletin board to exchange information and opinions about contemporary issues impacting the aerospace profession?

18. Would you use your on-line access to take part in live "round table" discussions with AIAA guests during lunch hour or evenings?
19. Would you prefer to use e-mail to register for AIAA events such as dinners and seminars?
20. What innovative applications of the "electronic superhighway" would you like to see tried out by the Houston Section? **■**

CLCTS

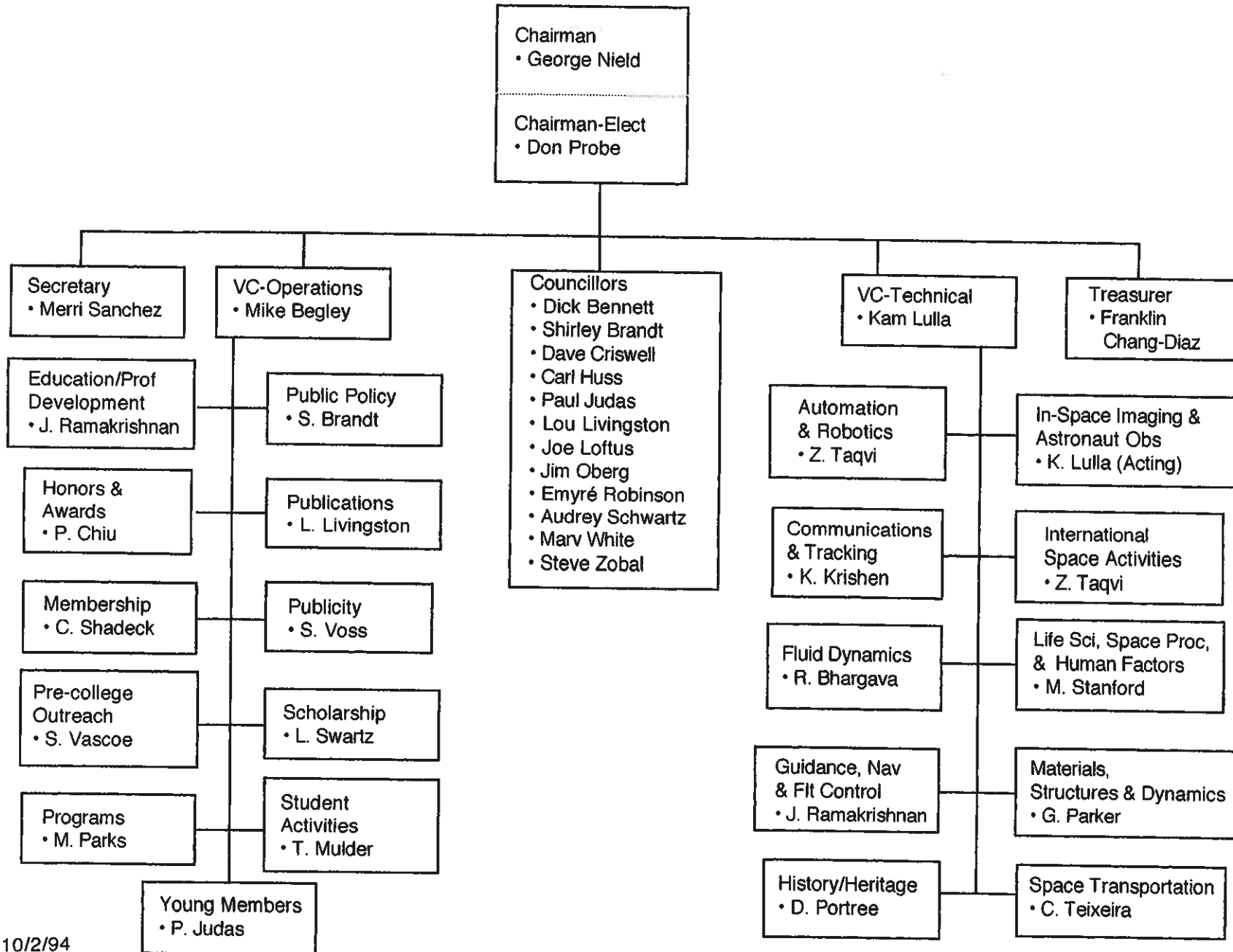
Bill Best
CLCTS Representative

Some AIAA members from time to time may see or hear reference to the Clear Lake Council of Technical Societies (CLCTS). The CLCTS is an organization composed of local technical societies. Any local technical society can join (dues are \$20 per year) and send a voting representative to the monthly council meeting. The purpose of the Council is to coordinate activities among the societies and to undertake activities which a single group might not be able to do. An example is the current long range goal of the society to obtain an "engineering building" which member organizations could use as a meeting place and repository of organization records. The Council sponsors a banquet each June at which winners picked from nominees submitted by member societies are honored in three categories: Technical Person of the Year, Technical Manager of the Year, and Technical Educator of the Year.

