WHORM Subject File Code: OS
(Outer Space)
Case file Number(s): 112000-129999
Box: 1

WITHDRAWAL SHEET
Ronald Reagan Library

DOCUMENT NO. AND TYPE	SUBJECT/TITLE	DATE	RESTRICTION
letter case (125780)			
1. memo	from Michael Wheeler to Donald Greg, Charles Hill et al. re: IG (space) meeting (1p)	4/25/83	P1
COLLECTION: WHORM: Subject File			smf
FILE FOLDER: OS Outer Space (112000-129999)			5/23/94

RESTRICTION CODES

Presidential Records Act - [44 U.S.C. 2204(a)]

- **P-1** National security classified information [(a)(1) of the PRA].
- **P-2** Relating to appointment to Federal office [(a)(2) of the PRA].
- **P-3** Release would violate a Federal statute [(a)(3) of the PRA].
- **P-4** Release would disclose trade secrets or confidential commercial or financial information [(a)(4) of the PRA].
- **P-5** Release would disclose confidential advice between the President and his advisors, or between such advisors [(a)(5) of the PRA.
- **P-6** Release would constitute a clearly unwarranted invasion of personal privacy [(a)(6) of the PRA].

Freedom of Information Act - [5 U.S.C. 552(b)]

- **F-2** Release could disclose internal personnel rules and practices of an agency [(b)(2) of the FOIA].
- **F-7** Release would disclose information compiled for law enforcement purposes [(b)(7) of the FOIA].
- **F-8** Release would disclose information concerning the regulation of financial institutions [(b)(8) of the FOIA].
- **F-9** Release would disclose geological or geophysical information concerning wells [(b)(9) of the FOIA].
- **C.** Closed in accordance with restrictions contained in donor's deed of gift.

EE

113074CA

OS

FG006-11

FG006-01

THE WHITE HOUSE

WASHINGTON

November 20, 1982

MEMORANDUM FOR KEN CRIBB

FROM: CRAIG L. FULLER

SUBJECT: Khedouri on Space

Fred Khedouri and I have had several conversations about the current space program. It would be useful at this point to have a 15-20 minute meeting with Ed on the subject of "space initiatives" to give him a feel for what is under consideration. Fred is the best person around on the subject.

Could you get us some time? Thanks

EF

follow-up

113549CA 12/9

CS

FG006-11

FG006-01

THE WHITE HOUSE

WASHINGTON

November 20, 1982

MEMORANDUM FOR KEN CRIBB

FROM: CRAIG L. FULLER

SUBJECT: Khedouri on Space

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Could you get us some time? Thanks

Meeting Scheduled for 12/9 - 8:45 am.

115765

ID # 05

WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

☐ O - OUTGOING
☐ H - INTERNAL
☑ I - INCOMING
Date Correspondence Received (YY/MM/DD) 82/12/21

Name of Correspondent: Larry E. Craig

☐ **MI Mail Report** **User Codes:** (A) _____ (B) _____ (C) _____

Subject: Encloses a letter from Robert E. Barr regarding building a "flying saucer" at Moses Lake, Washington

ROUTE TO:		ACTION		DISPOSITION		
Office/Agency (Staff Name)	Action Code	Tracking Date YY/MM/DD	Type of Response	Code	Completion Date YY/MM/DD
LA Duke	ORIGINATOR	82/12/21 CJ	K.D	A	82/12/22 CJ
	Referral Note:				
		/ /			/ /
	Referral Note:				
		/ /			/ /
	Referral Note:				
		/ /			/ /
	Referral Note:				
		/ /			/ /
	Referral Note:				

ACTION CODES:
A - Appropriate Action
C - Comment/Recommendation
D - Draft Response
F - Furnish Fact Sheet to be used as Enclosure
I - Info Copy Only/No Action Necessary
R - Direct Reply w/Copy
S - For Signature
X - Interim Reply

DISPOSITION CODES:
A - Answered
B - Non-Special Referral
C - Completed
S - Suspended

FOR OUTGOING CORRESPONDENCE:
Type of Response = Initials of Signer
Code = "A"
Completion Date = Date of Outgoing

Comments: _____

Keep this worksheet attached to the original incoming letter.
Send all routing updates to Central Reference (Room 75, OEOB).
Always return completed correspondence record to Central Files.
Refer questions about the correspondence tracking system to Central Reference, ext. 2590.

5/81

RECORDS MANAGEMENT ONLY

CLASSIFICATION SECTION

No. of Additional Correspondents:_____ Media: L Individual Codes: 1240 _____ _____

Prime Subject Code: 105 _____ Secondary Subject Codes: _____ _____

_____ _____

_____ _____

PRESIDENTIAL REPLY

Code	Date	Comment	Form
C __ __	_____	Time: _____	P- _____
DSP	_____	Time: _____	Media: _____

SIGNATURE CODES:

CPn - Presidential Correspondence
- n - 0 - Unknown
- n - 1 - Ronald Wilson Reagan
- n - 2 - Ronald Reagan
- n - 3 - Ron
- n - 4 - Dutch
- n - 5 - Ron Reagan
- n - 6 - Ronald
- n - 7 - Ronnie

CLn - First Lady's Correspondence
- n - 0 - Unknown
- n - 1 - Nancy Reagan
- n - 2 - Nancy
- n - 3 - Mrs. Ronald Reagan

CBn - Presidential & First Lady's Correspondence
- n - 1 - Ronald Reagan - Nancy Reagan
- n - 2 - Ron - Nancy

MEDIA CODES:
- B - Box/package
- C - Copy
- D - Official document
- G - Message
- H - Handcarried
- L - Letter
- M - Mailgram
- O - Memo
- P - Photo
- R - Report
- S - Sealed
- T - Telegram
- V - Telephone
- X - Miscellaneous
- Y - Study

December 22, 1982

Dear Larry:

Thank you for your December 20 letter in behalf of Mr. Robert Barr of Lucile, Idaho. You may assure your constituent that his message was received at the White House.

With best wishes,

Sincerely,

Kenneth M. Duberstein
Assistant to the President

The Honorable Larry E. Craig
House of Representatives
Washington, D.C. 20515

KMD:CMP:NAP

5

KD

INTERIOR AND INSULAR AFFAIRS COMMITTEE
SUBCOMMITTEE ON PUBLIC LANDS AND NATIONAL PARKS
SUBCOMMITTEE ON MINES AND MINING
EDUCATION AND LABOR COMMITTEE
SUBCOMMITTEE ON HEALTH AND SAFETY
SUBCOMMITTEE ON ELEMENTARY, SECONDARY, AND VOCATIONAL EDUCATION
SELECT COMMITTEE ON AGING

LARRY CRAIG
1ST DISTRICT, IDAHO

Congress of the United States
House of Representatives
Washington, D.C. 20515

WASHINGTON OFFICE:
515 CANNON HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6611

DISTRICT OFFICES:
134 BORAH POST OFFICE BUILDING
BOISE, IDAHO 83702
(208) 334-9046

903 D STREET
LEWISTON, IDAHO 83501
(208) 743-0792

101 NORTH 4TH STREET
COEUR D' ALENE, IDAHO 83814
(208) 667-6130

December 20, 1982

115765

Mr. Kenneth Duberstein
House Congressional Liaison
West Wing - White House
Washington, D. C. 20500

Dear Mr. Duberstein:

Enclosed please find a copy of correspondence recently received from Mr. Robert Barr.

As you will note, Mr. Barr is concerned with getting the enclosed letter to President Reagan.

I would greatly appreciate your review of his correspondence and your response to his concerns.

Please reply to: Congressman Larry Craig
515 Cannon House Office Building
Washington, D.C. 20515
Attention: Annie Whipple

Thank you for your assistance.

Sincerely,

Larry E. Craig

Larry E. Craig
Member of Congress

LEC/aw
Enclosure

This is to assure you ... [illegible] ... WH

Mr. Larry Craig — Please see that the President gets this.
Thank you!

Hon. President Ronald Reagan
The White House
Washington, D.C. 20500

Dec 13, 1982

DEC 17 1982

Dear President Reagan.

I would like to build a "flying Saucer" at Moses Lake, Washington, because of their titanium Plant.

Sincerely,
Robert E. Barr
Box 306
Lucile, Idaho, 83542
208 — 628 — 3440

File original to NASA

ID # 118657 CA
WS

05

OFFICE OF CABINET AFFAIRS
ACTION TRACKING WORKSHEET

Action resulting from:
- ☑ document (attached)
- ☐ telephone call
- ☐ meeting (attach conference report if available)

Document Date: / /

From: Anne Higgins

Date Received: / /

Subject: NASA: Preservation of Gantry Tower

ACTION CODES:
A — Appropriate Action
B — Briefing Paper
C — Comment/Recommendation
D — Draft Response
F — Furnish Fact Sheet
I — Info Copy Only/No Action Necessary
R — Direct Reply w/Copy
S — For Signature
X — Interim Reply

ROUTE TO:

Date Sent	Name	Action Codes	Date Due	Action Taken
83/04/27	Fuller	A	83/04/27	
83/04/27	(2) Anne Higgins	A	/ /	
/ /			/ /	
/ /			/ /	
/ /			/ /	
/ /			/ /	

COMMENTS: (1) see note / please advise
(2) Fuller does not want to get involved but he said he thinks it may have already been saved.

Originator: ☑ Dunlop ☐ Faoro ☐ Fuller ☐ Gonzalez ☐ Hart ☐ Hodapp

KEEP THIS WORKSHEET ATTACHED TO THE ORIGINAL INCOMING MATERIAL AND WHEN THE ASSIGNED ACTION IS COMPLETE, RETURN TO:

Office of Cabinet Affairs
Attention: Karen Hart (x-2823)
West Wing/Ground Floor

THE WHITE HOUSE
WASHINGTON

ANNE HIGGINS
Special Assistant to the
President and Director
of Correspondence
Room 94, x7610

4-26-83

Jerky -
Would Craig want
to get involved
in saving the
flower?

R

1983 APR 26 PM 4 48

RECEIVED

ID # 118962

05

DE

WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

☐ O - OUTGOING
☐ H - INTERNAL
☐ I - INCOMING
Date Correspondence Received (YY/MM/DD) 83/02/07

Name of Correspondent: Carol Allen

☐ **MI Mail Report** **User Codes:** (A) _____ (B) _____ (C) _____

Subject: appreciates Air and Space event

ROUTE TO:		ACTION		DISPOSITION		
Office/Agency	(Staff Name)	Action Code	Tracking Date YY/MM/DD	Type of Response	Code	Completion Date YY/MM/DD
PL	Cavaney	ORIGINATOR	830228	NRN	C	830228
		Referral Note:		Thank you		
			/ /			/ /
		Referral Note:				
			/ /			/ /
		Referral Note:				
			/ /			/ /
		Referral Note:				
			/ /			/ /
		Referral Note:				

ACTION CODES:
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C - Comment/Recommendation
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A - Answered
B - Non-Special Referral
C - Completed
S - Suspended

FOR OUTGOING CORRESPONDENCE:
Type of Response = Initials of Signer
Code = "A"
Completion Date = Date of Outgoing

Comments: _____

Keep this worksheet attached to the original incoming letter.
Send all routing updates to Central Reference (Room 75, OEOB).
Always return completed correspondence record to Central Files.
Refer questions about the correspondence tracking system to Central Reference, ext. 2590.

5/81

RECORDS MANAGEMENT ONLY

CLASSIFICATION SECTION

No. of Additional Correspondents: _____ Media: M Individual Codes: 4200 __·____ __·____

Prime Subject Code: 03 ____·__ Secondary Subject Codes: __ ____·__ __ ____·__
__ ____·__ __ ____·__
__ ____·__ __ ____·__

PRESIDENTIAL REPLY

Code	Date	Comment	Form
C __ __	_____	Time: _____	P- _____
DSP	_____	Time: _____	Media: _____

SIGNATURE CODES:

CPn - Presidential Correspondence
- n - 0 - Unknown
- n - 1 - Ronald Wilson Reagan
- n - 2 - Ronald Reagan
- n - 3 - Ron
- n - 4 - Dutch
- n - 5 - Ron Reagan
- n - 6 - Ronald
- n - 7 - Ronnie

CLn - First Lady's Correspondence
- n - 0 - Unknown
- n - 1 - Nancy Reagan
- n - 2 - Nancy
- n - 3 - Mrs. Ronald Reagan

CBn - Presidential & First Lady's Correspondence
- n - 1 - Ronald Reagan - Nancy Reagan
- n - 2 - Ron - Nancy

MEDIA CODES:
- B - Box/package
- C - Copy
- D - Official document
- G - Message
- H - Handcarried
- L - Letter
- M - Mailgram
- O - Memo
- P - Photo
- R - Report
- S - Sealed
- T - Telegram
- V - Telephone
- X - Miscellaneous
- Y - Study

CAROL WARD ALLEN
PO BOX 12336
OAKLAND CA 94604

Western Union Mailgram®

UNITED STATES POSTAL SERVICE® U.S. MAIL

31

1-048561S038 02/07/83 ICS IPMRNCZ CSP WHSA
4158394108 MGM TDRN OAKLAND CA 55 02-07 0553P EST

file
Air & Space
to PB Event file

PRESIDENT RONALD REGAN,
HONORARY CHAIRPERSON
FOR AIR & SPACE BICENTENNIAL WHITE HOUSE
WASHINGTON DC 20500

118962

Red Cavaney

ON BEHALF OF BAY AREA WOMENS ENTREPRENEURS WE RECOGNIZE THE TREMENDOUS CONTRIBUTION OF THE AIR AND SPACE EXPLORATION HAS MADE TO THIS NATION. WE APPLAUD YOUR EFFORTS IN BRINGING THE BICENTENNIAL TO THE AMERICAN PEOPLE.

SINCERELY,
CAROL WARD ALLEN,
PRESIDENT

17:54 EST

MGMCOMP

TO REPLY BY MAILGRAM MESSAGE, PHONE WESTERN UNION ANYTIME, DAY OR NIGHT:

FOR YOUR LOCAL NUMBER, SEE THE WHITE PAGES

OF YOUR LOCAL TELEPHONE DIRECTORY

OR

DIAL (TOLL-FREE) 800-257-2241

(EXCEPT IN NEW JERSEY 800-632-2271)

OR DIAL WESTERN UNION'S COMPUTER DIRECTLY:

FROM TELEX I 6161 FROM TELEX II (TWX®) 910-420-1212

ID # 119394

05

WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

☐ O - OUTGOING
☐ H - INTERNAL
☑ I - INCOMING
Date Correspondence Received (YY/MM/DD) 831 01 13

Name of Correspondent: Gene Taylor

☐ **MI Mail Report** **User Codes: (A)** _____ **(B)** _____ **(C)** _____

Subject: Encloses a letter from Mr. Floy Haworth, who feels he could make a contribution to the Space Program.

ROUTE TO:	ACTION		DISPOSITION		
Office/Agency (Staff Name)	Action Code	Tracking Date YY/MM/DD	Type of Response	Code	Completion Date YY/MM/DD
LA Duke	ORIGINATOR	831 01 13			
	Referral Note:				
✓ C O Higgs	A	83 01 12		C	83 01 18
Mail	Referral Note:				
	R	83 01 20		A	83 03 22
	Referral Note:	Letter to Mr Floy Haworth			
		/ /			/ /
	Referral Note:				
		/ /			/ /
	Referral Note:				

ACTION CODES:
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C - Comment/Recommendation
D - Draft Response
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5/81

RECORDS MANAGEMENT ONLY

CLASSIFICATION SECTION

No. of Additional Correspondents:_____ Media: L Individual Codes: 1240 _.____ _.____ _.____

Prime Subject Code: 05 ____-___ Secondary Subject Codes: FG 185-__ __ ____-__
__ ____-__ __ ____-__
__ ____-__ __ ____-__

PRESIDENTIAL REPLY

Code	Date	Comment	Form
C __ __	_____	Time: _____	P- _____
DSP	_____	Time: _____	Media: _____

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- n - 2 - Ron - Nancy

MEDIA CODES:
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- L - Letter
- M - Mailgram
- O - Memo
- P - Photo
- R - Report
- S - Sealed
- T - Telegram
- V - Telephone
- X - Miscellaneous
- Y - Study

National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of NB-9

March 22, 1983

Mr. Floy Haworth
103 Elm Street
Monett, MO 65708

Dear Mr. Haworth:

Your recent letter, which was addressed to President Reagan at The White House and which referred to several ideas previously submitted to the National Aeronautics and Space Administration (NASA), was forwarded to NASA Headquarters and then referred internally to the Inventions and Contributions Board for review and reply.

Unfortunately, a search of our files revealed no record of receipt for your contribution. Therefore, it is suggested that you submit your concept to the Inventions and Contributions Board which is responsible for the evaluation and review of scientific and technical contributions.

In order that your contribution can be formally evaluated, we ask that you submit a complete written description of the contribution in the English language, and that it be accompanied by drawings, sketches, diagrams, or photographs illustrating the nature of the contribution and the scientific and technical principles upon which it is based. Supporting documentation can include copies of patents, technical reports, and articles from scientific journals. You may also submit any available test or performance data, or observations of pertinent scientific phenomena.

If the submittal is judged to be complete by the Board, arrangements will be made to have the technical merits of the contribution evaluated by qualified NASA specialists with special emphasis on validity of design, operational feasibility, and potential for space and aeronautical applications. Upon completion, the results of the evaluation will be forwarded to you together with recommendations for further action that the Board deems appropriate.

Your interest in contributing to the advancement of NASA's space and aeronautical programs is appreciated.

Sincerely,

for Francis W. Kemmett
Director of the Staff
Inventions and Contributions Board

bcc: Ms. Sally Kelley
Director of Agency Liaison
Presidential Correspondence

bcc: AEM/Ms. Vitagliano

NB-9/FWkemmett:mfs:53729:03/22/83

A-36387

T H E W H I T E H O U S E O F F I C E

REFERRAL

JANUARY 20, 1983

TO: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACTION REQUESTED:
DIRECT REPLY, FURNISH INFO COPY

DESCRIPTION OF INCOMING:

ID: 119394

MEDIA: LETTER, DATED JANUARY 11, 1983

TO: KENNETH DUBERSTEIN

FROM: THE HONORABLE GENE TAYLOR
U. S. HOUSE OF REPRESENTATIVES
WASHINGTON DC 20515

SUBJECT: ENCLOSES A LETTER FROM MR. FLOY HAWORTH
WHO FEELS HE COULD MAKE A CONTRIBUTION TO
THE SPACE PROGRAM

PROMPT ACTION IS ESSENTIAL -- IF REQUIRED ACTION HAS NOT BEEN TAKEN WITHIN 9 WORKING DAYS OF RECEIPT, PLEASE TELEPHONE THE UNDERSIGNED AT 456-7486.

