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FOIA MARKER

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Record Group/Collection: George H.W. Bush Presidential Records
Collection/Office of Origin: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: National Security Files

OA/ID Number: 62072
Folder ID Number: 62072-001

Folder Title:
[National Aero-Space Plane] [3 of 4] [1991]

Stack:

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Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
01. Presentation	Hypersonic Propulsion (28 pp.)	2/25/91	(b)(1)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: National Security Files
WHORM Cat.:
File Location: [National Aero-Space Plane] [3 of 4] [1991]

Date Closed:	2/25/1991	OA/ID Number:	62072-001
FOIA/SYS Case #:	2005-0336-F	Appeal Case #:	
Re-review Case #:		Appeal Disposition:	
P-2/P-5 Review Case #:		Disposition Date:	
AR Case #:		MR Case #:	
AR Disposition:		MR Disposition:	
AR Disposition Date:		MR Disposition Date:	

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 the 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]

C. Closed in accordance with restrictions contained in donor's deed of gift.

PRM. Removed as a personal record misfile.

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

(b)(1) National security classified information [(b)(1) of the FOIA]
(b)(2) Release would disclose internal personnel rules and practices of an agency [(b)(2) of the FOIA]
(b)(3) Release would violate a Federal statute [(b)(3) of the FOIA]
(b)(4) Release would disclose trade secrets or confidential or financial information [(b)(4) of the FOIA]
(b)(6) Release would constitute a clearly unwarranted invasion of personal privacy [(b)(6) of the FOIA]
(b)(7) Release would disclose information compiled for law enforcement purposes [(b)(7) of the FOIA]
(b)(8) Release would disclose information concerning the regulation of financial institutions [(b)(8) of the FOIA]
(b)(9) Release would disclose geological or geophysical information

THE WHITE HOUSE

WASHINGTON

February 26, 1991

MEMORANDUM FOR RICHARD G. DARMAN

FROM: D. ALLAN BROMLEY *AWB*

SUBJECT: NASP BUDGET SUBMISSION, FY 92

In the course of our discussions with the Vice President, you asked that we provide succinct information on the NASP teaming arrangement and on NASP spinoff technologies for OMB's use. Those papers are attached. (We have much greater detail should you be interested.) Please let me know if we can be of further help.

Attachments:

1. The NASP National Team
2. NASP Technical Accomplishments
3. NASP Technology Spinoffs

THE NASP NATIONAL TEAM

The NASP National Program Office (NPO) was formerly established in 1990 with the strong backing and support of the government-led Joint Program Office (JPO). The NPO consists of the five original contractors: General Dynamics, McDonnell Douglas, Rockwell, Pratt and Whitney, and Rocketdyne.

The teaming agreement is structured to ensure equality, and equitability of work so that in the future the U.S. aerospace industry will have at least five companies competent in air-breathing hypersonic vehicle design and development. The management and organization of the NPO is designed to ensure an equal sharing of responsibility among the joint venture partners. It is headed by a Program Director from Rockwell who was chosen by the companies.

Equitability within the NPO is not measured on the basis of the volume of work each contractor does but on the understanding that the parties will have an equitable participation in all of the technical and management functions of the X-30 program. In practice each of the contractors is assigned lead responsibilities. In addition, each of the three airframe companies is assigned a lesser role in those airframe areas where it is not the designated leader. This same partnership philosophy is applied to the two propulsion companies -- Rocketdyne and Pratt and Whitney. In this way accountability is maintained through the designation of "leads" while at the same time providing the five companies experience in all areas of the NASP airframe or propulsion system.

With the formation of the NPO the nature of the contract also transitioned from a competitive, fixed-price acquisition to a single, cost-plus-award-fee contract. To further promote cooperation among the contractors the NPO agreed to an equal distribution of the contract fee. According to the Program Director, "By equally dividing the fee, all contractors will recognize that the only way to earn money is to do what's best for the program. The only way a company can succeed is if the whole team does."

Yet another innovative concept that breaks new ground is the involvement of government labs and research centers in this national effort. Using a process called "mainlining" certain government facilities essentially assume the role of subcontractors and accept responsibility for explicit pieces of NASP work. Their work statements are developed jointly by the NPO and the Joint Program Office but only JPO directs the labs. As a result accountability is maintained but the unique expertise the labs possess is not lost to the program.