A common goal already achieved is the satellite receiving system located at the Gilruth Center which is available for use by the societies. This system is used to participate in video conferences mainly broadcast by the IEEE. The Council also furnishes a monthly calendar of local technical events.

I am currently the AIAA representative to the Council and if you would like to participate in some of the activities, give me a call at 282-6970. **■**

AIAA Houston Section Organization - 1994/95



EVA "By The Numbers"

James Oberg

STARTING WITH SPACEWALKS by Aleksey Leonov and Ed White in 1965, a total of 121 "extravehicular excursions" have occurred (65 by the US, 56 by USSR/Russia) on earth's 162 humanned orbital missions (87 US, 75 USSR/Russia); there have been twelve one-man, 108 two-human, and one three-man EVAs, for a total of 231 "person-EVAs." 87 people have ventured outside their spacecraft (52 American, 34 Soviets/Russians, one French), out of 304 space travelers. One Russian woman and two American women are among these 87.

The EVAs by program break down as: one in Voskhod (1965), nine in Gemini (1965-6), one in Soyuz (1969), one Apollo in low earth orbit (1969), 15 Apollo on the lunar surface (1969-1972), three Apollo in Moon-Earth transit (1971-1972), ten on Skylab (1973-4), three on Salyut-6 (1977-9), 13 on Salyut-7 (1982-6), 38 so far on Mir (1987-present), and 27 on STS (1984-present).

EVA, or "Extra-Vehicular Activity," means depressurizing a humanned spacecraft and then performing some action outside it, even if it's only a "stand-up" or a "poke-out." Pure cabin depressurization (and sometimes hatch opening) is not enough: it was done several times on Gemini and Apollo to throw out trash; it happened once on Skylab to inspect a docking probe. Non-EVA but fully suited spacefarers who stayed inside their depressurized vehicles are McDivitt (two missions), Stafford, and Lovell; Young and Conrad also stayed inside on one flight, but went outside on another.

The STS-61 Hubble Repair EVAs set many US and/or shuttle records. The five EVAs matched the five EVAs on Apollo-15. Akers achieved the status of the most experienced ever American spacewalker for duration, although Dave Scott retains the US record for number of EVAs (five). The world record for number of EVAs was also broken in 1993, by Serebrov, who now has ten. The shuttle record is still four, held by van Hoften and Ross and now (post 61) shared by Hoffman and Musgrave also. Among

still-active shuttle astronauts, Hieb, Thuot, and Thornton have three, Apt has two, and Runco, Harbaugh, Low, Wisoff, Newman, and Walz have one each. Wait until Space Station!

The famous 1992 STS-49 "triple EVA" was fittingly enough the world's 100th EVA, and the only one ever to involve three crewmen outside (three crewmen have been in vacuum, but not all outside, on five previous US missions: Apollo-9, -15, -16, and -17, and Skylab-2). The only three Russians to be in vacuum together were the tragic victims of the accidental cabin depressurization on Soyuz-11 in 1971.

STS-49 also established the world's longest EVA (8:29) and the world's second longest (7:45). The previous longest single EVA was 7:37, on the Moon, by Cernan and Schmitt in 1972. The longest EVA in zero-g had been 7:20, by Fisher and van Hoften in 1985. The longest Soviet EVA is 7:00 by Solovyov and Balandin in 1990, and that involved extra time for an emergency ingress after the airlock hatch failed to close.

STS-49 doubled the previous record for longest woman's EVA, with 7:45 for Thornton. The longest woman's EVA had been 3:35, set in 1984 by Savitskaya. That program was designed after the Russians read in Aviation Week that the planned EVA for Sullivan would last 3:30. The American record, by Sullivan on STS 41-G, was 3:29, but Sullivan remarked later that they could have stayed outside longer but nobody in the MCC could find the duration of Savitskaya's EVA (nobody called me).