RETURN CORRESPONDENCE, WORKSHEET AND COPY OF RESPONSE (OR DRAFT) TO:
AGENCY LIAISON, ROOM 91, THE WHITE HOUSE

SALLY KELLEY
DIRECTOR OF AGENCY LIAISON
PRESIDENTIAL CORRESPONDENCE

January 14, 1983

Dear Gene:

Thank you for your January 11 letter enclosing correspondence to the President from Mr. Floy Haworth of Monett, Missouri.

I will be pleased to bring this to the attention of the Office of Presidential Correspondence to see whether a reply may be sent on the President's behalf. We appreciate your interest in writing.

With best wishes,

Sincerely,

Kenneth M. Duberstein
Assistant to the President

The Honorable Gene Taylor
House of Representatives
Washington, D.C. 20515

KMD:CMP:NAP

cc: w/copy of inc, Anne Higgins -- for appropriate response

WH RECORDS MANAGEMENT WILL RETAIN ORIGINAL INCOMING

GENE TAYLOR
7TH DISTRICT, MISSOURI

COMMITTEES:
RULES

SUBCOMMITTEES ON:
RULES OF THE HOUSE
(RANKING MINORITY MEMBER)
LEGISLATIVE PROCESS

POST OFFICE
AND CIVIL SERVICE

SUBCOMMITTEES ON:
POSTAL OPERATIONS AND SERVICES
(RANKING MINORITY MEMBER)
CIVIL SERVICE

5870

KD

Congress of the United States
House of Representatives
Washington, D.C. 20515

DISTRICT OFFICES:
314A WILHOIT BUILDING
SPRINGFIELD, MISSOURI 65806
(417) 862-4317

302 FEDERAL BUILDING
JOPLIN, MISSOURI 64801
(417) 781-1041

WASHINGTON OFFICE:
2134 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6536

119394

January 11, 1983

Mr. Kenneth M. Duberstein
Assistant to the President
for Legislative Affairs
The White House
Washington, D.C. 20500

Dear Ken:

My constituent, Mr. Floy Haworth of Monett, Missouri has asked that I forward to the President the enclosed communication which also containes a copy of Mr. Haworth's letter to the President of the Boeing Company. Mr. Haworth is a man who seriously desires to help this country move forward.

Thanking you in advance, I remain

Sincerely,

Gene Taylor
Member of Congress

GT:hdl
enclosure

December 17, 1982

7849

~~119394~~

President Ronald Reagan
The White House
Washington, D.C.

Dear Sir,

This is not an attempt to sell something to the United States Government or to obtain a grant or to obtain a loan or ask for a big personal favor but rather to voice concern about how effectively one person at the top and near the top, in both the commercial and the government field of aviation, can and probably does stifle and prevent progress in that field, simply because they do not have the vision, imagination or natural ingenuity to recognize progress when they see it. I am providing two examples of what I mean.

Boeing Aircraft did answer my letter so I am writing to them again and in a manner which I hope will provoke thought. I am sending you a copy of said letter and I believe it is self explanatory. I feel that I can write to Boeing in this manner because for years I have felt as if I wore the Boeing brand. I have a small gold lapel pin which I got when I graduated from class 19, Boeing School of Aeronautics at Oakland Airport, in 1941. At that time, Boeing awarded to me a "sheepskin" or honor diploma for being top in that class with a 91.6 average. In the history of the school, to that date, only one student had made a higher average. This was in a school where all perfect grades and test results could have only earned a 95 average. I am tooting my own horn here so you won't think my qualifications are limited to a ground level study of high altitude aircraft.

Because of the two "unanswered" letters to NASA, I will make no further attempts there. Let them muddle along in their narrow minded bliss. In my first letter to NASA, I stated that I had some very definite ideas that I feel would be helpful to the space program, especially concerning re-entry problems and I would like to work with them under an arrangement where I would receive a fair reward for the ideas. I don't believe the extreme crisis that exists during re-entry is all absolutely necessary. First lets try some logic. The spacecraft comes in from outer space where the temperature is down below, way down below zero, and enters atmosphere that is also very cold. With air being the most adaptable and generally used cooling agent we have, it seems strange that nobody can devise a plan to bring them together without flames, heatshields, communication blackout and a general crisis. I think it can be done and if my theory is right, it can be helpful in all fast flying aircraft. During my study, which consists of sketches, diagrams and illustrations, showing what I think will happen under specified conditions, and based to a large extent on educated guesses, calculations, estimations, predictions, a certain amount of speculation and just plain guess and logic, I became aware that the sonic boom was not a problem but rather a symptom and if the cause can be successfully treated, the sonic boom will be reduced to a whisper and also that particular aircraft will be released to a higher top speed.

for a [illegible] lf but I am goi[illegible] to apply [illegible] to
[illegible] at the [illegible] the sonic boom. If succe[illegible], [illegible]ill
[illegible]ction[illegible] theory is sound [illegible]l would [illegible]ed
[illegible]ft.

[illegible]ave [illegible]otential and may [illegible]de away. [illegible]rt
[illegible]ime, [illegible]ause that potenti[illegible]l has bo[illegible] [illegible]t
[illegible]gress[illegible]. I am fascinated b[illegible]e possi[illegible] in
[illegible]are [illegible]ed.

Sincerely,

Mr. Floy Haworth
10[illegible] Elm Street
[illegible]t, Miss[illegible]708

December 17, 1982

President
Boeing Aircraft
Seattle, Washington

Dear Sir,

I have a copy of your engineering departments evaluation of my plan for a wing that efficiency peaks at two speeds and I especially noted the part about Boeing having a better approach and pointing with obvious pride at the one-half acre, three feet deep of jet fuel stowed in the wings, so I have decided to tell you a bedtime story.

Once upon a time a man decided to build himself a car. He only put a one-speed transmission in it because that was the way things were done in those days. He used a low speed that would achieve peak efficiency at twelve miles per hour. He started his car, went down the winding lane, turned the corner, climbed a steep grade and started down the highway. He looked all around and said, "This is great but maybe I could go faster", so he pushed the throttle and sped along at sixteen miles per hour but he knew he was abusing the engine and wasting fuel. So he returned to his workshop. The car performed very well down the steep grade, around the corner and along the winding lane. This time he used a high speed transmission so the car would reach peak efficiency at eighty miles per hour but it was also a one-speed transmission because that was the way things were done in those days. He started his car but he couldn't go down the winding lane or turn the corner or climb the steep grade to the highway so he had his varlets and knaves and court jester push his car to the top of a long grade onto the highway and he sped away. He looked all around and upon discovering that his fuel consumption was very low indeed, he said, "This is truly great!" He drove east, he drove north, he drove west, he drove south and then east but when he arrived, he could not go down the steep grade, around the corner, or along the winding lane. This time he decided on a compromise and used a middle speed transmission that would reach peak efficiency at thirty five miles per hour and he used a one-speed transmission because that was the way things were done in those days. He started his car and although he had a rather wild ride down the winding lane, around the corner, up the steep grade and onto the highway, he was on his way. Again he looked all around and observed the tank of fuel he was towing behind and said, "I have done good!"

The End.

Floy Haworth

Mr. Floy Haworth
103 Elm Street
Monett, Missouri 65708

ID # 113394

05

WHITE HOUSE
CORRESPONDENCE TRACKING WORKSHEET

☐ O - OUTGOING
☐ H - INTERNAL
☑ I - INCOMING
Date Correspondence Received (YY/MM/DD) 831 01 13

Name of Correspondent: Gene Taylor

☐ **MI Mail Report** **User Codes: (A)** _____ **(B)** _____ **(C)** _____

Subject: Encloses a letter from Mr. Flow Lawerth, who feels he could make a contribution to the Space Shuttle.

ROUTE TO:		ACTION		DISPOSITION		
Office/Agency	(Staff Name)	Action Code	Tracking Date YY/MM/DD	Type of Response	Code	Completion Date YY/MM/DD
LA Duke		ORIGINATOR	831 01 13	KD	A	83 01 14
✓ C O'Kelley		Referral Note: A	83 01 17			/ /
		Referral Note:	/ /			/ /
		Referral Note:	/ /			/ /
		Referral Note:	/ /			/ /
		Referral Note:				

ACTION CODES:
A - Appropriate Action
C - Comment/Recommendation
D - Draft Response
F - Furnish Fact Sheet to be used as Enclosure
I - Info Copy Only/No Action Necessary
R - Direct Reply w/Copy
S - For Signature
X - Interim Reply

DISPOSITION CODES:
A - Answered
B - Non-Special Referral
C - Completed
S - Suspended

FOR OUTGOING CORRESPONDENCE:
Type of Response = Initials of Signer
Code = "A"
Completion Date = Date of Outgoing

Comments: _____

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Always return completed correspondence record to Central Files.
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5/81

January 14, 1983

Dear Gene:

Thank you for your January 11 letter enclosing correspondence to the President from Mr. Floy Haworth of Monett, Missouri.

I will be pleased to bring this to the attention of the Office of Presidential Correspondence to see whether a reply may be sent on the President's behalf. We appreciate your interest in writing.

With best wishes,

Sincerely,

Kenneth M. Duberstein
Assistant to the President

The Honorable Gene Taylor
House of Representatives
Washington, D.C. 20515

KMD:CMP:NAP

cc: w/copy of inc, Anne Higgins -- for appropriate response

WH RECORDS MANAGEMENT WILL RETAIN ORIGINAL INCOMING

January 14, 1983

Dear Gene:

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House of Representatives
Washington, D.C. 20515

KMD:CMP:NAP

cc: w/copy of inc, Anne Higgins -- for appropriate response

WH RECORDS MANAGEMENT WILL RETAIN ORIGINAL INCOMING

GENE TAYLOR
7TH DISTRICT, MISSOURI

COMMITTEES:
RULES
SUBCOMMITTEES ON:
RULES OF THE HOUSE
(RANKING MINORITY MEMBER)
LEGISLATIVE PROCESS

POST OFFICE
AND CIVIL SERVICE
SUBCOMMITTEES ON:
POSTAL OPERATIONS AND SERVICES
(RANKING MINORITY MEMBER)
CIVIL SERVICE

Congress of the United States
House of Representatives
Washington, D.C. 20515

DISTRICT OFFICES:
314A WILHOIT BUILDING
SPRINGFIELD, MISSOURI 65806
(417) 862-4317

302 FEDERAL BUILDING
JOPLIN, MISSOURI 64801
(417) 781-1041

WASHINGTON OFFICE:
2134 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, D.C. 20515
(202) 225-6536

January 11, 1983

Mr. Kenneth M. Duberstein
Assistant to the President
for Legislative Affairs
The White House
Washington, D.C. 20500

Dear Ken:

My constituent, Mr. Floy Haworth of Monett, Missouri has asked that I forward to the President the enclosed communication which also containes a copy of Mr. Haworth's letter to the President of the Boeing Company. Mr. Haworth is a man who seriously desires to help this country move forward.

Thanking you in advance, I remain

Sincerely,

Gene Taylor
Member of Congress

GT:hdl
enclosure

December 17, 1982

119394

President Ronald Reagan
The White House
Washington, D.C.

Dear Sir,

This is not an attempt to sell something to the United States Government or to obtain a grant or to obtain a loan or ask for a big personal favor but rather to voice concern about how effectively one person at the top and near the top, in both the commercial and the government field of aviation, can and probably does stifle and prevent progress in that field, simply because they do not have the vision, imagination or natural ingenuity to recognize progress when they see it. I am providing two examples of what I mean.

Boeing Aircraft did answer my letter so I am writing to them again and in a manner which I hope will provoke thought. I am sending you a copy of said letter and I believe it is self explanatory. I feel that I can write to Boeing in this manner because for years I have felt as if I wore the Boeing brand. I have a small gold lapel pin which I got when I graduated from class 19, Boeing School of Aeronautics at Oakland Airport, in 1941. At that time, Boeing awarded to me a "sheepskin" or honor diploma for being top in that class with a 91.6 average. In the history of the school, to that date, only one student had made a higher average. This was in a school where all perfect grades and test results could have only earned a 95 average. I am tooting my own horn here so you won't think my qualifications are limited to a ground level study of high altitude aircraft.

Because of the two "unanswered" letters to NASA, I will make no further attempts there. Let them muddle along in their narrow minded bliss. In my first letter to NASA, I stated that I had some very definite ideas that I feel would be helpful to the space program, especially concerning re-entry problems and I would like to work with them under an arrangement where I would receive a fair reward for the ideas. I don't believe the extreme crisis that exists during re-entry is all absolutely necessary. First lets try some logic. The spacecraft comes in from outer space where the temperature is down below, way down below zero, and enters atmosphere that is also very cold. With air being the most adaptable and generally used cooling agent we have, it seems strange that nobody can devise a plan to bring them together without flames, heatshields, communication blackout and a general crisis. I think it can be done and if my theory is right, it can be helpful in all fast flying aircraft. During my study, which consists of sketches, diagrams and illustrations, showing what I think will happen under specified conditions, and based to a large extent on educated guesses, calculations, estimations, predictions, a certain amount of speculation and just plain guess and logic, I became aware that the sonic boom was not a problem but rather a symptom and if the cause can be successfully treated, the sonic boom will be reduced to a whisper and also that particular aircraft will be released to a higher top speed.

I have no need for a spacecraft myself but I am going to apply my theory to a device aimed at the elimination of the sonic boom. If successful, I will have the satisfaction of knowing my theory is sound and would have worked on the spacecraft.

Automobiles may have reached their potential and may fade away. If aircraft fades at this time, it won't be because that potential has been reached but rather that progress has stopped. I am fascinated by the possibilities in air travel that are still untouched.

Sincerely,

F. Floy Haworth

Mr. Floy Haworth
103 Elm Street
Monett, Missouri 65708

December 17, 1982

President
Boeing Aircraft
Seattle, Washington

Dear Sir,

I have a copy of your engineering departments evaluation of my plan for a wing that efficiency peaks at two speeds and I especially noted the part about Boeing having a better approach and pointing with obvious pride at the one-half acre, three feet deep of jet fuel stowed in the wings, so I have decided to tell you a bedtime story.

Once upon a time a man decided to build himself a car. He only put a one-speed transmission in it because that was the way things were done in those days. He used a low speed that would achieve peak efficiency at twelve miles per hour. He started his car, went down the winding lane, turned the corner, climbed a steep grade and started down the highway. He looked all around and said, "This is great but maybe I could go faster", so he pushed the throttle and sped along at sixteen miles per hour but he knew he was abusing the engine and wasting fuel. So he returned to his workshop. The car performed very well down the steep grade, around the corner and along the winding lane. This time he used a high speed transmission so the car would reach peak efficiency at eighty miles per hour but it was also a one-speed transmission because that was the way things were done in those days. He started his car but he couldn't go down the winding lane or turn the corner or climb the steep grade to the highway so he had his varlets and knaves and court jester push his car to the top of a long grade onto the highway and he sped away. He looked all around and upon discovering that his fuel consumption was very low indeed, he said, "This is truly great!" He drove east, he drove north, he drove west, he drove south and then east but when he arrived, he could not go down the steep grade, around the corner, or along the winding lane. This time he decided on a compromise and used a middle speed transmission that would reach peak efficiency at thirty five miles per hour and he used a one-speed transmission because that was the way things were done in those days. He started his car and although he had a rather wild ride down the winding lane, around the corner, up the steep grade and onto the highway, he was on his way. Again he looked all around and observed the tank of fuel he was towing behind and said, "I have done good!"

The End.

Floy Haworth

Mr. Floy Haworth
103 Elm Street
Monett, Missouri 65708

8794
121149
4200
OS
WE

THE WHITE HOUSE

WASHINGTON

January 5, 1983

Dear Dr. Heiss:

Thank you for your letter of December 17 concerning private sector funding of a commercial Space Shuttle Orbiter. As you know, the policy questions surrounding commercialization of the Shuttle is under active review by the Senior Interagency Group for Space. Within the next couple of months we hope to be able to delineate Administration policy concerning the subject. Your specific proposal is being reviewed by NASA and you should be hearing from them soon.

The President's Space Policy is very clear in its encouragement of commercial enterprise in space whenever feasible. You and the Space Transportation Company are to be commended for your pioneer efforts in breaking new ground in commercial space transportation.

I encourage you to keep up the good work and I think you will find the Administration will be forthcoming in the very near future in providing the framework for commercialization initiatives in space.

Sincerely,

/s/

X

Dr. Klaus P. Heiss
President
The Space Transportation Company, Inc.
Twenty-Two Chambers Street
Princeton, New Jersey 08540

X Enclosures filed in Oversize Attachments # 6138

476

National Security Council
The White House

Package # 8794

82 DEC 22 P6:55

	SEQUENCE TO	HAS SEEN	ACTION
John Poindexter	1	X	A
Bud McFarlane	2	JM	
Jacque Hill	3	H	
Judge Clark	4	✓	A
John Poindexter	5	X	
Staff Secretary	6		D
Sit Room			

I–Information A–Action R–Retain D–Dispatch N–No further Action

DISTRIBUTION

cc: VP Meese Baker Deaver Other

COMMENTS

We wish to hold ltr.

Wishes to discuss further w/JP. May want to make ltr stronger and get it off dead center

Done

12/30 Duvall informed.

NSC/S PROFILE UNCLASSIFIED ID 8208794

RECEIVED 20 DEC 82 14

TO CLARK FROM HEISS, KLAUS P DOCDATE 17 DEC 82

KEYWORDS: SPACE PROGRAMS ECONOMICS

SUBJECT: PRIVATE SECTOR FUNDING OF COMMERCIAL SPACE SHUTTLE ORBITER

ACTION: PREPARE REPLY FOR CLARK SIG DUE: 23 DEC 82 STATUS S FILES

FOR ACTION	FOR CONCURRENCE		FOR INFO
RYE	RAYMOND NC	POLLOCK	MCGAFFIGAN
	BAILEY NC	NAU	

COMMENTS

REF# LOG NSCIFID (H /)

ACTION OFFICER (S)	ASSIGNED	ACTION REQUIRED	DUE	COPIES TO
Clark	X 12/22	for signature	12/26	
	C JAN 0 5 1983	Clark sgd ltr		Rye

DISPATCH mail W/ATTCH FILE cl (C

MW

MEMORANDUM

NATIONAL SECURITY COUNCIL

ACTION

MEMORANDUM FOR WILLIAM P. CLARK

SIGNED

FROM: GILBERT D. RYE GDR

SUBJECT: Private Sector Funding of a Commercial Shuttle Orbiter.