NASP TECHNICAL ACCOMPLISHMENTS

The following represent some of the key technical accomplishments for which the NASP program can take credit:

1. The development of a synergistic NASP vehicle design which produced better performance than any of the previous competitive designs. The design features a twin-tailed, wedged-shaped aircraft with three scramjet engines incorporated within the underside of the X-30.
2. Completion of subscale wind tunnel testing to speeds greater than Mach 14. These tests provided the lift, drag, and control moments that establish the basis for vehicle performance prediction.
3. Completed a series of tests to successfully demonstrate a scramjet engine operating at a speed of Mach 17.
4. Manufactured titanium metal matrix composite panels and installed them in a structural test fixture. The panels will be used for thermal protection on the underside of the X-30.
5. Manufactured a large-scale cryotank section. The lightweight tank section passed two tests at full pressure with liquid nitrogen substitute. This was the first successful demonstration of the lightweight thermoplastic noncircular tank concept.
6. Completed development of computational fluid dynamic (CFD) codes for the hypersonic forebody, inlet, and nozzle component flows. These CFD codes were validated by simulating the experiments in a hypersonic wind tunnel. The CFD codes provided key reaction rates for hydrogen-air mixtures required for accurate scramjet performance.
7. Successfully tested a concept for actively cooling the airframe, demonstrating that leading edge structures can withstand the heat produced at speeds approaching Mach 15.

NASP TECHNOLOGY SPINOFFS

The following represent technology spinoffs resulting from the NASP Technology Development Program. They are identified as actual (A) or in process (I) spinoffs.

1. (A) The development of expanded integrated thermal-structural analysis tools for larger, more complex applications. These new methods have already been used for the design of a heat exchanger on a fighter aircraft and, the fabrication of lighter, stiffer wings for commercial aircraft.
2. (A) The development of a new set of analytical methods for computing supersonic/hypersonic boundary layer transition that result in more accurate drag prediction and lighter aircraft.
3. (A) The design and manufacture of prosthetic joint replacements. By using titanium metal matrix composites developed under the NASP program the durability of many joint replacements will double (20 years versus the 10 year average life) resulting in a dramatic reduction in the number of major prosthetic surgical procedures. These new joint replacements are currently in the FDA evaluation cycle.
4. (A) The development of new thermal barrier material that is virtually opaque to infrared energy. It has the potential to reduce home cooling costs by 20% and lower heating costs by 10%.
5. (I) The design and fabrication of lightweight, high temperature internal combustion exhaust valves. The valves are 50% lighter than conventional steel valves and will have higher oxidation resistance.



Rockwell International

9/30/91

Rich,

Attached are the technology transfer briefing and newsletters that Tom Hansha briefed. I hope they are useful to you and Dr. Bromberg.

I very much enjoyed visiting with you last week and look forward to working with you in the future.

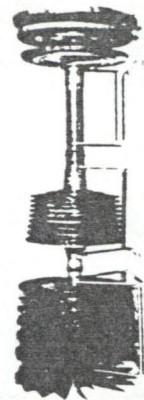
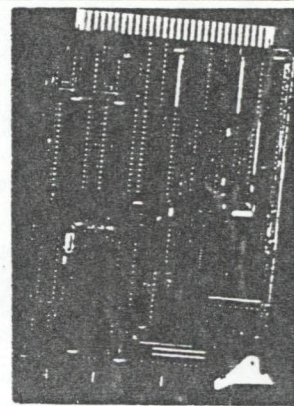
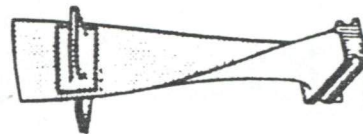
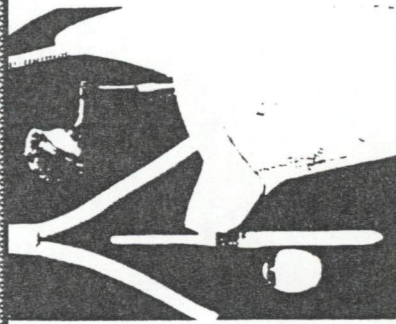
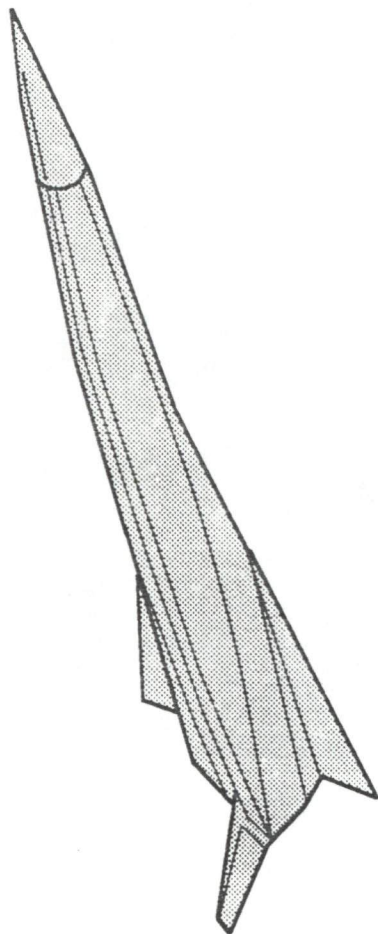
Regards,