The longest career total time on EVAs for any person is:

- 1st place: Sergey Krikalev, 7 EVAs, 36.1 hours
- 2nd place: Musa Manarov, 7 EVAs, 34.5 hours
- 3rd place: Anatoliy Artsebarskiy, 6 EVAs, 32.0 hours
- 4th place tie: Vladimir Solovyov and Leonid Kizim, 8 EVAs, 31.7 hours
- 6th place: Aleksandr Serebrov, 10 EVAs, 30.8 hours
- 7th place: Thomas Akers, 4 EVAs, 29.7 hours
- 8th place: Anatoliy Solovyov, 6 EVAs, 28.7 hours
- 9th place: Story Musgrave, 4 EVAs, 25.9 hours
- 10th: Jeff Hoffman, 4 EVAs, 25.0 hours

- 11th: Eugene Cernan, 4 EVAs, 24.2 hours
- 12th: H. H. Schmitt, 4 EVAs, 23.2 hours
- 13th: Jerry Ross, 4 EVAs, 22.7 hours
- 14th: James van Hoften, 4 EVAs, 22.0 hours
- 15th: Charles Duke, 4 EVAs, 21.6 hours
- 16th: Kathy Thornton, 3 EVAs, 21.2 hours
- 17th: Viktor Afanasyev, 4 EVAs, 20.9 hours
- 18th: John Young, 3 EVAs, 20.2 hours
- 19th: David Scott, 5 EVAs, 20.2 hours
- 20th: Aleksandr Viktorenko, 6 EVAs, 19.7 hours

Viktorenko is scheduled for at least two more EVAs (maybe ten more hours) on his Soyuz TM-20 "Mir-17" mission. Nobody else on the "top twenty" list is likely to make more EVAs soon, if ever.

Historical details: This summation counts the Apollo-9 EVA as a single EVA event, even though the two astronauts went outside through separate airlocks. Some government records counted it as two separate EVAs. Proper definitions are as important as proper counting!

Note also: The first EVA transfer from one spacecraft to another was in 1966 by Mike Collins on Gemini-10 to Agena-8. The first (and so far only) EVA transfer where the crewmen remained on board the second spacecraft (and landed in it) was in 1969 by Yeliseyev and Khrunov on Soyuz-5 and -4, practice for the later canceled lunar orbit crew transfer a part of the secret landing mission. We now know that the Russians also planned (and practiced for) lunar surface EVAs in 1968-1971, but their secret program was canceled before any manned lunar flights were attempted. That suit was recently auctioned off in New York City.

Record-keeping for this "space event" can be extremely difficult. Official US tallies are subject to typos, omissions, and oversights; e.g.,

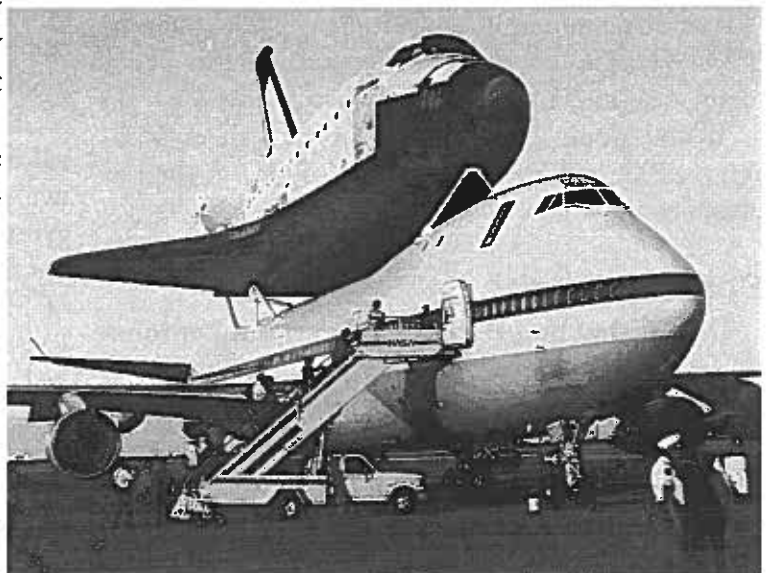
Many Houston Section members were among the visitors recently when the orbiter Columbia and its Shuttle Carrier Aircraft made an overnight stop at Ellington Field in Houston. Columbia was being ferried from the Kennedy Space Center in Florida to Edwards Air Force Base in California for maintenance and modification at Palmdale. The orbiter looked like it could use a good cleaning after 17 trips to orbit, but it still made for a beautiful sight and attracted large crowds during its brief stay in Houston.