At Tab II Klaus Heiss has provided additional details concerning his offer to procure a Shuttle Orbiter. This letter follows on from his and Fred Smith's (Federal Express) discussion with you on December 9.

The question of commercialization of Shuttle and ELVs is Phase 2 of our SIG(Space) working group on Space Launch Policy. I have asked the working group to draft an NSDD on this subject which we would then circulate for agency coordination prior to submitting it to the President some time in February 1983. The proposed reply for your signature at Tab I is non-committal other than indicating that we plan to provide Administration policy on this subject.

RECOMMENDATION

That you sign the letter to Dr. Heiss at Tab I.

Approve ✓ Disapprove _____

Attachments
Tab I Letter to Dr. Heiss
Tab II Letter from Dr. Heiss

THE SPACE TRANSPORTATION COMPANY INC.
Twenty-Two Chambers Street
Princeton, New Jersey 08540

Telephone: (609) 924-6755
Telex: 843-369

82 DEC 20 09:58

December 17, 1982

The Honorable William Clark
Assistant to the President for
National Security Affairs
The White House
Washington, D.C. 20500

Re: Private Sector Funding of a Commercial Space Shuttle Orbiter

Dear Judge Clark:

As we discussed last week the Space Transportation Company Inc. (SpaceTran) - founded in 1979 - proposed in February 1982 to NASA the private sector (U.S.) funding of an orbiter. This proposal was amended in May 1982. The proposal has been under intense discussion by NASA with SpaceTran after the President's Space Policy Address of July 4, 1982.

We believe that the SpaceTran proposal to NASA is the single, most far-reaching and imaginative step taken by any group regarding private sector involvement in the U.S. space effort. This initiative is the foremost example of the substance of the President's Space Policy Statement of July 4, 1982 regarding private sector involvement.

The initiative has long lasting, beneficial effects on the U.S. commercial position in worldwide competition for the developing space market. A number of sources estimate that market to be anywhere from $20 to $50 billion (1983-1995).

Europe already has chosen a private commercial approach (Arianspace - 1980) and other nations may follow - including the Soviet Union (see attachments). This will leave the United States - the leader in space transportation - as the lone country mired in a multiple government agency approach to developing commercial space business.

The SpaceTran proposal is simple, based on sound economic principles, and can be financed now, in the U.S. market. The SpaceTran group-comprising the Founders, the Prudential Insurance Company of America, and the Federal Express Company-exhibits a high degree of conceptual, financial and operational credibility. Awaiting a government decision on its orbiter initiative SpaceTran has taken a further step important to the United States position in worldwide space transportation markets: On October 30, 1982 SpaceTran has signed a Memorandum of Intent with Martin Marietta, United Technologies Corporation,

and Aerojet General to procure Titan launch vehicles, thereby providing a logical and essential backup to commercial shuttle users. This assures a complete U.S. launch capability - with schedule certainty while encouraging the design of shuttle class payloads. The potential contract value over a ten year period is in excess of $2 billion. Had the Government opted to continue Titan procurement over the same period, the cost to the Government would have been in excess of $4 billion. (NASA, August 1982 NSTS Report). The SpaceTran Team has requested the requisite Government waivers to proceed with the commercialization of Titans.

In its private sector initiative SpaceTran proposes to:

° Finance a space shuttle orbiter vehicle;

° Turn over this orbiter to NASA (the operator) as an integral part of the orbiter fleet;

° Obtain marketing and contracting rights to the capacity provided by SpaceTran to the fleet (its orbiter) to non-U.S. government users;

° Reimburse NASA (operator) for cost added by the SpaceTran Orbiter to government operations.

What SpaceTran is NOT Proposing

SpaceTran will have:

(1) NO hardware or operations rights of any space shuttle orbiters;

(2) NO exclusive marketing rights: any entity will be able to market to non-U.S. government users worldwide under SpaceTran's proposal as now fully discussed with NASA;

(3) NO exclusive rights to any Space Transportation System (Orbiter) components;

(4) NO exclusive financial rights for future funding of any system components or orbiters;

(5) NO exclusive arrangement as to any other private venture in space transportation or space applications.

Advantages to the U.S. Government From the SpaceTran Initiative

The SpaceTran approach is totally responsive to - and in accordance with - Department of Defense and National Security Requirements. It preserves and makes efficient use of United States space resources and capabilities in the Space Shuttle and in Expendable Launch Vehicles. At the same time our approach retains complete U.S. Government control of launch operations.

The SpaceTran initiative combines the efficiencies of the private sector with the government operated National Space Transportation System. It is a key example of "economic accountability" between the U.S. government and the private sector as expoused most recently in the June 14 letter by OMB to NASA:

° The U.S. government provides all "baseline" investment and systems needed to accomodate U.S. government uses in the National Space Transportation System.

° The private sector provides the investment - the SpaceTran Orbiter - and operations costs to meet private sector needs.

° The private sector contributes its expertise to do that which the government (because of statutory restrictions on financing, marketing and insurance activities) cannot do effectively, i.e., market the National Space Transportation in worldwide competition.

° The U.S. government retains the right to requisition the SpaceTran Orbiter for its national security needs.

° The SpaceTran approach - and others like it - will enable the United States to capture its "share" of the next decade's potential space market; proven American ability in the market matches vigorous efforts by the Europeans, the Soviets and, in the near future, the Japanese.

° The addition of a privately funded Orbiter assures a reasonable cost per flight to commercial users in that the total cost added by such an Orbiter to Space Transportation System operations costs is not significant when compared to the ability of the fleet to accomodate all the traffic for the Space Transportation System on time.

° The presence of a commercially provided backup (Titan) to the national space launch capability (the Space Shuttle) safeguards the nation's access to space in the event of orbiter fleet grounding, extended turnaround times, or unforeseen orbiter losses.

° The SpaceTran contribution to the National Space Transportation System frees NASA from its marketing role in an operational system and lays the groundwork for private sector participation in future space operations and space applications.

We believe that a timely decision on the private funding of an orbiter is very important for this nation's future in space.

We appreciate your attention.

Sincerely,

Klaus P. Heiss

Klaus P. Heiss
President
Chief Executive Officer

Enclosures

cc: Fred Smith
Chairman and Chief Executive Officer
Federal Express Company

8794
21149
4200
OS
WE

THE WHITE HOUSE

WASHINGTON

January 5, 1983

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/s/

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President
The Space Transportation Company, Inc.
Twenty-Two Chambers Street
Princeton, New Jersey 08540

Enclosures filed in Oversize Attachments # 6138

Annual cigarette survey Page 55 Labor's 1983 bargaining outlook Page 72

A McGraw-Hill Publication

BusinessWeek

14115

December 20, 1982 • $2.00

Cargo space on a Soviet rocket, anyone?

It seems like a crazy idea. Two Frenchmen are trying to line up U. S. aerospace and communications companies to act as agents in finding commercial payloads that would be launched into space by, of all people, the Russians.

Sperry Corp., Rockwell International, AT&T, and others have been approached by J. Roda and P. Pamart of Paris "seeking to interest us in representing them in the American market for payloads that would be launched by Soviet rockets," says Richard R. Mau, Sperry vice-president for corporate and government relations. As evidence that the request was authentic, the French proposal included a copy of a letter dated Aug. 12, 1982, and signed by Boris E. Kurakin, director general of the Soviet foreign trade organization, Licensintorg. The Soviet launch service, the letter stated, would be provided by Licenstransmash, a division of Licensintorg. The letter, according to Sperry's Mau, did not discuss prices in detail but indicated they would be less than those of any competitor—including the U. S. National Aeronautics & Space Administration and the European Space Agency.

No thanks. Sperry has declined to act as a salesman for the French entrepreneurs. In fact, even the Soviets are surprised at the boldness of the Frenchmen's sales tactics. In Moscow, Igor D. Alexeyev, acting director of Licenstransmash, acknowledges that the Soviet Union has made "unofficial" contacts with Roda and Pamart regarding the sale of space on Soviet space rockets. But he says those communications have been through the State Committee for Science & Technology, which is not bureaucratically linked to his agency.

Although Alexeyev doubts that the Soviets will put much pressure on the marketing of launch services in the U. S., he makes clear that the Soviets do plan to drive hard to sell them in other parts of the world. A commercial agreement was signed last May between the Soviets and India to launch an Indian satellite in 1986. And the Soviets have offered to provide "backup" launch services for a European Space Agency satellite if Ariane proves unable to do the the job.

In Paris, Roda, a real estate manager by profession and an economist by training, sees prospects somewhat differently. He has invited "about 20" U. S. companies to become agents for selling space on Soviet rockets and says he has had one reply so far, "from a company that told me they had sold their aerospace division." His agreement with Licenstransmash to find agents in the U. S. and elsewhere resulted from correspondence with Soviet officials in Moscow and from meetings with the Soviet commercial staff in Paris, he says. "I realized there was a telecommunications market," he explains. "I know the Soviets have roughly equivalent technology to the Americans in rockets. So I said, 'Why not?' "

Roda admits that his agent arrangements are still in the embryonic stage. But the Frenchmen should have something to sell. The Soviet launch price will be less than anyone else's; the Soviets are promising they will make the necessary financing arrangements; and customers will be invited to accompany their payloads until the moment of launch. Up until now, the Russians have rarely invited Western observers to their launch sites.

U. S. companies are treating the proffered French connection very delicately. Nor is anyone expected to pursue it. Quips one company official: "At least you must give the Frenchmen high marks on *chutzpah*. They want to open a store in our own front yard."

FY 1984 BUDGET FOR NASA COULD AFFECT SPACETRAN PROPOSAL

NASA's response to SpaceTran Inc.'s proposal to fund the fifth Space Shuttle orbiter depends strongly on whether a federally-funded fifth orbiter is included in the Administration's FY 1984 budget request, a NASA source told the DAILY.

Because the budget will not be made public until mid-January, a response to SpaceTran is not expected before then. The fifth orbiter was the agency's number one priority when submitting the budget to the Office of Management and Budget. NASA received the OMB mark last week, but because the mark is embargoed, NASA isn't revealing whether or not OMB gave the fifth orbiter the axe. Earlier this year, OMB Director David Stockman indicated in a letter to NASA that he felt four orbiters were enough to serve U.S. government requirements (DAILY, June 28).

SpaceTran's latest proposal, to commercialize the Titan expendable vehicle as a Shuttle backup (DAILY, Dec. 1), could put additional pressure on NASA to respond favorably to the fifth orbiter proposal. Although the Titan proposal is connected with the fifth orbiter proposal, SpaceTran plans to pursue commercialization of the Titan even if NASA turns down the offer to buy the fifth orbiter, a SpaceTran official told The DAILY.

After negotiating for several months, SpaceTran and three aerospace companies signed a "memorandum of intent" to commercialize the Titan. The three companies, Martin Marietta Aerospace, Denver; United Technologies Corp., Chemical Systems Div., Windsor Locks, Conn.; and Aerojet Liquid Rocket Co., Sacramento, Calif., are involved in producing the Titan. Dr. Klaus Heiss, president of SpaceTran, said the industry team hopes to have an answer from NASA and the Air Force by spring 1983.

The industry team is negotiating with the Air Force to use existing Titan launch facilities at Cape Canaveral AFS, Fla. The companies do not propose to launch DOD payloads or to launch from facilities at Vandenberg AFB, Calif.

One of the problems the Shuttle faces is providing backup capability to maintain the launch schedule, considered critical by customers.

The Titan proposition would solve that problem, according to Heiss. The Titan is capable of launching as many as eight payloads at once, and could handle a multiple payload from a Shuttle mission. Additionally, the industry team plans to invest in developing payload fairings comparable in diameter to the Shuttle's payload bay.

By enlarging the fairing, it will be easier for payload designers to optimize new spacecraft to take advantage of the Shuttle. One criticism that has been directed at payload designers by Lt. Gen. James Abrahamson, NASA's associate administrator for space flight, is that new spacecraft are not designed to take advantage of the Shuttle. However, most satellite buyers have opted for spacecraft that can be launched on either Shuttle or an expendable, a factor that has placed limits on the size and shape of payloads.

The Titan was chosen because of its long history of reliability, Heiss said. The European Space Agency-developed Ariane 4 was also considered and rejected as being not reliable enough.

Under the memorandum of intent, Martin Marietta will provide for an initial purchase of four Titan 34Ds for launch beginning in 1986. SpaceTran will have exclusive marketing and user rights to the commercial Titans.

SpaceTran also plans on providing Shuttle users with financing, insurance and technical support services, although no specific arrangements for these services have been announced yet.

* * *

THE SPACE TRANSPORTATION COMPANY INC.

M E M O R A N D U M

TO: Lt. Col. Gilbert D. Rye
National Security Council

FROM: K. P. Heiss

DATE: November 13, 1982

SUBJECT: The Question of Orbiter V - A National Perspective from Private Enterprise

---

I The Shuttle Program in a National Perspective

(1) Evolution of the Shuttle Program

The space shuttle program is the result of an intense effort to define the goals of the U.S. Space Program in the late 1960's, the "Post-Apollo" period.

The basic options considered then were (1) a large manned space station (MOL), (2) a space shuttle to support such a space station, and (3) a commitment by the United States to "land man on Mars" by 1981.

In 1969 the Space Task Force had settled on a commitment to land man on Mars by 1981. The effort was headed by the Vice President. The unanimous conclusion of the Space Task Force was "sabotaged" by John Ehrlichman who (mis)represented to the Vice President the "total" opposition of the President to any such enterprise.

On the manned space station (MOL) a thorough study effort by the Department of Defense led to the conclusion that a commitment of a permanent presence of man in low-earth orbit for reasons of national security was not warranted. I know of no reason why that conclusion does not hold with equal validity today.

This left NASA with the Space Shuttle Program as the only component of an ambitious further commitment of the United States to space in the 1970's. At the insistence of the Office of Management and Budget, a detailed economic study effort on the Space Shuttle System was undertaken by NASA. I had the pleasure of heading up that study effort which also included the Aerospace Corporation and Lockheed (LMSC).

The principal conclusion of that study effort was that a reusable Space Transportation System was warranted by the United States, not so much because of space transportation cost savings but because of the "payload effects," i.e., the reduction of total mission costs over a twelve-year application program (DOD, NASA, other USG agencies, and commercial users).

(2) U.S. Government Needs in a Space Transportation System

The reusable Space Transportation System was developed as a means to increase the access of all users to space by reducing the total cost of space operations. The development of the STS by the U.S. Government was justified by STS ability to meet U.S. Government needs in space, including: a manned U.S. presence in space, U.S. national security objectives, reasons of national prestige and various U.S. Government applications programs in the civil sector (weather, remote sensing, space research, including possibly large platforms).

Actual U.S. Government needs - by the Department of Defense, NASA, and other USG agencies - are documented in the latest NASA report of August 1982 (NASA, "National Space Transportation System - Analysis of Policy Issues," August 1982).

Based on these latest findings, as well as the judgment of the aerospace community, four orbiters are ample to supply all U.S. government needs throughout the 1980's and early 1990's, absent some totally unforeseen dramatic increase in Department of Defense needs and excluding an ambitious United States goal - such as a large manned space station in low-earth orbit requiring very frequent resupply flights. (Even with a space station, it seems likely that four orbiters are ample to meet DOD, NASA, and any other U.S. government needs of the 1980's and early 1990's.)

Specifically, present U.S. Government needs may be considered to require: one orbiter for Department of Defense needs, one orbiter used up by other civil government needs, one orbiter for possible joint use by the Department of Defense and other U.S. government agencies and one orbiter "out" either due to a loss, maintenance and repair requirements, or technical updates in the USG fleet.

Without non-U.S. Government users added to the space shuttle fleet, the fleet of four orbiters now under procurement by the USG are ample for any foreseen USG needs to the year 1995.

Even if unforeseen USG demands require additional orbiters, then clearly those additional orbiters ought to be allocated to the program costs of the new missions. No programs have been proposed, to my knowledge, that would warrant procurement of additional orbiters either by the DOD or NASA in the context of USG demand.

Hence, the addition of a fifth space shuttle orbiter is solely required in the context of meeting non-USG (commercial and foreign) demands for the space shuttle. It is not unreasonable to ask that the commercial sector contribute the added investment and operations cost of such added uses of the U.S. Space Transportation System. If the commercial sector is not capable or willing to do so, the U.S. government is not obligated to supply such capacity at the taxpayers' expense in a market economy: excess capacity of the four-orbiter fleet should be available to non-USG users - but that is a long way from the conclusion or decision to fund with taxpayer funds capacity clearly warranted only by non-USG users.

We believe that the orbiter can be supplied by the (U.S. domestic) commercial sector.

(3) Commercial Needs - The Non-U.S. Government Demand for Space Transportation

Based on all demand, financial, and other market studies performed by NASA and the aerospace community, at least one full orbiter can be used up by the commercial, non-U.S. Government, demand for space on the U.S. Space Transportation System.

Our marketing studies have indicated that the non-USG flight level can be anywhere from 6 to 8 flights a year of non-USG demand from 1988 through 1995.

However, this demand will not develop "automatically." Competition to the shuttle can be expected from European as well as Japanese launch systems in the late 1980's early 1990's, as well as possibly from the entry of the USSR providing space launches commercially in world markets. (What irony if the USSR acted before the United States!)

In addition, several expendable commercial efforts may develop in the United States (Delta, Atlas/Centaur, Titan, and possibly others) which will play some role in the mid 1980's and possibly into the early 1990's.

For the United States to capture its "share" in world markets of space transportation, it needs an aggressive, commercial approach to marketing space transportation systems, very much along the lines of the example set by the Europeans with Arianespace.

The key components needed to a successful worldwide marketing of U.S. capabilities are:

- o A "one-stop shop" for the full range of U.S. Space Transportation Systems capabilities - shuttle and expendables. This would include orbiter capabilities, Titan expendable vehicles, and a stable of upper stages.

- o Schedule certainty: expendable backups as insurance against the grounding of the space shuttle orbiter fleet, loss of orbiter(s), or operations difficulties of STS fleet.

- o Financing of space launches and space payloads, i.e., full mission financing rather than only launch financing.

- o Insurance of launches and missions.

- o "In-place" marketing and support of U.S. space transportation and space systems capabilities to the worldwide aerospace market.

II The Non-U.S. Government Contribution to the Space Transportation System

(1) Economic Accountability Between USG and the Commercial Sector

The funding of Orbiter V and the expendable backup required for commercial uses should, if possible, be provided by the private sector rather than the U.S. Government. The key national advantage of such an approach is simply "economic accountability:"

- o The USG shall provide all "baseline" investment, infrastructure, operations costs, and systems needed to accommodate U.S. government uses and needs in national space transportation systems. Any "excess capacity" that might be available from U.S. Government investments in space transportation systems can, under OMB guidelines, be made available to the private sector on an "added cost" basis. This was discussed most recently in the letter by David Stockman, Director of the Office of Management and Budget, to the Administrator of NASA dated June 14, 1982.

- o Similarly, investments, operational systems, and costs needed for accommodating non-USG needs on a USG system - that is the cost added to the USG system - clearly ought to be paid by the non-USG sector (commercial and foreign). This (in our opinion) would include Orbiter V which, being the latest and "most advanced" orbiter of the five-shuttle fleet, might contribute up to 30% of the fleet capacity. In principle, it

should also include any added facility costs needed to accommodate non-USG payload users above the USG baseline, integration thereof into the orbiter(s), and the processing of the commercial orbiter, as well as all the launch costs added by the non-USG users on top of the baseline USG system (say 30 flights a year for 1988 to 1997). Table 1 shows a simple breakdown of the USG baseline system consisting of two launch sites and four orbiters already under procurement vs. the non-USG investment and operations requirements which include at least one full dedicated orbiter and operations costs and facilities to be added thereunder and an expendable backup to the commercial missions.

(2) The Need for Expendable Backups to Commercial Non-USG Space Transportation

Whereas I cannot assess correctly national security requirements and the need for an expendable backup to the space shuttle fleet, it goes without saying that a substantial investment by the private sector - such as the procurement of Orbiter V - and the subsequent need to recover the financing of this capacity in the commercial market, lead to the undisputable requirement that the commercial sector provide an expendable backup capability to whatever commercial flights are contracted for in the context of providing Orbiter V to the government fleet.

This requirement for expendable backups arises from several considerations.

- Grounding or total loss of orbiter(s): Orbiter V and/or other orbiters out of the government fleet can be grounded or totally lost, in which case the USG provided fleet capacity will have to be dedicated first and foremost to USG requirements at the expense of commercial users. Particularly when one considers national security requirements on some of these missions, the commercial sector - despite any promises by the government to the contrary - cannot rely on the availability of USG capacity for commercial uses. Quite to the contrary: it is clear that the USG capacity will be pre-empted first and foremost by priority government flights. Hence, the need by the commercial sector (in addition to financial insurance for Orbiter V loss which can be provided by the insurance market to the commercial venture) to provide a de facto capability to launch non-USG payloads on schedule irrespective of what happens to individual orbiters or the orbiter fleet. Financial insurance against hardware loss is not sufficient. The users have to develop markets based on these payloads. The development of such markets can only be assured to the user if he has launch guarantee and schedule guarantee with a narrow range of uncertainty.

- The grounding of the orbiter fleet is substantially different from the "grounding" of expendables or the grounding, for that matter, of aircraft, be they civilian or military. In each of the latter cases, the law of large numbers and the availability of a large mixed fleet and alternate transportation modes (planes, cars, trains, ships) mitigates the danger of "single cause" grounding of a transportation system. If the DC-10 fleet is grounded, there are still numerous other civil aircraft available to meet air transportation demands. If the FB-111 bomber is grounded, again there are a variety of vehicles available to fulfill military fighter bomber requirements. Similarly, if an expendable launch vehicle system is grounded for any period of time, again other expendable systems are available or, if need be, in case of national emergency, expendable systems can be launched one by one incurring a slightly higher risk in each mission. (The launch vehicle will be "expended" anyhow.)

  These situations are totally different from the orbiter fleet case: There will be only four orbiters; even with private funding, only five vehicles will be available for the total fleet. With five vehicles, the "law of large numbers" statistically simply does not apply, meaning that whatever the flight success of NASA between 1982-87, even when full operations capability is achieved beyond 1987, no statistically meaningful inference can be made on the non-occurrence of a fleet grounding event for a substantial time, (say six months or one year) or possibly even the abandonment of the space shuttle fleet as an operationally viable space transportation system. The self-interest of NASA has to be discounted when considering these important commercial and national security issues.

  If launch assurance (with expendable backup) is not given by the U.S. market, invariably the Arianespace set of vehicles of the Europeans will become the de facto backup system to the U.S. Space Transportation System; Arianespace may become in many cases the primary system with the shuttle serving only as a backup to commercial users in world markets.

- Unforeseen growth in market demand: If the commercial market grows unexpectedly large, the initial "spillover" of commercial as well as government demand should accrue to the full fleet of space shuttle vehicles - be they U.S. government or commercial. Yet there are significant uncertain space transportation requirements which on an "interim" basis can be met by expendable launch vehicles until the procurement of additional orbiters beyond the fleet of five can be provided.

The commercial sector can provide an expendable backup to the shuttle for the range of commercial STS missions foreseen today: only with such a commercial backup can the investment in Orbiter V itself be made by the commercial market.

- o If indeed the commercial market provides the expendable backup to shuttle payloads, I suggest that inherent benefits also accrue to the Department of Defense. The expendable backup to commercial payloads will de facto also provide a backup capability to the Department of Defense. The backup capability will cover all payloads within the range of commercial capabilities (roughly two-thirds of the shuttle payload bay, or 35,000 to 40,000 pounds to low earth orbiter equatorial). Although expendable backup may not be required for foreseen national security use, the commercial sector will provide backup without any added cost to the Department of Defense. Such commercial provision should indeed alleviate whatever doubts may still exist as to the need for an extended backup capability in the confines of the NSC. If that expendable backup is coincident also with the expendable system used to date by the Department of Defense (Titan), then the coincidence and the value of such expendable backup provided by the commercial sector may become a great value added to the nation from such commercial investments.

(3) Payload Effects With Shuttle Equivalent Expendable Backup Capability

The commercial backup to the shuttle will have to be a shuttle equivalent backup at least to low earth orbit: this means that a common payload interface has to be provided between the expendable and the shuttle system, so that, ideally, the commercial payload user will not have to know whether he is launched on the shuttle or on an expendable system. That is, standardization of payload systems between such expendables and the shuttle will have to be provided to commercial users until such time as the shuttle fleet size and proven performance is such that it outgrows the problem of "small numbers" of a four- or five-orbiter fleet.

Given this desired requirement, the need for an expendable backup of the Titan family becomes close to inescapable. The private sector can and will bear the costs of maintaining such production capabilities throughout the investment life of a privately funded, commercial orbiter (Orbiter V - 1997).

The private sector can provide such expendable backup capability based on the "total cost added" principle, meaning that no sunk costs or "sunk" facilities are recovered in user charges to the

commercial sector. On the other side, the commercial sector should be required to pay all the costs added to maintain the expendable backup capability to commercial payloads. Given the commercial backup to commercial payloads - if the Department of Defense were to decide to make some investments to maintain Department of Defense specific expendable capabilities, then the USG should have to bear such costs.

(4) Is Orbiter V Needed with a "Full Shuttle Equivalent" Expendable Backup?

As pointed out above, it makes sense for the private sector to fund one full shuttle orbiter (Orbiter V) and a "full expendable shuttle backup" capability, preferably a capability that is compatible also with Department of Defense requirements.

If for one reason or another the private funding of Orbiter V were not to come about, and a "full shuttle equivalent" expendable backup in the above sense were provided by the commercial sector, then the question of whether the USG should fund Orbiter V out of taxpayer funds - as opposed to staying with a four-orbiter fleet for USG uses, and whatever incidental commercial uses of that fleet might be made - indeed becomes a hard question to answer.

Based on the NASA NSTS report of August 1982 cited above, the only reason for USG funding of Orbiter V would be the assumption that one full shuttle equivalent would be constantly "out," i.e., the USG would be limited to a three orbiter fleet, and the turnaround of orbiters would be limited to only 16 launches from KSC. Under that scenario, the demand for the expendable "backup" would indeed suddenly become a full space shuttle equivalent. In that case, the commercial demand could not be accommodated on the shuttle fleet with any semblance of schedule assurance, and the combined government and commercial demand would be such as to lead to a very extensive use of expendables.

Under this scenario four orbiters would in fact only provide four shuttle flights per orbiter per year, in which case I seriously doubt that the shuttle will be an economically efficient system when compared to expendables in any case. That is, government procurement of an additional orbiter is justified only if one makes assumptions on turnaround time for orbiters, and launch capabilities at KSC would make questionable the very efficiency and economics on which the acquisition of orbiters is based.

My own conclusion, therefore, is that whereas it makes perfect sense - for a variety of reasons (economics, accountability, stimulation of the commercialization of the space program, and

world marketing of U.S. space transportation capabilities) - to have a private funding of Orbiter V, as well as the provision of commercial backup capabilities for non-USG users of the space shuttle system, it makes no sense to have the U.S. government fund an additional U.S. government space shuttle orbiter other than to provide capacity to accommodate non-USG uses on the shuttle fleet, in direct competition with proposed commercial ventures.

Hence, the provision or Orbiter V from U.S. government funds for the purposes of the non-USG uses of the shuttle fleet only makes sense and might be allowed to go forward (not should) if and only if the private sector is not willing to make a very substantial funding contribution towards Orbiter V.

III The Advantages to all Users of Orbiter V with Full Expendable Shuttle Backup

(1) The Advantages of the Titan Family as a Commercial Backup to Orbiter V - and the Shuttle Fleet

The commercial funding of Orbiter V, or any commercial orbiter, only makes sense if that commercial investment (of $1 billion) is backed up (insured de facto) by an expendable backup to such commercial missions.

The choice of a commercial backup for the space shuttle system clearly has only two systems to choose from: the Atlas/Centaur - (upgraded to accomplish Intelsat VI, HS393 and direct broadcast satellite applications) and the Titan family of launch vehicles.

The advantages of the Titan family as a commercial backup to the space shuttle orbiter(s) include the following:

- Titan, on a commercial cost added basis (without sunk cost recovery) is competitive in world markets compared to other expendable launch systems (which also compete on a "cost added" basis).

- The Titan system is less advantageous than the likely shuttle launch cost, based on the current projected user charge of the shuttle of $71 million per shuttle equivalent flight (1982 dollars).

- With the Titan, the Air Force will get a de facto expendable backup option throughout the maintenance of the commercial Titan backup to the space shuttle system, in the case of Orbiter V funding possibly through 1997.

- o The commercial Titan will allow NASA to phase out totally other expendable systems currently still included in NASA budgeting.

(2) Shuttle Technology Evolution

Related to the question of whether to continue orbiter production capabilities or close the production lines is the question of the development and maintenance of the orbiter technology base.

The question that arises is whether a continuation of the current space shuttle design by acquisition of additional orbiters is in the overall national interest or whether the production of orbiters should be frozen with the current number (four or five) while initiating a second generation space shuttle family to replace the current family of shuttles.

My own instincts tell me - and they are only instincts - that many components in the current space shuttle design can be upgraded gradually, in an evolutionary shuttle technology program so as to make a "closing" of space shuttle production of the current design undesirable. The current shuttle design can be evolved gradually to a substantially improved space shuttle version by the mid-1990's without a dramatic cut in production lines and a total redesign effort.

For example, substantial improvements are possible on individual components of the current space shuttle system, such as the external tanks, the solid rocket boosters (possibly to be replaced by pressure-fed systems), improvements in the thermal protection system - without a radical redesign of the shuttle vehicle. Included therein also will be a gradual upgrading of engine performance and engine life. The active maintenance of an evolutionary space shuttle technology program would clearly be of great advantage to the nation. If the commercial sector were to fund this capability for one orbiter, the "close down" and "moth balling" - if any - of shuttle production lines could be postponed to well into the mid-1980's - if those capabilities were closed at all.

The other advantages of maintaining the production lines of orbiters include the following:

- o insurance against catastrophic loss(es) of Orbiters I through IV;

- o insurance against unforeseen operational difficulties affecting availability of specific orbiters or the orbiter fleet;

- o assurance of a reasonable cost per flight in that the total cost added by Orbiter V to STS operations costs is not significant when compared to the ability of the fleet to accommodate all the traffic for STS on time;

- o insurance against future demand growth for STS beyond the capacity of a four-orbiter fleet;

- o more cost effective operations from improvements in Orbiter V arising from earlier experience in the space shuttle flight program;

- o assurance that all payloads scheduled to be launched on STS can be launched (65,000 pounds capability from the Eastern Test Range (ETR) and 40,000 pounds capacity from the Western Test Range (WTR), payload return capability, etc.); and

- o assurance of continued orbiter production capability into the late 1980's and 1990's.

IV Commercial Participation, Orbiter V, and the National Perspective

(1) Orbiter V and a Significant New Space Goal for NASA

An additional orbiter, even out of government funds, might well be justified if the nation were to commit to a large, manned, low earth orbit space station. I am not saying that such a goal is desirable or economically warranted (large platform technology in LEO as well as GEO seems to be a more rational, commercially significant goal), but if the nation decided on such a large, manned station, the requirement for an additional orbiter for U.S. government uses may indeed be warranted.

On the other side, presentations by Johnson Space Center indicate that with a space station capability in place, the requirements for additional orbiter production to accomplish United States space transportation needs beyond low earth orbit may be substantially reduced. This is in part due to the possibility of using the low earth orbit space station as a fueling station for missions beyond low earth orbit and using the excess volume not filled in individual orbiter launches for carrying such fuel to low earth orbit.

Thus, while the commitment to a large space station in low earth orbit may indicate the need for additional orbiters, ultimately it is not clear that government funding would be required for additional orbiters once one allows for a "feedback" effect that such a space station might have on transportation requirements from LEO to GEO.

(2) $1 Billion for New Aerospace Technology Initiatives 1983 to 1986

Even if government funding for Orbiter V were clearly conceivable, we still submit that equivalent funds would be better invested by NASA in significant new technology initiatives than in building one more orbiter when this orbiter could be provided by the private sector anyhow.

Such new technology initiatives certainly ought to include (1) large space structures, (2) orbit transfer vehicles, (3) civil space applications, and (4) civil aeronautics initiatives. These initiatives will add to the U.S. technology base in the late 1980's and 1990's, whereas one more orbiter will not.

Also, these important new technology initiatives might be "squeezed out", postponed or altogether foregone if Orbiter V funding has to come from the Federal Budget. On the other hand, the example set by NASA in private sector participation in a significant part of the U.S. space program - the SpaceTran proposal - may provide a powerful incentive to the Administration and Congress to proceed with significant new technology initiatives so that similar examples of commercial phaseover and success may be set in the future, based on these same principles.

(3) At Stake: The World Space Applications Market

While it is difficult for some to accept that government agencies are not best suited to compete in world markets, it is obvious to people experienced in international marketing that private entities are best suited to pursue economic interests of the United States. The success of the U.S. aerospace sector is particular witness to this statement.

At stake in world space applications markets are anywhere from $20-50 billion in commercial investments between now and 1995. If one were - by assumption - to assume a figure of $30 billion, about one-third of that would be space transportation costs, one-third would be payload related costs, and one-third would be ground systems costs (mostly communications systems).

Of this total commercial world market, about one-half may be open to competition by the United States and the other leading industrial regions (Europe, Japan). It is time for the United States to set up economic structures that will be able to compete in such markets. This directly leads to the need to establish a "one-stop shop" for U.S. space transportation capabilities of the type that Arianespace represents in Europe (a commercial entity), and of the type that SpaceTran indeed has proposed for the United States in its proposal to NASA concerning the funding of Orbiter V from U.S. domestic sources of funds.

It is totally inconceivable to me that NASA - or any other government agency - can fulfill the complete marketing functions needed to succeed in world competition. Indeed, SpaceTran alone will not suffice. Further, any and all U.S. aerospace companies should be free and able to compete worldwide for payload uses on the U.S. STS.

Fundamental to the success of the United States in world markets - and the space market - are:

- o financing capabilities of missions (payloads and launches);
- o a one-stop shop (meaning one place where users can be launched to low earth orbit, geosynchronous orbit by the shuttle or expendably);
- o launch schedule guarantee;
- o insurance capabilities;
- o "in-place" marketing, contract, and technical support;
- o joint venture capability in space missions.

Few of these functions can be expected to be fulfilled by any government agency, including NASA -- NASA should bring about research and development of space technology, not the operation of space transportation systems or marketing of U.S. aerospace capability in worldwide competition.

Aerospace companies to date have done an outstanding job in world markets (it is the most successful industrial sector of the United States), and nothing has happened to suddenly make a government agency (NASA) capable of doing as good a job as industry has provided. Hence, private institutions should be allowed - indeed encouraged - to go forward and assume these functions.