Photo by George Nield

NASA doesn't keep Russian records, Apollo-9 may count twice, and the 1989 Congressional Research Service's summary omitted one EVA from STS 41-C (has the hours) and printed "McNair" for "McCandless" in the spacewalkers list. Recent official NASA reports overlooked Scott's fifth EVA. Every record-keeper's first list was found to be in error; only together was an authoritative catalog possible. This listing is a compilation and correlation of research and record-keeping by at least four individuals. It is now regarded as the "baseline" for future additions.

For the first half of 1994, there seemed to be a mutual "EVA hiatus" for both astronauts and cosmonauts. This is expected to end shortly. In any case, EVA really adds up to be statistically significant!

Copyright © 1994, James E. Oberg, all rights reserved. This statistical summary is prepared privately by space historian and trivialist Jim Oberg for the amusement of himself, historians, flight crews, flight controllers, newsmen, and the general public. Any published/broadcast reference to these factlets and statistics should have the courtesy to acknowledge their source. The author has done his double damnedest to verify accuracy of all data but takes no responsibility for the consequences of errors, except personal embarrassment and penitence. ♣



Logistics Symposium

Steve Zobal
SSLS Co-Chair

THE SIXTH SPACE LOGISTICS Symposium (SSLS) will be held at South Shore Harbour Resort & Conference Center February 22-24, 1995. This symposium is held at approximately 18 month intervals and is sponsored jointly by the AIAA and the Society of Logistics Engineers (SOLE). The AIAA Houston Section is the lead host organization for the sixth symposium. Dr. Carolyn Huntoon, Director, Johnson Space Center, will be the keynote speaker. Conference program details will be published in the December issue of *Aerospace America* and locally in the December *Horizons*.

Space Logistics is generally considered to be the maintenance and resupply of a spacecraft or station or other entity on earth orbit or in space. This is true, but it also follows that any specialized interfacing environment, hardware, software or operations supporting these activities is also space logistics—including massive earth-based, space projected infrastructure of facilities, equipment, maintenance and repair, supply, training, transportation, and other traditional support operations.

The attached article is the annual summary report submitted by the Space Logistics Technical Committee (SLTC) to the AIAA National Technical Activity Committee. John Peronnet is Chairman of the SLTC. He is a Houston Section member and a member of the Houston SOLE chapter.

If you would like to help out with the symposium, please call Steve Zobal (244-4231) as soon as possible.

Space Logistics

Don Waltz, Bob Dellacamera & John Peronnet

The NASA Hubble Space Telescope (HST) was the first observatory spacecraft designed to effectively accept on-orbit logistics support. This was thoroughly demonstrated during the first December 1993 repair and servicing mission of the HST by seven

astronauts on the five EVA, 11-day mission number 61 of Shuttle Endeavor.

This flight, which required about 1200 people on the ground to generate the logistics support related to the training, the 16,000 pounds of servicing/repair hardware and tools, and logistics operational planning, resulted in the HST being restored to the optical capabilities originally intended. The logistics support techniques learned on this mission will be applied to future Space Station assembly and maintenance operations.

Significant hardware replaced on the first HST servicing mission in order of priority was: solar arrays, gyro systems, wide field/planetary camera II, Corrective Optics Space Telescope Axial Replacement (COSTAR), magnetometers, solar array drive electronics, coprocessor, and the Goddard High-Resolution Spectrograph (GHRS).

In developing a planned integration logistics support infrastructure for the HST repair mission, a functional analysis was performed for each major repair event. Individual tasks, task frequency, task complexities, and support interface requirements were all analyzed. The type and complexity of repair tasks, IVA or EVA, to be performed determined the ground crew based training, support equipment availability and reliability goals, support interface equipment, and critical technologies needing enhancement. Logistics and system engineering organizations in NASA and contractor facilities were combined to plan for and conduct the successful HST repair mission.