KPH:rs

APPENDICES

TABLE 1

STS COST REIMBURSEMENT PRINCIPLES

DEFINITION OF STS BASELINE

U.S. GOVERNMENT USES OF STS - FOR FULL COMMITMENT TO SPACE SHUTTLE AND ABANDONMENT OF OLD EXPENDABLE SYSTEMS REQUIRE AT LEAST:

- o TWO FULLY OPERATIONAL LAUNCH SITES (ETR & WTR)
- o FOUR FULLY OPERATIONAL ORBITERS
- o MINIMUM ANNUAL LAUNCH SITE CAPACITY OF 30 LAUNCHES PER YEAR FOR U.S. GOVERNMENT USES

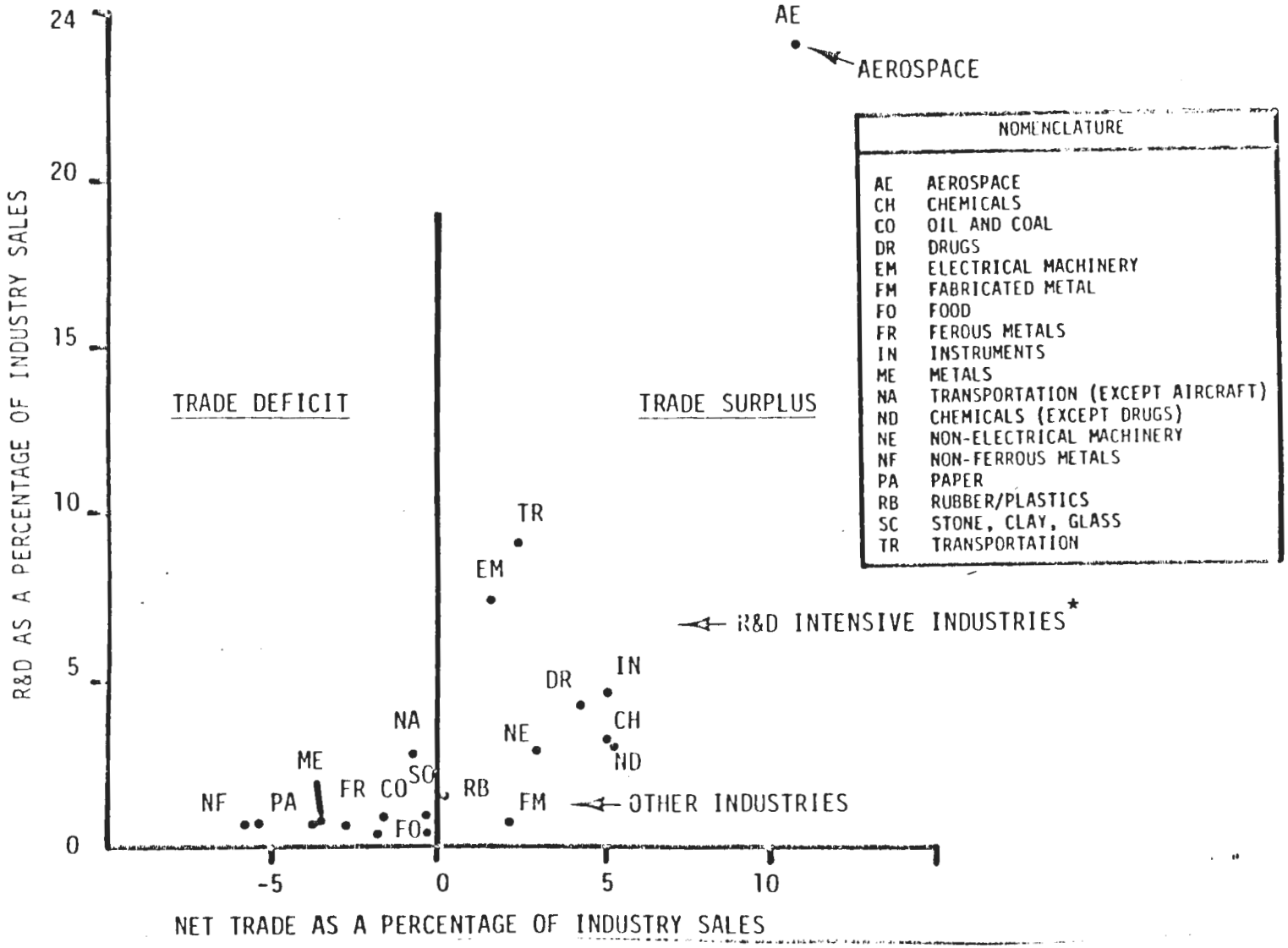
TABLE 2

TRANSPORTATION COST
(FY82 DOLLARS IN MILLIONS)

	CASE 3			CASE 4
	TITAN & ARIANE			4 ORBITERS (8 FLTS/YR/ORB) DELTA/ATLAS/ARIANE
	0% OUT	50% OUT	100% OUT	50% OUT
SHUTTLE				
SHUTTLE FLT AT KSC	218 @ $96.2 20,972	198 @ $104.2 20,623	173 @ $117.0 20,241	198 @ $104.2 20,632
SHUTTLE FLT AT VAFB	54 @ $127.4 6,880	48 @ $139.4 6,691	41 @ $158.9 6,515	48 @ $139.4 6,691
SHUTTLE TOTAL	272 @ $102.4 27,852	246 @ $111.1 27,323	214 @ $125.0 26,756	246 @ $111.1 27,323
ELV	12 @ $70.8 850	54 @ $77.9 4,206	111 @ $73.9 8,200	47 @ $47.4 2,227
UPPER STAGES	235 @ $18.9 4,434	198 @ $20.3 4,029	145 @ $22.4 3,248	209 @ $20.9 4,371
SUBTOTAL	$33,136	$35,558	$38,204	$33,921
SHUTTLE ORBITERS/FAC	—	—	—	—
OTV/DDT&E + PROC	1,000	1,000	1,000	1,000
TITAN/CENTAUR DDT&E	345	345	345	—
CLOSEOUT/CAPABILITY MAINT	250	330	250	110
SUBTOTAL	$34,731	$37,233	$39,799	$35,031
UNFLOWN MISSIONS	0	0	0	8 @ $104.2 834
TOTAL	$34,731	$37,233	$39,799	$35,865

COMPARISON OF LAUNCH COSTS: TITAN, ARIANE, AND STS
(FROM NASA "ANALYSIS OF NSTS POLICY ISSUES," AUGUST 1982)

TABLE 3



R&D AND NET TRADE PERFORMANCE AS PERCENTAGE OF INDUSTRY SALES
(1958-1975 AVERAGES)

SpaceTran

Gateway to Space

SpaceTran® was established in February 1979 to explore private-sector financing of space initiatives. SpaceTran proposes to purchase a space shuttle which will be dedicated to commercial and foreign users. SpaceTran flights will be launched from Kennedy Space Center in Florida. SpaceTran employs a team of professionals with extensive experience in both the space industry and the financial community. We plan to provide the following services:

- Safe, reliable launches on manned spacecraft;
- Launch schedules to suit the customer's needs;
- Financing of satellite purchases and launches;
- Assistance in satellite procurement and contract negotiations with aerospace firms;
- Advice on satellite and launch insurance;
- Competitive prices;
- Workshops on new space technologies.

SpaceTran will make space technology accessible to as many companies and countries as possible. We hope you will consider our services when planning space ventures.

Space: An Essential Component of Economic Development

Space technologies will play an integral role in worldwide economic development in this and coming decades. Communications satellites alone have revolutionized the way business is conducted in industrialized countries: their high-speed transmission capability has prompted the growth of a $130 billion industry—information processing—in the United States alone. Yet only a fraction of communications satellites' potential impact has been felt; many new opportunities for their use exist today, particularly in developing countries without established communications infrastructures. In addition to the communications revolution, space offers myriad possibilities for earth observation applications, materials processing, and energy generation. The uses of space will be so important in the future world economy that no country can afford to neglect this sector as an essential part of a comprehensive, farsighted development program.

The primary space applications now available or under development are described below.

Communications

The demand for satellite communications services will increase dramatically in the next few decades. Worldwide satellite traffic is expected to grow by a factor of thirty to thirty-five by the year 2000, quadrupling between 1980 and 1985 alone. Simultaneously, the cost of satellite transmissions will decline, making such communication competitive with earth-based systems. Large geographical markets inaccessible to land systems will be reached. Information networks will be established to make data stored anywhere in the world—on medicine, engineering, science and business—instantly accessible.

Direct Broadcasting

DBS systems make broadcasting possible without the construction of large, expensive ground stations, greatly facilitating communications with remote areas. Satellites launched by Canada, Japan and the United States have successfully employed direct broadcast technology, while France and West Germany are together developing a DBS system. India successfully conducted a one-year test of direct broadcasting in 1975 to bring educational television programs to 2,500 villages; two satellites to be launched by shuttle in 1983 will extend this service.

Remote Sensing

Satellite data can be used to make timely crop measurements, run water management systems, locate mineral and hydrocarbon resources, and provide land-use information. One example of the potential utility of such information is that current predictions based on earth-gathered data of small grain harvests are correct only to within 100 million metric tons per year, or two and one-half times the size of the U.S. wheat crop. The United States operates the most widely used remote sensing satellites—the LANDSAT system—while several other nations have similar capabilities. The French SPOT satellite will provide earth observation data beginning in 1984.

Teleconferencing

Meetings conducted via satellite rather than in person will eliminate the escalating costs of business travel. Teleconferencing will encourage more efficient communication between head and branch offices, suppliers and clients, providing the most cost-effective use of management time. Worldwide demand for teleconferencing services is projected to grow sevenfold between 1985 and 2000.

Navigation

Accurate navigation both at sea and in the air is vital to all nations. Improved safety, optimized traffic flows, and fuel-efficient routing are some immediate benefits of navigation satellites. Together, satellite and computer can plot the fastest, most fuel-efficient courses for airplanes and ships based on data gathered on currents, wind and distance.

Meteorology

Meteorological satellites provide cloud-cover pictures, temperature profiles, sea-surface temperatures, and sea-ice and snow-cover determinations. Further applications such as flood prediction are being tested. Various international programs have been successfully run by the World Meteorological Organization.

Materials Processing

The advantages of a space environment—microgravity, near vacuum, and high and low temperatures—make possible many new manufacturing processes. Through a drug separation process called electrophoresis, pharmaceutical companies hope to manufacture a cure for diabetes, interferon in significant quantities, skin treatments for burn patients, and purer growth hormone products. Containerless processing and the absence of convection will permit the manufacture of unique alloys from metals immiscible on earth. Other potential applications include the manufacture of perfect crystals, semiconductors, and special-purpose glass. European nations have scheduled 260 materials processing experiments to be conducted on board the shuttle-launched Spacelab.

Before the end of this decade large communications platforms are expected to be operational. By combining several missions on a single platform, costs will be reduced, capacity increased, and congestion in the geostationary orbit alleviated. Large platforms to be used for materials processing and satellite servicing in low-earth orbit may be available in the early 1990's. Another long-term prospect is a solar-power generating station to utilize the continuous availability of sunlight and absence of atmosphere.

The possibilities in space are limitless and the potential benefits to all nations enormous.

The Space Shuttle: An Outstanding Technological Achievement

The space shuttle has the largest capability of any rocket system available to commercial users: it can lift 30,000 kilograms into low earth orbit or, with the addition of an upper-stage propulsion system, the shuttle can lift payloads into higher geosynchronous orbit. As already demonstrated, the shuttle performs reliably time and again. Larger satellites can be carried on the shuttle due to its capacious cargo bay; their construction can be more fragile because shuttle flights are characterized by lower acceleration forces than flights of expendable launch vehicles.

But the greatest advantage of the shuttle is that it is manned. Satellites can be checked immediately prior to release; dysfunctional ones can be returned to earth, thereby avoiding a total loss to the owner. Satellites that break down while in low-earth orbit can be retrieved and repaired in space or brought back to earth, eliminating the need for redundant capabilities. Moreover, the presence of a flight crew enables the operation of manufacturing processes—the space-technology application with perhaps the most potential.

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STATUS OF SPACETRAN VENTURE

1. Commercial Orbiter

SpaceTran has proposed to NASA the private funding for a commercial Orbiter (V). The basic idea underlying the SpaceTran proposal is that the non-USG sector should - and can - fund the capacity needed by the non-USG users on the space shuttle fleet (i.e. one orbiter).

The terms and conditions of the SpaceTran proposal have been fully reviewed by NASA. No "basic flaws" have been found in this review.

NASA is currently evaluating the SpaceTran proposal and is considering the presentation of the proposal to Congress, after further negotiations with SpaceTran.

Before doing so, NASA will present its views on Orbiter V - and private funding thereof - to the NSC to determine:

- Does the nation need a fifth orbiter
- Should private funding be "allowed"

SpaceTran is proposing to fund only the cost of a commercial orbiter (about $1 billion in 1982 dollars or about $1.5 billion in "then year" dollars). Another $1.5 billion of future system investments may be needed to continue orbiter production beyond the current four or five orbiters now considered for procurement.

2. Commercial Titan Launch Vehicles

A key part of SpaceTran's effort to market the Space Transportation System is its ability to provide firm launch date commitments. SpaceTran, Martin Marietta Corporation, United Technologies Corporation and Aerojet Liquid Rocket Company have signed a memorandum of intent providing exclusive marketing and user rights to SpaceTran of Titan launch vehicles. The Titan launch vehicle will be made available by SpaceTran as an expendable backup to the U.S. National Space Transportation System.

With the Titan backup and the private funding of Orbiter V, SpaceTran intends to become the first U.S. "one-stop shop" to provide guaranteed space launches to commercial or private users. Included in the "one-stop shop" is the provision of financing, insurance packages, and technical support services for all commercial space users worldwide.

The first Titan 34D, a modification of the Titan III, was launched successfully on October 30, 1982, from Cape Canaveral Air Force Station. The launch placed two defense communications satellites into geosynchronous orbit. The Titan III operational history of 117 successful launches represents this nation's most reliable expendable launch vehicle. Discussions have been initiated with the Air Force and NASA for access to government property and facilities at ESMC in Florida for payload integration and launch operations.

3. Milestones

Mid-December:

- o Decision by NASA on use of SpaceTran proposal
- o Recommendation by NASA to NSC on Orbiter V (national need and funding source)
- o Decision by NSC on
  (1) Orbiter V
  (2) Private funding of Orbiter V
- o Review of NSC decision with OMB, NASA, DOD, others
- o **Decision by President**

SpaceTran Objectives

(1) Commercialization of Orbiter(s) funding, marketing and contracting to non-USG users, worldwide.

(2) Provide Titan backup to Orbiter(s) for a mixed expendable and reusable United States launch capability in world markets - to meet European and (future) Japanese, and Soviet competition.

(3) Provide, where necessary, financing, insurance, technical contracting and marketing support worldwide.

(4) Set an early example of the maturity of the U.S. Space Transportation System.

Needed:

(1) Decision by President and Executive Agencies (OMB, DOD, NASA) to allow commercial sector financing of the Space Transportation System used by non-USG. (Winter 1982/83)

(2) Review and concurrence by the Senate and House with Executive decision. Possible need for legislation. (Spring 1983)

THE SPACE TRANSPORTATION COMPANY INC.

For Immediate Release

SPACETRAN AND MARTIN MARIETTA SIGN INTENT TO BUILD TITAN LAUNCH VEHICLES FOR COMMERCIAL MARKET

Princeton, New Jersey, and Denver, Colorado, November 30, 1982 -- The Space Transportation Company Inc. (SpaceTran) and Martin Marietta Corporation have signed a memorandum of intent to have SpaceTran undertake the commercialization of Titan launch vehicles and launch services for non-U.S. government purposes as a backup for the launch of commercial payloads on the shuttle system. The memorandum of intent provides exclusive marketing and user rights to SpaceTran and calls for Martin Marietta to provide for an initial purchase of four Titan 34D launch vehicles for launch from the Eastern Space and Missile Center (ESMC) beginning in 1986. Additional Titans will be purchased as required over the next decade. The companies who manufacture the Titan's propulsion systems -- the Chemical Systems Division of United Technologies, and Aerojet Liquid Rocket Company -- also signed the memorandum, with Martin Marietta providing the interface with SpaceTran.

SpaceTran earlier this year proposed to privately fund and market the capacity of a space shuttle orbiter. Having the Titan launch vehicle available as a common, expendable backup to the U.S. National Space Transportation System will allow SpaceTran to provide firm launch date commitments. The SpaceTran Titan, with a 14-foot payload fairing, would be capable of flying 1, 2 or 3 satellites to low-earth orbit. Payloads would be designed to be compatible with either the shuttle or Titan. Upper stages would be selected to provide dual compatibility with shuttle and Titan launches based on mission requirements.

With the Titan backup and the private funding of Orbiter V, SpaceTran intends to become the first space U.S. "one-stop shop" to provide guaranteed launches to commercial or private users. Included in the "one-stop shop" is the provision of financing, insurance packages, and technical support services for all commercial space users worldwide.

The first Titan 34D, a modification of the Titan III, was launched successfully on October 30, 1982, from Cape Canaveral Air Force Station. The launch placed two defense communications satellites into geosynchronous orbit. The Titan III operational history of 117 successful launches represents this nation's most reliable expendable launch vehicle. Discussions have been initiated with the Air Force and the NASA for access to government property and facilities at ESMC in Florida for payload integration and launch operations.

SpaceTran, founded in 1979 with its main objective to see to the private funding of a commercial orbiter, is taking this initiative in the context of the many other ventures currently initiated or under review on commercializing expendable vehicles in the United States, Europe, the Soviet Union, and Japan.

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# # #

Economic Opportunities In Space Enterprise

Inspired national leadership, combining economic interest and technical and scientific enterprise, should lead to increased return from space.

Klaus P. Heiss
ECON, Inc.

At this juncture of the United States space program a major opportunity exists to give a new impetus to space applications (and space sciences) for the next two decades. It involves a redirection of the U.S. space program from an emphasis on means to an emphasis on scientific and economic goals of space technology.

It also means a redirection and rethinking of the role of private enterprise, national enterprise and international enterprise in space applications, sciences and transportation. Is it feasible, for example, to conduct civilian land resources observations entirely through private initiative and private enterprise, with international cooperation? On the other hand, is the creation of some entirely new federal institutions called for in the conduct of space applications program for the public and private benefit?

Along similar lines, is indeed the Federal Government the best operator of space transportation systems?

Should, for reasons of accountability, a private management approach be considered to provide the nation with least cost transportation to space in an efficient and accountable manner? To those

who object immediately on the basis of national security, let them be reminded that much more important technology components today are handled by private enterprises, such as the technology for enrichment of uranium. Finally, has the time come in space enterprise to let venture capital take risks and earn rewards just as was done in so many other fields of national and international enterprise? Indeed, that was done well before the notion of nation-states was invented. The time to rethink these options is now.

This opportunity comes about with the successful deployment of the space shuttle system in the early 1980s.

Of course any venture in private, national or international enterprise has to and ought to be guided by direct, visible, and clearly expected benefits. There seems to be a certain technological mysticism in the country which advocates technological pursuits for technology's sake and for the sake of science.

It is as irresponsible for a national institution to advocate blind pursuits of technology as it would be for a private enterprise to do so. The context in which benefits and rewards are measured may shift. Indeed the information and knowledge generated by technological pursuits at the federal level may be akin to the "public good" in the best sense. It is clearly widespread knowledge that should be distributed throughout the system rather than be held by one or two individuals.

Nevertheless, the public good aspect does not excuse from *documenting* that public good in equally detailed and accountable fashion beyond any reasonable doubt. It is this lack of—or unwillingness to provide—such accountability that increasingly is hurting the civilian space effort of the United States.

Private enterprise (national as well as international enterprise) can meaningfully operate when guided by true opportunities (benefits, new goods and services). Such a search for opportunities can be grouped into major themes.

In the following, four topics are emphasized. They include: (1) The Development of Global Information Systems; (2) Large Space Structures Applications; (3) Space as an Energy Base for Mankind; and (4) Likely Phases of Space Application Development.

GLOBAL INFORMATION SYSTEMS

Space applications in the 1960s and 1970s were nearly exclusively data gathering, transmission, and data processing and evaluation to

uses of fossil fuels in this century have led to local measurements that seem to indicate a long-term, secular trend of increased levels of CO_2 worldwide. However, to truly assess the potential magnitude of this problem, information on agricultural activities, rain forest, and a multitude of other biological processes worldwide is needed. These measurements of CO_2 conversion activities and how they impinge on human activities are today just simple guesswork, rather than statements based on global measurements. The LANDSAT system and other supportive space systems will make the measurement of biological CO_2 conversion activities possible on a worldwide scale.

Pressure For Measurable Benefits

The pressure for directly measurable benefits to justify the expenditures of public funds is strong, and indeed I believe NASA and the national space program have nothing to fear from the insistence upon such accountability. In Table 1 a summary of three areas contributing to the establishment of a global information system (the ones that technologically are well into the development stage) are listed. Only benefits for which reasonable, detailed estimates exist have been listed. In but two areas, Land Resources and Ocean Observations, information benefits of the type that LANDSAT/SACIE and SEASAT will be capable of by the early to mid 1980s are listed. The benefits for Land Resources information are estimated roughly from half to one billion dollars a year. These are benefits accruing to the United States only. They do not include benefits that might accrue to other nations by access to these United States systems. For ocean observations (SEASAT) a joint cooperative venture between industry and government is coming about, and industry will finance economic experiments in cooperation with NASA. Similar economic verification experiments on the use of weather information using space systems are currently being constructed in a cooperative enterprise on frost warnings for citrus crops in Florida.

For civilian space communications, worldwide investment numbers are listed. I estimate total market investments made in civilian space communications at one billion dollars in 1976, with total annual systems revenues of about $500 million. For the mid-1980s, even without the establishment of large structure antennae, we estimate this investment to increase to about $500 billion, with annual revenues of between $1.5 to $2 billion. Items listed under civilian space communications include total worldwide investments, excluding communist countries.

provide information. This is the case in the areas of national security as well as civilian space applications. This substantial thrust of the United States as well as worldwide space programs will be continued in the 1980s and 1990s, and well into the twenty-first century.

One has to realize that a substantial part of the economic activities in the United States as well as worldwide have to do with the collection of information, the transmission of information and the evaluation of information. Dr. Fritz Machlup estimated in 1960 that up to 20 to 30 percent of all economic activities in the United States economy have to do with the collection, storage and transfer of information. In addition to the obvious information activities, Machlup includes education, library functions, data evaluation, research activities, the postal service, and other less obvious information related activities of the United States economy. The revolution that the space program has already brought to the information industry, both domestic and worldwide, is so deep that we all too often forget entirely about it.

For just one example, a famine due to drought in some developing country today affects the compassion of a worldwide community, where 20 and certainly 100 years ago such events may have gone totally unnoticed. Or, more recently, the exchange of views among Middle Eastern countries, while not possible across the immediate frontiers, somehow was triggered, for better or worse, through space telecommunications linkups with United States reporters.

National Security

In the national security area it is impossible to estimate the magnitude of the contribution of having objective, strategic information on adversaries, yet this mutual knowledge more than anything else had a greater effect on mutual defense expenditures, leading gradually to a process of negotiations and accommodations.

On the other side, where such objective information may disappear (due to sophisticated evasion, for example) such developments could prove to be extremely destabilizing.

Despite the impressive developments of the early 1960s and 1970s, the next two decades will see expansion of the role of space systems in the information era. The gathering of worldwide resources information, environmental information, climate and weather will make it possible, for the first time, to establish a quantitative base on which to research and husband natural resources regionally and worldwide.

To mention but one item of crucial importance: the shift of the United States, as well as other energy economies to the increased use of coal will have a significant impact on the generation of CO_2. Already the

Table 1
1980's Global Information Systems Benefits and Costs
(U.S. Benefits only)

LAND RESOURCES (LANDSAT/LACIE)		OCEAN OBSERVATIONS (SEASAT)	
Application Area	Annual Benefits	Application Area	Annual Benefits
Agricultural Crop Information	294 - 581	Arctic Operations	10 - 29
Petroleum-Mineral Exploration	64 - 260	Coastal Zones	.3 - .8
Hydrologic Land Use	22	Marine Transportation	22 - 53
Water Resources Management	13 - 41	Ocean Fishing	27 - 143
Forestry	7	Offshore Oil and Natural Gas	21 - 34
Land Use Planning and Monitoring	15 - 48		
Soil Management	5 - 9		
Annual Benefit Range	420 - 968	Annual Benefit Range	80 - 260
Annualized Systems Costs (at 10% interest rate)	60 - 80	Annualized Systems Costs (at 10% interest rate)	80 - 100

CIVILIAN SPACE COMMUNICATIONS			
	Space Systems		
	1976	Mid 1980's	For Comparison ATT 1977
Market System Investments	$ 1 Billion	$5 Billion (Est)	$100 Billion
Annual System Revenues	$500 Million	$1.5 - $2.0 Billion (Est)	$ 36 Billion

The listed programs are first, stepping stones to the establishment of truly global information systems, involving the active collection of worldwide information as well as the transmission and the processing of that information.

Government Role: Safeguarding or Obstructing?

Most of the information benefits gathered by observation satellites are public information benefits. The best analogy is the information services currently provided by the Department of Agriculture on domestic as well as worldwide crop information. It would be self-defeating—if not discriminatory— to restrict such global information to just a few users who might be able to afford to pay for the full costs.

Total system cost recovery in pricing such services would be inefficient as well. The public good aspect of information of the type gathered on earth resources, the environment, and ocean observations has long been recognized. Kenneth Arrow made sweeping statements about the relationship between information and the public good as early as 1962. Yet, in the case of space observation systems, the Office of Management and Budget (OMB) seems to have somewhat ambivalent ideas along the lines that if indeed these benefits exist, the private market should be able to bring these about ("capture them").

Combined with this seems to be the notion that the single role of the federal government is to "safeguard"—i.e., obstruct—the exploitation of space-based information by private interests, which invariably would happen if a consortium, for example, of major grain trading companies were to put up such information systems for their exclusive use. The Space Act of 1958 gives rise to an additional fault: it excludes NASA by statute from being an operationally useful agency in space applications by excluding that agency from implementing or operating such systems. This contrasts sharply with the situation in the Departments of Agriculture and Defense, to mention but two other institutions.

What I am trying to say is that the bottleneck to a full development of global space information systems is not the lack of benefits to the nation from such systems—if well managed—but a serious lack of institutional and entrepreneurial spirit that needs new, inspired initiatives by government and private enterprise.

The establishment of such global information gathering systems and the worldwide distribution of this information to all participating countries will be a significant achievement, possibly equal in scope to the role of space information in the national security area.

THE LARGE STRUCTURES CAPABILITY

The space shuttle system will make possible the deployment of large structures in space. Large structures would comprise all space applications or space science payloads that in dimension (length, width, volume) or mass clearly exceed capabilities of existing rocket launch systems. Some such structures ultimately envision the deployment of tens of square miles of antennae and solar arrays late this century or early next century. The assembly of such structures will occur in low earth orbit. The space shuttle being a reusable space transportation system to that orbit will open up to the United States the capability to deploy such structures in the 1980s and 1990s.

The in-orbit check-out capability, the revisit and repair functions, as well as the ability to refurbish large structures (power, fuel, instrument packages, degraded subsystems) for the first time allows the achievement of reliability levels of operational space systems that are necessary before large investments can be made either by the government or by industry. Today reliability of operational space systems still is only in the neighborhood of 95 percent in terms of assured in-orbit functioning of spacecraft. With revisit capabilities in earth orbit the United States will not have to risk a whole program like Skylab due to the malfunctioning of one or two minor items. Similarly, one cannot expect significant industry investment in space applications

sources, uses of environmental and natural resources, and global impacts of fossil fuel users, e.g., CO_2 effects mentioned in an earlier section.

Two spinoffs, or side products, of the large structures phase in space applications and space sciences will be:

(a) the disappearance of the juxtaposition of manned versus unmanned space activities that characterized so many of the discussions of the 1950s and 1960s. The assembly and maintenance of large structures will involve some degree of manned operations in space; the exact level will be determined case-by-case and program-by-program based on considerations of efficiency and cost effectiveness.

(b) The experience gained in the assembly and maintenance of large structures in earth orbit through the 1980s and 1990s will be an important stepping stone to the establishment of space power systems, an experience which is necessary, although not sufficient, to establish the economic viability of space as an energy source for mankind.

SPACE AS AN ENERGY BASE

In the remainder of this century and certainly in the years of the 21st century the viability of space as an efficient, clean and close to inexhaustible energy source for mankind will have been established.

It is too early to tell whether remaining environmental, and technical problems can be resolved, at economic costs, to make such investments feasible. The fact is, compared to all known fossil fuel resources on earth, the latter represent about 10 times the daily solar energy that impacts earth: earth's daily receipt of solar energy is about $1.49 \times 10_{22}$ joules (i.e., a large number), the total estimated world fossil fuel resources, accumulated over millions of years, are about 10 times that ($8 \times 10_{12}$ metric tons of coal equivalent). Any area of similar size located at 1 AU (orbit of the earth around the sun) has a similar energy collection potential.

Decisions For the Future Are Being Made Now

It is very difficult to project over time spans even as long as five years. When one conjectures about economic matters, as well as technology, over several decades toward the year 2000 matters become even less amenable. On the other side, particularly in the energy field and in space applications the "gestation" period of major projects is anywhere from eight to ten years: to affect major space applications programs in the mid 1980s decisions have to be made now on research development, testing and evaluation programs. In energy mat-

where single mode failures during launch could destroy investments and payloads worth several hundred million dollars. If reliability levels can be raised to 99 percent or more, space application systems will be competitive with investments in technical systems on the ground at reasonable, competitive costs.

Large space structures will first bring about a further significant revolution in information related space activities: the collection, the in-orbit processing and the distribution of information back to earth. While today the uses of space communications are limited to performing subsidiary functions in an extensive ground communication system, in the 1980s and 1990s a gradual shift to space investments will occur. Household to household communications for a diffuse, wide variety of communication and information needs can be expected. Large scale antennas, deployed for scientific uses will promise order of magnitude expansions of our understanding in astronomy and of the universe.

While space communications today involve annual industrial budgets of at most a few hundred million dollars per year, the investment for conventional telecommunications on the ground is much larger. The gross asset value of a single company, AT&T, exceeds $100 billion, with a further requirement by the same company to make a similar magnitude of additional investments over the next decade for communication needs in the 1980s; i.e., about $10 billion a year. By comparison space communications, however important and significant with regard to improving worldwide and domestic communications today, receive only a fraction of that amount.

The total world's investment in communications satellites and earth stations exceeds $1 billion and annual revenues exceed $550 million as of early 1977.

However, with the advent of large space structures some of the functions now performed tediously on the ground can be shifted to space-based operations, but only if maintainability, assured operation, inspection and repair capabilities indeed exist for such expensive ventures. With large structures this breakthrough indeed will come in the 1980s, with a considerable push needed by the federal government to indeed "drag along" a highly regulated, oligopolistic (if not monopolistic) ground-based telecommunications industry. These large space-based systems may significantly enlarge the competitive character in telecommunications, possibly leading to a total revolution of this industry. Space communications efforts to date have been highly competitive when compared to the structure and regulation of ground-based communications industry.

Similar order of magnitude advances can be expected in the gathering of information on such items as world crops, water flows and re-

The American Gas Association estimates the incremental cost for adding another 10 quads in generating capacity in the neighborhood of $476 billion. These numbers reflect the increasing cost of capital as well as the complexity and regulatory constraints imposed on new electric energy generation capacity. This estimate, coming from the Edison Electric Institute, may be taken as a reasonable, unbiased estimate of the true incremental cost for 10 quads.

Space Development In Context

Finally, one has to see such investment enterprises in the context of the national economy and the capital markets of such economies. In 1977 the total *net annual* funds raised in credit and capital markets totaled about $338 billion. This is in addition to depreciation and retained earnings. Of these about $85 billion went to finance government activities at the federal, state and local levels, $126 billion went to home mortgages and consumer credit, $115 billion went to business capital markets, and the rest went to miscellaneous other items. Depreciation funds in 1977 amounted to about another $100 billion to finance gross investments. Total capital requirements by the energy industries in 1977 were about $64 billion. Bankers Trust Company, in a 1978 survey "U.S. Energy and Capital, A Forecast 1978-1982," projected total capital requirements for the energy industries from 1977 to 1982 at about $494 billion (or $400 billion in constant 1976 dollars). Of this total about $190 billion would be invested in oil and gas, $19 billion in coal, $154 billion in electric utilities and $28 billion in gas utilities. Nuclear and other energy sources show capital requirements over the same years of more than $7 billion.

These figures are cited to show that even over short time spans the United States is able to handle investments of major sizes, and of the order of magnitude required for very large scale space-based enterprises, potentially up to $590 billion over 25 years. These numbers have to be compared to current conjectures about the cost of solar power satellites. ECON, Inc. has been deeply involved with three other corporations, Arthur D. Little, Grumman Aerospace Corporation, and Raytheon, in estimating the cost and performance of one particular solar power satellite of about five gigawatt capacity (output on the ground). Based on such units the estimated cost of generating 17 quads of electric energy through such technology will be about $500 billion. This cost estimate allows for substantial cost uncertainties. Within these uncertainties one may conclude that solar power satellite systems compare in the neighborhood, if not favorably, with conventional power generating capacity on the ground: for the same amount of total investment of $500 billion the nation would get 17 quads (i.e., 70 percent more) of electric generating capacity than by investing the same funds in conventional additions to such capacity.

ters major utility plants take anywhere from six to ten years to achieve full operational capability.

A Dilemma

Thus, one is confronted with an intrinsic dilemma: some of the most interesting and promising technologies need about a decade to be deployed, even where the technology is known to be feasible. Where major engineering or technology uncertainties exist, such as with solar power satellites, another five to ten years in experimentation, research, and prototype developments are added. Yet, our capabilities to project economic conditions to make investments with comfort and certainty is, at best, limited to a few years.

What is required in space applications is a willingness to incur risks for uncertain—but potentially large gains. The novelty, as well as the scale of space energy projects has to be seen in the context of the particular economic sector in which these innovative activities will take place.

In communications we quoted some figures above. In the energy sector I have summarized some aggregate numbers in Table 2. The Edison Electric Institute recently estimated the total sunk investments for electric energy production in the United States to be $161 billion (plant and equipment). We have estimated a similar number, in constant 1975 dollars, for that same plant and equipment of around $200 billion. This plant and equipment to date produces 17 quads of electric energy.

Table 2
Investment Costs in U.S. Electric Energy Production

	Today (1975) 17 Q	Earth Based Increment Δ 10 Q (additional)	Space Based Δ10 Q (additional or replacement)
Edison Electric/ American Gas Assoc. Estimates	$161 Billion (current dollars)	$476 Billion (current dollars)	
ECON Estimates	$200 Billion (constant, 1975 dollars)		$500 Billion (1975 dollars) (First 50 Five gw SSPS units)
Other Estimates			$200 Billion (SAI, Driggers) (First 20 Ten gw SSPS units)
Key Uncertainties			
Environmental	• O_2 Effects	• CO_2 Effects	• RF Interference
Technical	• Fossil Fuel Prices & Resource Availability	• Nuclear Proliferation & Contamination	• Ionospheric Effects
Economic		• Waste Disposal	• Micro Wave Radiation Zones
		• Fossil Fuel Prices & Resource Availability	• Large Space Structures Technology
		• Resources Access by Developing Nations	

Unresolved Issues

There are unresolved issues and problems with solar power satellites: the estimates assume a further substantial decrease in space transportation costs; but these are clearly in hand with the successful completion of space shuttle systems technology. The estimates assume a substantial decrease in the cost of solar cell production, assembly and deployment in space; but the cost uncertainties allowed for, cover these uncertainties. Finally, there do exist serious questions of environmental effects: radio frequency interference, possible ionospheric effects of such large energy transmission (on the other side, solar energy output fluctuates by order of magnitude larger amounts each day and season), and local microwave radiation zones.

Conventional additions to electric generating capacity (or replacement of that capacity) has at least equally serious environmental problems: for nuclear fission technology the problems are myriad and may seriously conflict with other national interests; fusion technology remains an economic promise of the future with serious contamination problems (tritium), and technically unresolved issues of being able to sustain a net energy output from such enterprises.

For fossil plant systems, even existing uses of fossil energy do seem to have a noticeable CO_2 effect, with potentially dangerous climatic long term implications; in addition, an equal use of world energy resources by developing countries at some future time clearly conflicts with the available resource base for fossil fuels, whatever those resources may be: a per capita energy equivalent consumption by developing countries, using United States 1970 energy consumption data, would have implied for 1970 a total worldwide fossil fuel production equivalent of 40 billion metric tons of coal, an irrationally high and economically unfeasible goal as of today.

While the energy problem is getting serious attention, a major energy option, using space as an energy source seems to whittle away unnoticed or neglected. At the same time millions will be spent in inefficient or unreliable solar ground systems. I consider this a serious imbalance in the context of long term inexhaustible energy technologies available to the United States. The potential of solar power satellites and technology ranks at least at the same level as that promised by fusion or other inexhaustible energy options beyond the year 2000, yet the funding is practically nonexistent.

While space may not be an energy source for mankind on earth (for example due to ionospheric effects or microwave radio frequency interferences) space may yet become a natural energy sea for mankind to expand into with space-based industrial and habitat establishments, given the singular importance of energy in any economic sys-

tem, the one resource for which no substitutes exist in the long run. While these ideas today seem somewhat out of reach, these concepts have been shown to be within the technical capabilities of the United States.

AN EVOLUTIONARY PATH: PHASES OF INDUSTRIALIZATION

It is completely unreaslistic to expect today any commitment to investing $500 billion of our resources to the establishment of even such a lofty goal as space habitation.

This is not to say that social systems in the past have not dedicated similar amounts of their annual resources to the pursuit of national security interests, religious interests or mere pleasures of architectural design: the building of the largest pyramid in Egypt was a project extending over hundreds of years, and employing a large portion of the total available labor force. The building of the Great Wall of China was an enterprise of similar magnitude, again extending over many hundreds of years, and equivalent to certainly much more than 10 million man-years needed for a solar energy base (i.e., $500 billion) facility. In more recent times, up to 80 percent of the gross national product was dedicated by the United States in World Wars I and II to the pursuit of national security matters, adapting rapidly from a peacetime level of effort of between 10 to 20 percent of GNP. It is likely that any advanced society of the turn of the century (75 years ago) clearly would have committed tremendous resources to such a scheme—if given the technical option to do so. However, no such dedication, even by the wildest imagination, can be expected in the pursuit of space colonization today.