All major EVA tasks were performed in the original order designated as follows: EVA 1 replaced the two rate sensor units, each of which contained two gyroscopes used to point HST precisely; prepared the solar array carrier for EVA 2; and replaced eight of Hubble's twelve 3-amp fuses with 5-amp fuses. EVA 2 removed the two 40-foot, 5 kW solar arrays and installed new ones. EVA 3 replaced the wide field/planetary camera with a second generation camera and installed new magnetometer units. EVA 4 installed COSTAR and installed the coprocessor

(see LOGISTICS, page 9)

LOGISTICS (from page 8)

on the DF-224 computer. EVA 5 installed new solar array drive electronics, manually deployed the new solar arrays, and installed the redundancy kit for Hubble's GHRS. The total EVA time for the mission was 35 hours and 28 minutes.

The corrected hardware, subsequent on-orbit checkout, and 15 weeks of verification tests and spacecraft/telescope system initializations by Goddard controllers have brought the HST back to program expectations for sensitivity of scientific investigations, quantitative accuracy of astronomy data, and the ability to make space-based measurements in crowded star fields.

Servicing the HST in orbit has been one of the most important missions involving U. S. astronauts. Space logistic disciplines contributed significantly to this impressive display of astronaut EVA capabilities, servicing hardware development, orbital operations, and mission support interfaces.

The now healthy observatory should remain a valuable United States space science asset through early 1997, when the second Space Shuttle logistics support mission is planned.

An important Single Stage Rocket Technology (DC-X) program is under way which could have significant impact on logistics support of space systems. The DC-X program demonstrated during several suborbital flights that single stage to orbit capability with rapid turnaround is feasible within current technology.

Two significant logistics support aspects of the project are the potential for significant reductions in cost per pound to orbit and the ability to rapidly turn around the vehicle. Rapid turnaround is important to the reduction of costs and is accomplished by employing "airline type" logistics practices wherever practical. The fastest turnaround between hot firings experienced during the test program was six hours, showing that in excess of one flight per week is achievable. Vehicle modifications are being made to a more capable DC-XA configuration and flight envelope expansion tests are scheduled for next year. **H**

Cranium Cruncher

September Solution

A LAYER CAKE is 8" square with three 1" layers. There is a thin layer of icing on top, on all four sides, and between the layers. How can the cake be cut into seven portions so that each portion has the same amount of cake and of icing?

Solution: Mark the circumference in seven equal distances, then make straight cuts from each mark to the center. The area of icing on the sides is the same for each slice. Since each portion consists of one or two triangular pieces with the same altitude and the same total base length, the area of horizontal icing, and volume of cake, are the same for each portion.

Frank Baiamonte of JSC submitted the above solution; Walt Karakulko of LESC came up with a more complex but equally valid approach. And the winner of the free dinner at an upcoming meeting, drawn at random, is Walt Karakulko.

October Solution

A hole is drilled completely through the center of a solid sphere such that the depth of the hole is 1". What is the volume of the remaining material?

Solution 1 (the hard way): If x is measured radially from the axis of the cylinder and y along the axis from the center of the sphere, a volume element can be expressed as

$$\begin{aligned}dV &= 2 \pi x (2y) dx \\ &= 4 \pi x (r^2 - x^2)^{1/2} dx\end{aligned}$$

where r is the radius of the sphere, and the total volume as

$$V = 4 \pi \int x (r^2 - x^2)^{1/2} dx$$

Substituting $x = r \sin t$,

$$\begin{aligned}V &= 4 \pi \int r \sin t (r^2 - r^2 \sin^2 t)^{1/2} r \cos t dt \\ &= (4 \pi / 3) (r^2 - x^2)^{3/2} \Bigg|_r \\ &= \pi h^3 / 6\end{aligned}$$

where h is the depth of the hole, or $\pi/6$ in.³

(see CRUNCHER, page 10)

CRUNCHER (from page 9)

Solution 2 (the easy way): Since the radius of the sphere wasn't specified, it doesn't enter into the calculations. Therefore, set the diameter, and hence the volume, of the hole to zero. The diameter of the sphere in this case is 1", and the volume of material remaining is equal to the volume of this sphere, which is $\pi/6$ in.³

Only one solution was submitted, by Mike Lounge of SpaceHab (he did it the easy way). Mike also wins a free dinner at a Houston Section meeting. Congratulations to our winners, and keep trying.

November Cruncher

Which is greater, π^e or e^π ? Calculating the numbers is too easy, so that doesn't count. You have to *prove* the answer. Hint: $e < \pi < 2e$.