There is also no need for any such drastic acceleration of space expenditures to bring about space colonization over the next 100 years. Rather, many of the programs in space will logically evolve some of the most important building blocks necessary for the accomplishment of space industrialization; using opportunities offered by the space shuttle and related technologies over the next decades, many of the technology components needed to commit to a full-scale space industrialization will come about by the utilitarian and scientific uses of space. Table 3 indicates five phases of space industrialization that are likely over the next several decades.

FIVE PHASES OF SPACE INDUSTRIALIZATION

The Information Phase

This phase is geared toward using space and space sensing systems to gather, transmit and evaluate information on a worldwide basis. This

Table 3
Phases of Space Applications Development

Phases	Information Phase	Large Structures Phase	Industrial Prototype Phase (with ground support)	Industrialization Phase	Space Habitation Phase
Main Tasks	Collection, Transmission	Assembly/Support Technologies	Testing/Costing Open Systems	Closed Systems Designs/Tests	Economic Balance of Closed System (with Net Energy Output)
Initial Start up	1960s - 1990	1980s - 2010	1990s - 2025	2010s - 2075	2075 Islands I - III
Economic/ Technical Scientific Activities	INTELSATS DOMSATS TIROS NIMBUS GEOS LANDSAT SEASAT ATS Surveillance	• Antennas • Optical Systems • Spacelabs • Information Processing • Space Power Support Systems • Reuse of Space Materials and Systems • Weather & Climate Res.	• SSPS Prototype • Processing: LG Capillary Forces • Cryogenic Refrigeration • Biocultures • Space Station/Base • Recycling of Space Materials • Weather Modification	• Lunar Base • Closed Agriculture Systems • Environmental Balance • Net Energy Output of Closed Systems • Large Scale Recycling Systems • Helium 3 Prod. in Space (Fusion)	• 10,000 People • $50 Billion/ Year Gross Product • Space Energy Base with 17 Quads Net Energy Output • Autark Space Economics • Climate Modification (Management)
Space Transportation System Needs	Expendable Rocket Systems	• Space Shuttle • IUS, Tugs • Assembly Platforms	Chemical/Laser LLV Large Seps Mass Driver RDT&E Space Shuttle Derivatives	• Laser Fusion Propulsion • Modified "ORION" Systems • Lunar Mass Driver RDT&E	
Costs (1975 $)	$75 Billion	$100 Billion	$150 Billion	≤$200 to $250 Billion	Total > ≈ $500 Billion

Average Annual Funding $5 Billion per year, 1975 dollars

phase of space colonization began in the 1960s and will extend in the development and the initial deployment phase well into the 1980s and 1990s. It comprises programs such as communications, weather and climate, earth observation, ocean measurements, as well as military surveillance. The space science program also is built around similar themes of information gathering, transmission and evaluation. The information technology in space will evolve substantially beyond the year 1990 and make important contributions to the organization, control and general feasibility of space habitation.

Large Structure Phase

The area of large structures will be opened with the advent of the space shuttle (1980s-2010). With an ability of repetitive flights, the ability to assemble larger structure in space operations, the capability to maintain, repair and refurbish large systems, the 1980s and 1990s will see the establishment of entirely new antenna systems, optical systems, initial prototypes of space power and space manufacturing systems. The space lab program, as currently envisioned for the 1980s, will include a variety of research important to answering some of the key questions with regard to any space habitation: how do organisms grow in low gravity; what is the effect of capillary forces; what is the ability and role of man in EVA; how long can man operate

in space without adverse physiological effects; is there a high energy radiation problem; what will be the role of automated assembly and remote control through teleoperators?

Industrial Prototype Phase

This phase, starting in the late 1990s or early decades of 2000, will see the deployment of economic prototype and operational SSPS systems, space processing systems, justified by economic uses on earth and the establishment of biocultures, as well as a permanent space station and construction base. Most of these activities will be undertaken by governments, with substantial industry participation. Elements of a space construction base will evolve much earlier in the large structures phase, beginning in the mid-1980s.

Industrialization Phase

In the following decades (2010-2075), industrial space activities, with or without financial participation by government, will develop and sustain themselves entirely, based on pursuits of economic interests. Once this point is reached, the space program will have become truly irreversible: economic self-interest, again and again, has proven to be the most lasting historical motivation to human activity. The most likely and obvious application will be space-based solar power systems—of the SSPS type—financed by utilities and industry.

Another area of substantial economic activities may be waste disposal for extremely toxic chemical, biological and nuclear wastes, vaccine and enzyme production, cryogeneric refrigeration, long-term storage, crystal growth, and possibly entirely novel space production processes. At the same time, closed space agriculture and habitat systems may be established, including possibly a permanent lunar base.

Space Habitation

This phase of space industrialization will be the threshold phase of space colonization. It means achieving the levels of economic output with a labor force sustained in space sufficient to regenerate closed systems in economic, technical, environmental and social balance. After the crossing of this threshold, no physical resource limitations (energy, materials) seem likely to limit the growth of such communities from then on for thousands of years. It could begin by 2075.

Beyond this threshold around the year 2075 little can be said as to dominant economic or technical considerations. The only limiting factors will be three principal determinants of economic systems:

DETERMINANTS OF ECONOMIC SYSTEMS

The Cost of Time

Even at three percent a year—the average rate of technological innovation over the past century in advanced societies—this interest rate will severely limit any substantial expansion beyond the asteroid belt. Given the time preference of societies today, a 10 percent interest rate seems more realistic, thereby confirming the rate of space industrialization even further.

The higher the interest rate placed on long term investments, the fewer of these can be undertaken. Since other advanced societies can be expected to be driven by similar utilitarian considerations, it makes physical travel beyond any solar system a ruinous enterprise. Communication of information is much cheaper and faster.

The Cost of Labor

In times of physical abundance, labor will become a severely limiting factor to space industrialization rates. An economic system has little incentive to expand faster than its population growth, once economic saturation levels are reached. But with limited population, labor resources will limit the rate of space industrialization.

The Rate of Technical Innovation

This rate has hovered about three percent over the past 100 years in the most advanced societies. Some decrease in this rate has been noticed for the United States economy over the past decade. At times, these rates of innovation have been truly explosive, leading to deep societal and economic changes and upheavals. Yet, historically, many advanced civilizations have stagnated at zero growth for centuries.

In many ways an explosive area of growth may develop, quite similar to the change from nomadic economies to agriculture systems 4,000 to 5,000 years ago, or the change from agricultural systems to industrial societies 400 years ago.

CONCLUSION

The above estimates and cost schedules may prove in time to be quite encouraging: while to some the cost estimates may seem exceedingly high. In rough outline form the feasibility of achieving these levels of investment and commitment over the next hundred years, in an evolutionary approach, seems assured, even with funding of space activi-

ties held at roughly current levels. The establishment of space habitation will be an evolutionary outcome of the current United States space program, with many intermediate steps already outlined. Several of the necessary steps will be self-supporting from an economic as well as technical-engineering viewpoint. With further innovation beyond the year 1995, indeed a self-supporting community of 10,000 people seems possible a hundred years hence.

However, for many of the reasons outlined above, this threshold is also not likely to be passed much sooner than that. In either case, mankind, through the efforts of the space program, will achieve in the next 100 years the most significant accomplishment yet: true earth-independent, self-supporting systems which will invariably lead to the establishment of a multitude of new, different, varied and enterprising civilizations.

Opportunities Must Be Pursued

The information, large structures and energy themes will form the major phases of the United States or world-space program over the next decades. Many additional themes and uses will develop, some entirely unforeseen today. Yet these opportunities will only come about if we pursue them.

The emphasis given the space applications program over the next decades will have tremendous differential impact on when and whether these new, in some sense revolutionary developments, will come about for mankind in the early 21st century.

This change is so fundamental that it makes any speculation beyond the early decades of the 21st century somewhat futile. Enterprises and economies making use of the inexhaustible energy resources of space near the sun are a fundamental step for mankind.

The German mathematician Hilbert was asked in 1905 what, in his opinion, the ultimate achievement for mankind would be. Hilbert replied, "The day man can catch a fly on the moon." While only 65 years later this may be considered by some as accomplished, what Hilbert may have meant in a broader sense is the stage when mankind will achieve a technical, scientific and humanistic development to truly take possession of the space around earth, and the solar system. This accomplishment, dictated and guided by possibly narrow economic needs, can be achieved by the United States over the next several decades. While in the 1960s such enterprises without government activity would have been inconceivable, the space shuttle will make this next important step possible. This development will be guided as much by the pursuit of economic interests as by those of

national prestige. No spectacular initiatives are needed by the nation to bring this about. What is needed is a firm, steady and constant support through the 80's of an inspired national space effort.

THE NEED FOR PRIVATE ENTERPRISE

A Pitiful Lack Of Funds

Today, the space program is receiving nothing but a pitiful fraction of the funds truly required if economic opportunities outlined herein are for real. In part this short sightedness and scarcity of funds is a direct consequence of the inability of NASA to put space opportunities and space needs in the context of everyday national economic concerns, needs and requirements. The pursuit of *means* (space transportation), has now led to a scarcity of thinking on the opportunities, goals and scope as well as purpose of space applications—in the sense of expanded large scale industrial enterprise.

From an era of vision and exploration of new frontiers in science and technology in space in the early 1960s, the nation has seen a constant retreat to a current myopia and inability to perceive even medium range large-scale technological opportunities that the United States has, and which the space shuttle system may make possible.

The total budget of NASA allocated to direct space applications is less than 10 percent of the total NASA budget, and that budget in turn is less than one percent of the total federal budget. Yet the nation is still widespread—in the public's mind and that of some academic institutions—that if it were not for wasteful space pursuits and expenditures, the country's fiscal problems would be solved—what folly!

Release Private Enterprise

Given this shortcoming of the government sector—the only viable recourse is to abrogate fully the bonds and restraints on private initiative and private enterprise in favor of an open skies, free space enterprise policy. Nothing like this exists today in the minds of public policymakers nor, of course, in the minds of industry. What has developed is a system of dependence from the Federal Government on any and all components having to do with space technology and space enterprise.

One last consideration: how best to integrate the space efforts of other allied nations with that of the United States. The best short term and long term interests of the United States are served by an open market policy, giving equal access to the means of space transportation to all

allied nations, in open competition, in some cases successfully, with and against United States enterprises. Protectionism in space would be a most negative and dangerous development. An open market policy in space should be a cornerstone of United States policy. Such a policy will help to bring about the most varied and dispersed uses of space applications and space sciences, while serving at the same time the best interests of the American people.

The United States today is offered a unique opportunity to pursue and bring about a vastly increased use of our investment in space with an inspired and sustained space applications policy. This, however, will only come about with inspired leadership in the public and private sectors, combining economic interests with those of technical and scientific enterprise. Such enterprise today is probably the weakest link of the United States space program.

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A quad = 10_{15} British thermal units (Btu)

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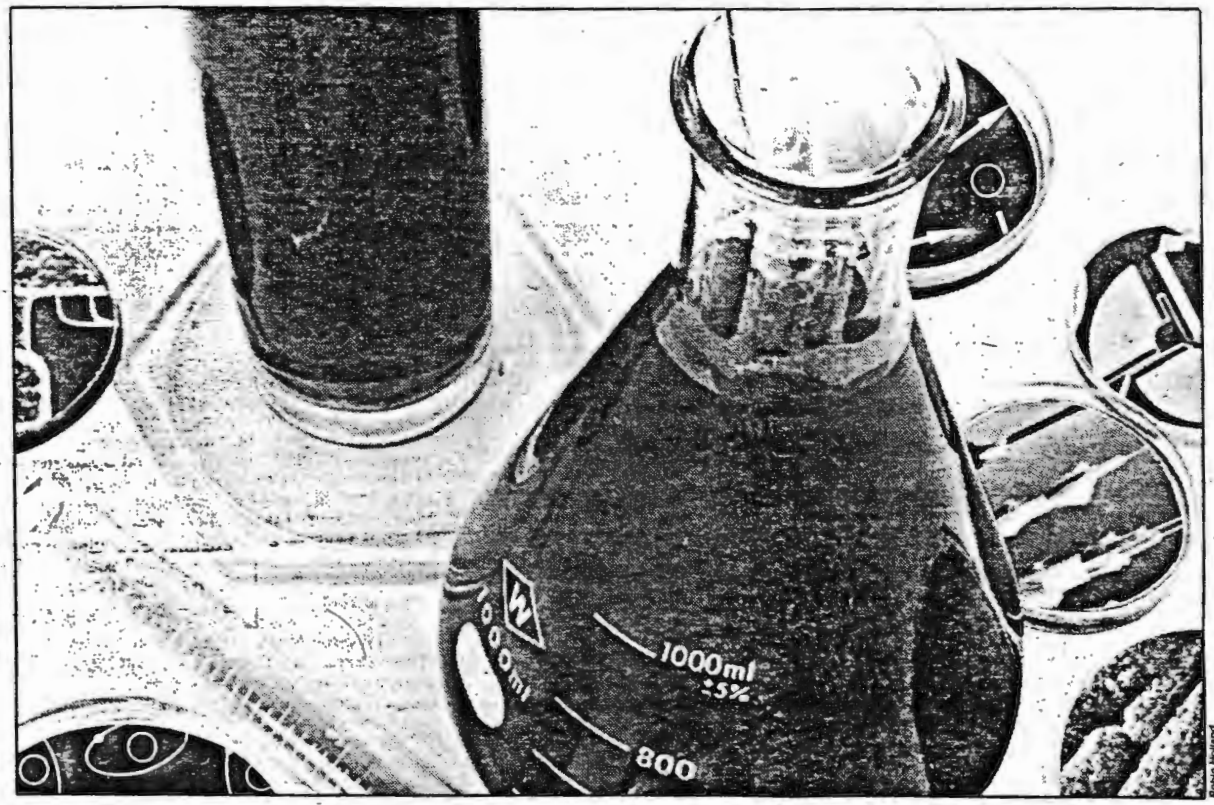



Penelope Breese

Magic Formula?

Uncle Sam's New Stress Is on Basic Research

WASHINGTON—The Reagan Administration's stress in the realm of science and technology has been to get the government out of applied research and to concentrate on encouraging basic research, where the payoff is too far in the future to attract much commercial investment.

George Keyworth, Science Adviser to the President and director of the Office of Science and Technology Policy, has overseen this shift and in a recent interview he spelled out its significance. Keyworth has a powerful voice within the policy-making center of the Administration.

A native of Boston and graduate of Yale, he earned a doctorate in nuclear physics from Duke University in 1968. Until he assumed his present post in August 1981, he worked at the Los Alamos Scientific Laboratory. (He calls the famous atomic scientist, Edward Teller, "my second father.")

—Shirley Hobbs Scheibla

BARRON'S: What is the most exciting development in science right now?

Keyworth: The biggest thing today is biotechnology.

Q: Okay, for the folks who just came in, can you explain biotechnology briefly?

A: Applying new biological techniques to manufacturing. The federal government invested billions of dollars over a 15-year period to build up our understanding of biological systems to the extent where it could be applied to a technology and finally to a production process. A Nobel Prize was given in 1980 for the development of what's called recombinant DNA technology [a form of genetic engineering].

Biological techniques have led to new pharmaceuticals like man-made insulin, and the drug called interferon. Ultimately, we'll be able to synthesize whole families of industrial chemicals, starting, for example, from agricultural products.

Q: Sounds like it could be a rather substantial activity.

A: There's speculation that it will be a hundred-billion-dollar industry by the end of the century, so we're talking about something building to the size of the electronics industry. Its potential applications are extraordinary. And some of them aren't very obvious. For example, it has application to mining.

Q: Mining?

A: Yes, you can use man-made bacteria to actually leach ores, to essentially extract the ore from the surrounding medium. Copper, for example.

Q: Pretty clever bacteria.

A: Very. It attacks the oxide of the metal. You flood it with this stuff and let it work for a while, and it will attach itself to the ore.

Q: The bacteria eat away the .

A: Sort of like acid.

Q: To what degree do you think there should be federal regulation and monitoring of biotechnology? That's a very hot subject, you know.

A: Oh, I know very well. Now, how we do that is going to depend upon much more than we know today. We're at a very embryonic stage. I think we just have to be very, very cautious as we proceed. There are potential areas of public hazard, from making bacteria that are highly resistant to any antibiotic that we know today to actually fiddling around with reproduction.

Q: Can we touch on the Administration's emphasis on supporting basic research rather than applied research?

A: The simple fact is that the private sector is not going to support basic research. Something on the order of 95% of all basic research conducted in America today is funded by the government.

Q: What will be the impact of the government's withdrawal from applied research?

A: I think it will better define the responsibilities of government and the private sector. The government invested $30 billion in short-term energy technology in the 'Seventies. What did we get for it? Nothing. Last year, we took funds that we were spending in short-term R&D and invested them in tax incentives for industry-sponsored R&D. We feel that industry can do it better than we can. After all, in 1981, in a terrible economic climate all manufacturing industries in America increased their investment in R&D by nearly 16%. That was largely in response to new competitive challenges from Japan and Western Europe. So the government really isn't needed in this area.

Q: Fair enough. Can you tell us, so far as government-sponsored research goes, where the next major development will come?

A: I think there will be enormous breakthroughs in astronomy. In less than four years, we will be putting up the first big telescope in space. I think we will come to understand how the universe was formed.

Q: I realize much more than the commercial aspect is involved, but I'll ask anyway: Will it have any significance for investors?

A: If I could project that, I would be out there where I am permitted to invest!

Q: A lot of people seem to be confused over the extent of the Administration's commitment to space. I know the appropriation you just got for 1983 for NASA was beyond what was requested.

A: Not by much. If I recollect, we asked for a little less than $6.6 billion and we got a little less than $6.8 billion. We raised the space program's budget by something approaching 13%. Now, my income certainly didn't go up 13% during that year, and neither did the average American's. And yet we invested that much extra in the space program. The thing is, there are many,

many beneficiaries of the space program. There are industries that benefit from it, and there are members of the scientific community who have particular interests. Necessarily we took some, let's say, discriminating views. We emphasized some things and we de-emphasized other things. The people who got what they wanted, like those who wanted the space telescope, remained quiet. Those who did not get what they wanted were very vocal.

Q: Want to identify some of those vocalists?