A random drawing from the correct solutions received by November 15 wins a free dinner at an upcoming meeting. Send your solutions to Michael Begley, LESC/C87.



AIAA Calendar

THE AIAA CALENDAR is intended to encompass all Houston Section events and significant dates. This includes Executive Council meetings, which are open to interested members, and *Horizons* deadlines. It will also include committee meetings, Lunch & Learns and similar events if *Horizons* hears about them in time for inclusion. Please send pertinent details to Mike Begley, LESC/C87.

November

7 - Monday

Horizons inputs for December due COB.

8 - Tuesday

Education/Career Enhancement Seminar.

"Internet Seminar," Naz Bedrossian, Neosoft.

LPI, 3600 Bay Area Blvd., 7:00 PM.

Info: Naz Bedrossian, 333-2127 or

Bill Best, 282-6970.

9 - Wednesday

IEEE videoconference.

"Mechatronics."

10 - Thursday

Executive Council meeting.

5:00 PM, Center for Advanced Space Studies.

15 - Tuesday

Monthly dinner meeting.

"Low-Cost Space Transportation," J. R. French.

Gilruth Center, 5:30/6:30/7:30.

18 - Friday

Systems Engineering Simulator Tour.

JSC Bldg. 16, front lobby, 11:30 AM.

Reservations: Andy Sylvester, 483-1545

30 - Wednesday

IEEE videoconference.

"Maximizing Productivity: Multimedia."

Gilruth Center.

30-Dec. 2 - Wednesday-Friday

JSC/IEEE/AIAA workshop.

"Virtual Reality."

Gilruth Center.

December

1 - Thursday

Executive Council meeting.

5:00 PM, Center for Advanced Space Studies.

7 - Wednesday

IEEE videoconference.

"Maximizing Productivity: Redesigning the Engineer & Designing for Maintainability."

Gilruth Center.

8 - Thursday

Monthly dinner meeting.

Director's Reception.

Gilruth Center, 5:30/6:30/7:30.

19 - Monday

Horizons inputs for January due COB.

(see CALENDAR, page 11)

CALENDAR (from page 10)

January

19 - Thursday

Executive Council meeting.
5:00 PM, Center for Advanced Space Studies.

23 - Monday

Horizons inputs for February due COB.

26 - Thursday

Monthly dinner meeting.
Program TBD.
Gilruth Center, 5:30/6:30/7:30.

February

16 - Thursday

Executive Council meeting.
5:00 PM, Center for Advanced Space Studies.

21 - Tuesday

Horizons inputs for March due COB.

23 - Thursday

Monthly dinner meeting.
Program TBD.
Gilruth Center, 5:30/6:30/7:30.

TBD

Space Logistics Symposium.

March

16 - Thursday

Executive Council meeting.
5:00 PM, Center for Advanced Space Studies.

23 - Thursday

Monthly dinner meeting.
Program TBD.
Gilruth Center, 5:30/6:30/7:30.

27 - Monday

Horizons inputs for April due COB.

TBD

Student Paper Competition.

April

3-6 - Monday-Thursday

Life Sciences & Space Medicine Symposium.

20 - Thursday

Executive Council meeting.
5:00 PM, Center for Advanced Space Studies.

24 - Monday

Horizons inputs for May due COB.

27 - Thursday

Monthly dinner meeting.
Program TBD.
Gilruth Center, 5:30/6:30/7:30.

May

18 - Thursday

Executive Council meeting.
5:00 PM, Center for Advanced Space Studies.

22 - Monday

Horizons inputs for June due COB.

25 - Thursday

Monthly dinner meeting.
Program TBD.
Gilruth Center, 5:30/6:30/7:30.

TBD

Annual Technical Symposium.

June

15 - Thursday

Executive Council meeting.
5:00 PM, Center for Advanced Space Studies.

22 - Thursday

Monthly dinner meeting.
Honors and Awards Banquet.
Gilruth Center, 5:30/6:30/7:30.