A: Oh, for instance, people wanted to see us go ahead with a large program to continue to explore the planets, like the Voyager II mission last year that showed us the beautiful rings of Saturn. That cost $500 million. The next mission would have cost $800 million, and the next one a billion. It would be at $2 billion each very soon, the cost rising much faster than inflation, because of the complexity.

We said "Whoa! We can't afford this any more. Let's retrench and see if we can't make missions for only a few hundred million dollars, like to go and look at the surface of Venus." We are doing that, and we are going to do them more often. But we are controlling the alarming rate of growth that is getting us well above a billion dollars per mission.

Q: Speaking of billions, how do you feel about a space station?

A: Extremely skeptical. For two reasons. First, I have asked ever since I came to this office for people to tell me what we will do with the space station. Neither NASA nor the space community has been able to define what those men would do who would be up on that space station.

Q: They told me.

A: What? Tell me then. NASA has just set up a huge interindustry panel to try to identify what they would do.

Q: I hate to bring coals to Newcastle, but, as it was explained to me, the space station essentially would function as a manufacturing facility.

A: To make what?

Q: Again, the way it was explained to me, if experiments in the shuttle demonstrated that you can make better drugs or crystals or metals in space, then you need some place in space to carry out the actual manufacturing, which necessitates a space station.

A: That's true.

Q: And obviously the number of companies that will want to back experiments in the shuttle if they find their experiments are successful but have nowhere to go from there will be rather limited.

A: Well, no question. A company is not going to invest—we are talking about $20 billion here—$20 billion.

Q: For what?

A: For one space station. The $4 billion or $5 billion that we hear being much talked about is simply for acquisition of the hardware. To design, build, launch and control an entire space station would cost in excess of $20 billion. Would a company build a new factory for a product if they haven't proven it can even be made? No. No company has.

The Johnson & Johnson experiment is fascinating, and has great promise, but it has not been proven by any means. [Last July, Johnson & Johnson, in conjunction with McDonnell Douglas, sent the first commercial cargo into space to determine the feasibility of producing pharmaceuticals in space. Five other flights are ticketed for the apparatus.]

Q: But as I understand it, you don't just decide on a space station Monday and put it up Tuesday. It will take about 10 years.

A: Why should the government invest $20 billion on a speculation that there will be a new industry? There is absolutely no proof of a new industry.

The main reason people would like to build a space station is to put man in space. Why do we want to do that when we are just entering the era of robots and automation? The Soviet Union is way behind us in microelectronics and robotics and all these automation technologies, which is why they have men in space. Why should we put men in space when our industrial base has this enormous capability to do tasks without men? You know, man is not suited for space. Creating an environment up there for him is very expensive. We have to do everything close to perfection because we won't tolerate losing an astronaut.

Q: You would put robots in a space station?

A: Of course. Good Lord, yes!

Q: To handle manufacturing?

A: Absolutely.

Penelope Breese

Q: Okay. Fine. So what is the government doing along those lines?

A: We have built the capability of putting large assemblies in space; we have committed ourselves to meeting the needs of the private sector in utilizing space and we have committed ourselves to exploiting applications of space.

Q: How much would an unmanned space station cost?

A: I've absolutely no idea. A half or a third less is a perfectly reasonable guess.

Q: How soon could we have one?

A: Oh, I think the technology is virtually here today. The question of how far off can only be answered by how soon the need is demonstrated.

Q: You feel the government then should be prepared to develop a robotic space station?

A: I think the government should be prepared to support it.

Q: How?

A: By providing the launch capabilities on our shuttle in a highly competitive way.

Q: Competitive with whom? Arianespace? [A European consortium headed by France.]

A: With Ariane and any other competitor who comes along.

Q: Are you concerned about the competition?

A: Ariane has a relatively primitive space capability. They have virtually 1960's U.S. technology. I constantly hear about the French competition. The French—excuse me, the whole European Space Agency—invests something on the order of a billion dollars a year. We spend about a dozen times that in our combination of our civil and military programs, and somehow we are losing leadership when we've had 20 years of this? I don't see it happening. Ariane's rocket isn't nearly advanced as even an MX missile.

Q: What about Japan?

A: It would have to make a very large investment to possess anywhere near our capability.

Q: Are you satisfied with the military role in space?

A: Yeah. I think it is extremely competent, sophisticated and professional.

Q: Do you have any ideas for how to handle the problem of military priorities? Some companies have been a little reluctant to book space on the shuttle and prepare an experiment because they felt that they might . . .

A: Get bumped?

Q: Yes.

A: Well, they have a legitimate concern. But with the four-ship fleet, which we have already funded, we project having a large surplus of launch capability. We project two-thirds higher capability than demand, at the end of this decade. So I think there is plenty of excess capacity.

Q: Does that mean you don't favor the fifth shuttle?

A: That's correct. I think that the four-orbiter fleet can meet all projected requirements, including having a spare.

Q: What about private ownership of a shuttle?

A: Oh, I think that is neat.

Q: Would it have to be for the fourth shuttle, since you don't favor a fifth?

A: Yes.

Q: Have you examined the proposal of the Klaus Heiss group? [Space Transportation Co. is a private outfit founded three years ago by Wm. Sword & Co., an investment firm, and Heiss, a former NASA official. Prudential Insurance Co. has agreed to finance 40% of the venture, provided it wins federal approval.]

A: Not in detail. I lack the skills of a lawyer. You know what I think is very exciting? You know this private rocket company in Texas, Space Services?

Q: Oh, yes. [Located in Houston, it's a privately held company founded a year ago by David Hannah Jr., a real estate developer, and other investors. Its first rocket blew up, but its second launch was a success.]

A: I think that is very, very impressive, and it is pure American entrepreneurial. It is done with great skill. We have had a lot of highly skilled, dynamic people working on the project, and I look forward with great anticipation to seeing them develop a capability. I think they may provide an augmentation to the shuttle program. It may be very attractive commercially. There are communication satellites, for example, that need to be put up routinely, that don't necessarily require the return capabilities of the shuttle.

Q: Let's talk now about the government's basic research. What is government doing now that could lead to another industry like biotechnology?

A: The government invests very heavily in our understanding of solids. We can look forward to an era where we can manufacture whole families of new materials.

In 50 to 100 years, I suspect that most of the electricity in the United States will be produced from seawater, an unlimited source of energy. It is probably the toughest technologial problem mankind ever addressed. We have been working on it for over 30 years now, and we spend half a billion dollars a year on it. What company is going to invest in it? It is a high risk and nobody is going to buy a stock that is going to pay off in 50 years.

Also the government invests heavily in controlled fusion for energy. I worked in the area for a long time. I think the payoff is tremendous. Wouldn't it be impressive to have electricity production from an inexhaustible source of fuel? Of course it would.

Q: I have discussed it with Edward Teller.

A: My dad! He is sort of my second father. But let's not underestimate the complexities.

Q: How far away is it now?

A: I don't expect to see it in my lifetime, and I come from a family of long-lived people.

Q: How do you feel about alternate energy?

A: I think there are a lot of promising things, but I don't expect them to

Continued on Page 38

MAGIC FORMULA?

Continued from Page 9

meet the large-scale requirements of the country. I think we have to look to fusion, to nuclear energy, and to better and more efficient use of fossil energy.

Q: This Administration supports the breeder reactor—

A: Yep.

Q: Why?

A: I think we can expect the breeder to supply low-cost electricity at the beginning of the next century. It's insurance that our industries will continue to have relatively inexpensive electricity, even if fusion takes us longer than we guess.

Q: Edward Teller once told me he would like to see radioactive waste stored so that it could be retrieved. He had a feeling that sometime in the future we are going to find a need for it.

A: He's got a good point. You see, a spent fuel element that comes out of a reactor today still has an enormous amount of energy that can be used, and we don't use it.

Q: Yet the Administration is talking about storing it for 2,000 years.

A: We don't have any choice in the matter. The fact is that a fuel element remains highly radioactive for anywhere from a few hundred years to a couple of thousand years, depending upon your definition of highly radioactive. But I can easily see that 100 years from now or 50 years from now, even, we would want to be taking all those spent fuel elements and recycling them and extracting the unused uranium and plutonium and burning it in another reactor.

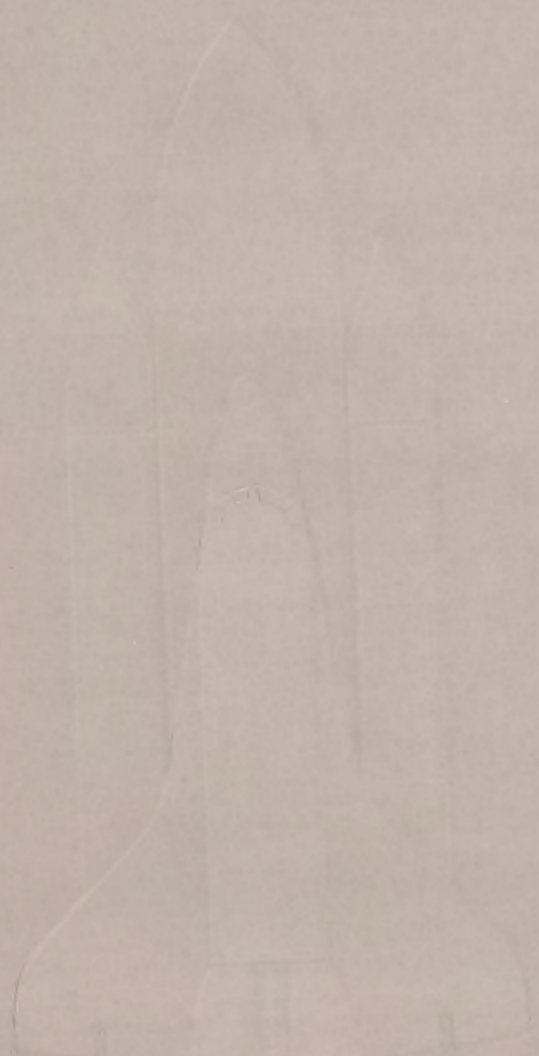
Q: What do you think. . . .

A: Gosh, excuse me but I've got the head of the whole French energy program, who has been waiting for 25 minutes.

Q: We don't want to make the French mad. Thanks so much. ■

SpaceTran

Gateway to Space



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The Geosat Committee, Inc.

January 17, 1983

The Hon. William French Smith
Attorney General of the United States
DEPARTMENT OF JUSTICE
Tenth St. & Constitution Ave. NW
Washington, DC 20530

Dear Mr. Smith:

I was unable to attend the Commonwealth Club meeting on the 21st of December at which you spoke on "Protecting US Technology." In the interest of the activities in which I am involved, I particularly wished to hear you speak.

As you can see from the enclosed flyer, The Geosat Committee is working in areas related to civilian satellites related to gathering knowledge about the global distribution of non-renewable resources and, in that context, how they deal with our future access to such resources. Geosat works in the area of developing satellite remote sensing technology with many interested countries who may (or may not) provide data of use to all of us.

As such, we are particularly interested in the issues you addressed in your talk in San Francisco. I would therefore very much appreciate the opportunity of meeting with you personally and discussing some of our concerns and activities, and receive what advice you might give us as to how to proceed in the common interest of all. I will be in Washington during the middle of March and undoubtedly several other times between now and July. I would be happy to meet with you in Washington, but if that is not convenient, I would like to meet with you in San Francisco, or perhaps we could meet in the Grove in July.

Repsectfully yours,

Frederick B. Henderson III

Frederick B. Henderson III, Ph.D.
President

cc: Gilbert Rye
Ted Storie

153 Kearny Street, Suite 209
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NATIONAL SECURITY COUNCIL

Jan 26

Craig Fuller

This fella visits me whenever he comes to Washington. He is a good source for commercialization initiatives.

G. J. Ryan

DOCUMENT NO. 125780 PD

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FG006-12

OFFICE OF POLICY DEVELOPMENT

STAFFING MEMORANDUM

DATE: 4/26/83 ACTION/CONCURRENCE/COMMENT DUE BY: fyi

SUBJECT: National Security Council memo re: IG Space meeting

National Space Policy

	ACTION	FYI		ACTION	FYI
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PORTER	☐	☐	TURNER	☐	☐
BARR	☐	☐	D. LEONARD	☐	☐
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Edwin L. Harper
Assistant to the President
for Policy Development
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MICHAEL O. WHEELER
Staff Secretary

cc: Edwin Harper
Craig Fuller

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G. PHILIP HUGHES
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OFFICE OF THE VICE PRESIDENT

THE WHITE HOUSE
WASHINGTON

Date 4/25

TO:
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EDWIN L. HARPER

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05

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Name of Correspondent: Charles J. Brooks

☐ **MI Mail Report** **User Codes: (A)** _____ **(B)** _____ **(C)** _____

Subject: Writes Concerning the Spaceship, The Challenger.

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✓ NASA	Referral Note: R	83/03/10		A	83/04/12 TJ
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NASA
National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of: MOC-8

APR 12 1983

Mr. Charles J. Broska
President
CJHB Consulting Corporation
6539 Circulo Dali
Anaheim Hills, CA 92807

Dear Mr. Broska:

I appreciate the concern you expressed in your recent letter to President Reagan relative to our problems with the Shuttle engines. As you know, the Shuttle operation is still in its infancy, and some of the troubles we experienced are the growing pains associated with bringing a new ship on line. I think we have learned several significant lessons from this set of problems with the Challenger engines. Since the leaks were discovered, we have developed several special techniques to measure leakage during engine acceptance test and to test the total engine for leakage during post-acceptance inspections. I am confident these procedures will avoid a repeat of the Challenger problems on future vehicles.

I feel strongly, as you obviously do, that any corporation should stand behind its products. Unfortunately, high technology development contracts with the National Aeronautics and Space Administration do not provide a mechanism for holding a specific contractor totally responsible for all costs associated with a deficiency in their product. However, we do have a defective product clause which will require the contractor to rectify the deficiency without accruing profit for their added work. We also have special award fees that are obtainable only by satisfactory performance. I have taken steps to see that these tools are invoked to the maximum extent possible to make sure that the responsible parties feel the impacts in their profit line.

I appreciate your interest in NASA and our Shuttle program and look for your continued support.

Sincerely,

J. Abrahamson

JAMES A. ABRAHAMSON
Lieutenant General, USAF
Associate Administrator
for Space Flight

MOC-8

APR 12 1983

Mr. Charles J. Broska
President
CJHB Consulting Corporation
6559 Circulo Dali
Anaheim Hills, CA 92807

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JAMES A. ABRAHAMSON
Lieutenant General, USAF
Associate Administrator
for Space Flight

bcc: Agency Liaison/Rm. 91
The White House
A, AD, AEM, L

CONCUR INITIALS					
DATE	ACTION:M83-274			SEE PREVIOUS SHEET	

PREPARED BY MOC-8:MCMCILWAIN:BRC:4-5-83:55247/RETYPED:4-8-83

NASA FORM 1267 (FEB 79) PREVIOUS EDITIONS MAY BE USED.

OFFICIAL FILE COPY

T H E W H I T E H O U S E O F F I C E

REFERRAL

MARCH 10, 1983

TO: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACTION REQUESTED:
DIRECT REPLY, FURNISH INFO COPY

DESCRIPTION OF INCOMING:

ID: 129008

MEDIA: LETTER, DATED FEBRUARY 16, 1983

TO: PRESIDENT REAGAN

FROM: MR. CHARLES J. BROSKA
PRESIDENT
CJHB CONSULTING CORPORATION
6539 CIRCULO DALI
ANAHEIM HILLS CA 92807

SUBJECT: WRITES CONCERNING THE SPACESHIP, THE CHALLENGER

PROMPT ACTION IS ESSENTIAL -- IF REQUIRED ACTION HAS NOT BEEN TAKEN WITHIN 9 WORKING DAYS OF RECEIPT, PLEASE TELEPHONE THE UNDERSIGNED AT 456-7486.

RETURN CORRESPONDENCE, WORKSHEET AND COPY OF RESPONSE (OR DRAFT) TO:
AGENCY LIAISON, ROOM 91, THE WHITE HOUSE

SALLY KELLEY
DIRECTOR OF AGENCY LIAISON
PRESIDENTIAL CORRESPONDENCE

MAR 14 3 25 PM '83

RECEIVED

THE WHITE HOUSE
WASHINGTON

Date: 3-7-73

To: Sally

Porter is a "first name" kind of K.K. Please send to NASA (give # 3) & have them answer him.

Thanks.

KATHERINE SHEPHERD
Presidential Correspondence
Office
Room 98, x7610

CJHB CONSULTING CORPORATION
6539 CIRCULO DALI
ANAHEIM HILLS, CALIFORNIA 92807
(714) 998-2710

CHARLES J. BROSKA
President

7951

February 16, 1983

20009

The Honorable
Ronald W. Reagan, President
The White House
Washington, D. C.

Dear Mr. President:

Jean and I both thank you very much for your letter of January 27, 1983, and for the Christmas card enclosed. It sure did brighten up a long business day.

You sure did look great celebrating your birthday cake on national television. Your Bride, Nancy, looked very happy and also was enjoying the joyous ocassion. Whatever you are doing to look as good as you do, President Ron, just keep on doing it. It will go a long way towards the start of your campaign for reelection in 1984. You are-are you not?

President Ron, I was shocked to learn of the many problems caused by the power plant, the energy source for the new spaceship, the Challenger which is being readied for flight. What is being conveyed to the public indicates that a problem after problem is in the offing. First there was some leakage; then it was another; the engine was replaced, and now - hopefully, we'll get her off the ground. No not again! Another leak and another engine. All of this sure must be expensive for NASA and their labor costs and I'm sure playing havoc with their budget and timing. A real sincere question President Ron - who does absorb this additional expense? It is sincerely felt the cost should be passed on back to the supplier for the lack of quality control procedures. All of this should be an integral part of the contract for purchase, not only in this instance but in all areas. If it was not done someone should explain why this was overlooked considering all of the experiences in the past. Perhaps the cost is insignificant in light of all other budget problems; but, if corrected - this and other instances could go a long way in helping to keep costs down in the area of defense expenditures, research et cetera.

I hope your decision is to RUN AGAIN!!!!!! The year 1984 is just around the corner and my friends and I want to become so very much involved. Your plans are starting to jell and there is no reason to give someone else the credit for the "stuff" you have taken these past few lengthy months. If interest rates came down somewhat - just a little more, it surely would help and you should be taking the credit for all of it and not just Mr. V. from the Fed. God Bless and Keep the Faith. Kindest regards.

Sincerely,

A370576