Horizons

OUTSTANDING SECTION AWARD

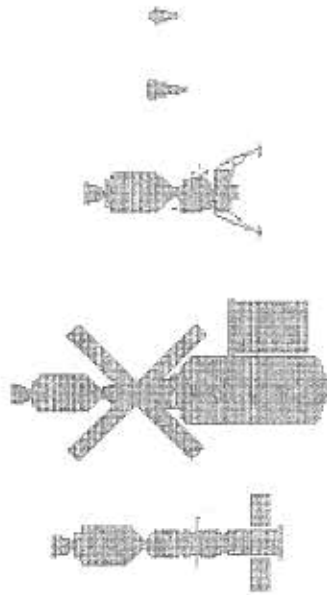


- 1975-1976
- 1976-1977
- 1979-1980
- 1980-1981
- 1981-1982
- 1983-1984
- 1986-1987
- 1988-1989

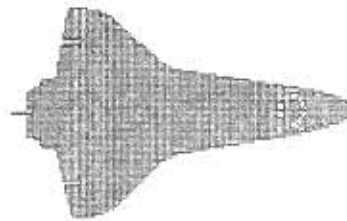
SECTION SPECIAL EVENT AWARD



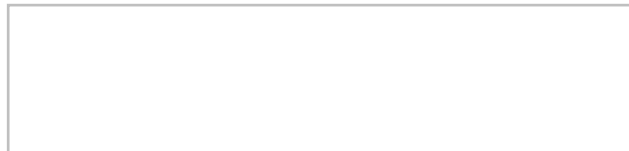
- 1971-1972
- 1972-1973
- 1979-1980
- 1981-1982
- 1983-1984
- 1985-1986
- 1988-1989



AIAA Houston Section
P.O.Box 57524
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GEORGE NIELD
CHAIRMAN 1994-95

American Institute of Aeronautics and Astronautics

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

Tuesday, November 15, 1994

**LOW-COST SPACE
TRANSPORTATION**

JAMES R. FRENCH
Consultant / Technical Advisor



PROGRAM / PRESENTER

This lecture briefly reviews the history of many of the attempts to achieve low cost transportation to orbit. The Single-Stage Rocket Technology (SSRT) program is reviewed with emphasis on the design concept and goals of the DC-X. The flight test program is described with emphasis on lessons learned. The speaker's personal experience on many earlier efforts and his experience as the government's Chief Engineer on SSRT from the beginning offer a unique personal flavor to the lecture. Mr. French started his career with Rocketdyne in 1958 and joined TRW in 1963. From 1967 to 1986, he was employed at the Jet Propulsion Laboratory where he worked on the Mariner, Viking, and Voyager Programs. He was Advanced Study Manager for Planetary Programs, and Systems Definition Manager for the SP-100 space nuclear power plant program. Since 1987 he has worked as a consultant and technical advisor to the aerospace industry and the government in the fields of spacecraft and mission design, launch vehicles, and propulsion. One of his primary clients has been BMDO (formerly SDIO) where he functions as Chief Engineer of the Launch Vehicle Directorate and Chief Engineer of the SSRT program. Mr. French is an Associate Fellow of the AIAA and author of the textbook Space Vehicle Design published by the AIAA.

DINNER MEETING

SOCIAL: 5:30
DINNER: 6:30
PROGRAM: 7:30

MENU: CHOPPED SIRLOIN

MEMBERS & SPOUSES	\$ 9.00
NONMEMBERS	\$10.00
STUDENTS/YOUNG MEMBERS	\$ 5.00
UNEMPLOYED MEMBERS	\$ 5.00

**ROBERT R. GILRUTH RECREATION CENTER
JOHNSON SPACE CENTER**

FRAN JAMISON
333-6277
LOCKHEED

ARDELL BROUSSARD
283-1040
McDONNELL DOUGLAS

MARY ANN BIVONA
483-1350
RSOC

SARAH LEGGIO
282-3160
ALLIEDSIGNAL

CALL ONE OF THE ABOVE FOR RESERVATIONS.

NOTE: RESERVATION DEADLINE IS THURSDAY, NOVEMBER 10, AT NOON.
ANY CANCELLATIONS ARE REQUIRED PRIOR TO DEADLINE. NO-SHOWS WILL BE BILLED.

ALL ARE WELCOME

DINNER RESERVATIONS ARE NOT REQUIRED FOR ATTENDING THE PROGRAM ONLY.



American Institute of Aeronautics and Astronautics
HOUSTON SECTION P.O. BOX 57524 WEBSTER, TEXAS 77598

**AIAA Education and Career Enhancement
Committee**

is proud to present

“INTERNET Seminar”

on Tuesday, November 8, 1994 at 7:00 pm
Hess Room at LPI
(Bay Area Blvd. & Middlebrook Drive)

The seminar is presented by NEOSOFT

All are invited!!

For More Information, please call:

Naz Bedrossian 333-2127

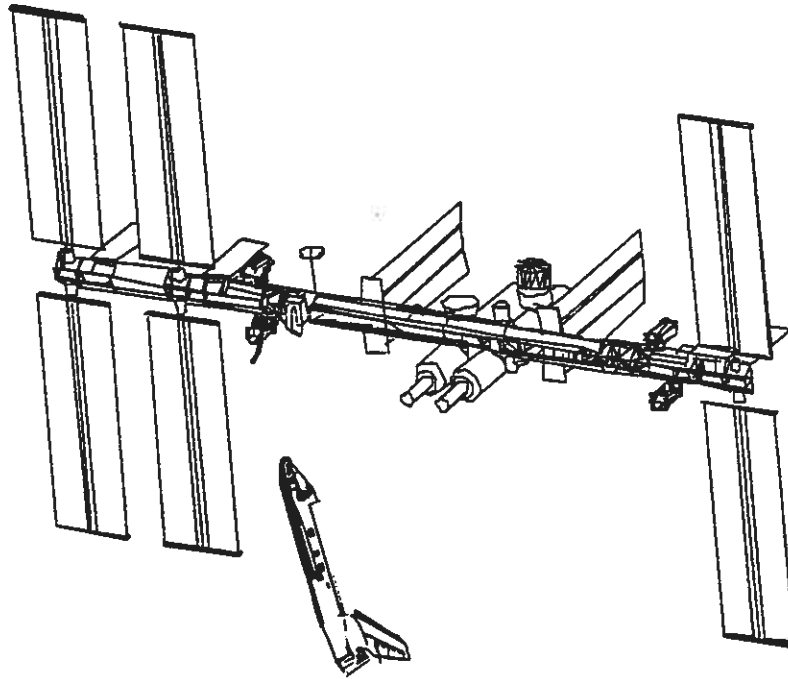
Bill Best 282-6970



American Institute of Aeronautics and Astronautics
HOUSTON SECTION P.O. BOX 57524 WEBSTER, TEXAS 77598

The AIAA is pleased to present

A Tour of the Systems Engineering Simulator



Friday, November 18, 11:30 am

**AIAA members and non-members are invited,
but NASA badges are required.**

Meet in the NASA Building 16 front lobby, which faces Building 13.

**Attendance is limited to 15 people.
Call Andy Sylvester, 483-1545, to confirm your reservation.**

SCIENCE FAIR VOLUNTEER SIGN UP FORM

Our organization has started a Science Fair Initiative Project to encourage the Pasadena Independent School District High School students to participate in the science fair program. This is the first time that the Pasadena Independent District high school students will have the opportunity to participate in science fair.

PLEASE SIGN UP FOR BOTH THE MENTORS AND JUDGES

PLEASE Note:

Expected volunteer time for mentoring is about 3-4 hours (total) for the whole project, from October 1994 to February 1995, mainly on telephone.

Expected volunteer time for judging is about 2-3 hours (total) in judging at a high school in January 1995.

Registration Form for Mentors and Judges

Name:.....

Employer:.....

Address:.....

Telephone:.....FAX:.....EMAIL.....

Subjects for **MENTORING**(circle all subjects of interest with preferences 1,2,3 etc.):

Chemistry.....Computers.....Earth/ Space Sciences.....EngineeringMathematics.....
Physics.....

Behavior/Social Sciences.....Biochemistry/Microbiology.....Botany.....
Environmental Science.....Medicine/Health.....Zoology.....

Subjects for **JUDGING**(circle all subjects of interest with preferences 1,2,3 etc.):

Chemistry.....Computers.....Earth/ Space Sciences.....EngineeringMathematics.....
Physics.....

Behavior/Social Sciences.....Biochemistry/Microbiology.....Botany.....
Environmental Science.....Medicine/Health.....Zoology.....

Please fill out the form, and send it to Dr. Zafar Taqvi, 2400 NASA Rd I, C-80, Houston, TX-77058, FAX at 333-7072 by October 1, 1994

SCIENCE FAIR INITIATIVE IS A JOINT IEEE/AIAA/CLCTS PROJECT