Clay

CLAY JONES

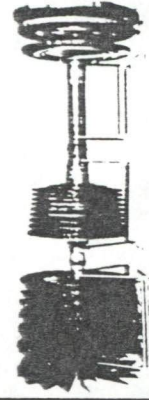
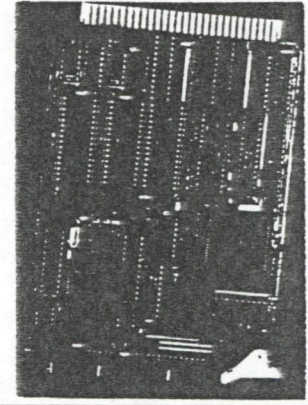
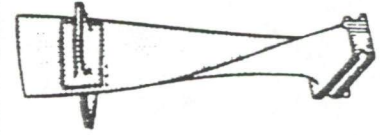
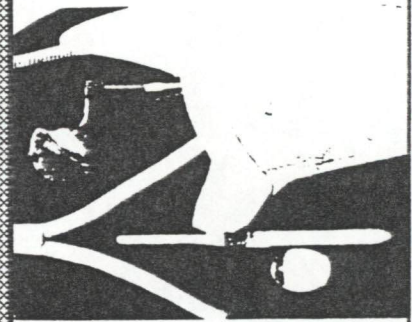
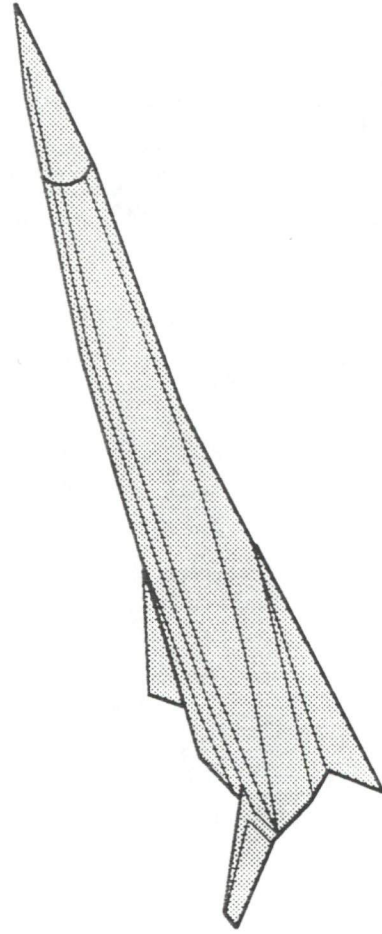


NASP TECHNOLOGY TRANSFER





NASP TECHNOLOGY TRANSFER





NASP TECHNOLOGY TRANSFER

T² Elements - 2D SOW

- T² Policy And Procedures, Define And Establish
- Create T² MOEs
- Establish T² Communications
- Identify/Assign Functional And Technical Leads
- Produce Technology Assessments
- Survey/Document Previous Or In-Process Transfers
- Evaluate Transfer For Net Economic Benefit
- Produce Technology Descriptions
- Evaluate Potential Of NASP Technologies For Application To:
 - Shuttle
 - Shuttle Replacement
 - Existing/New ELVs
 - A/C Jet Engines
 - 5 Other Aerospace Applications



NASP TECHNOLOGY TRANSFER

Outline

- ⇨ • Background And Objectives
- Technology Transfer - General
- Technology Transfer - NASP
- Issues
- Actions



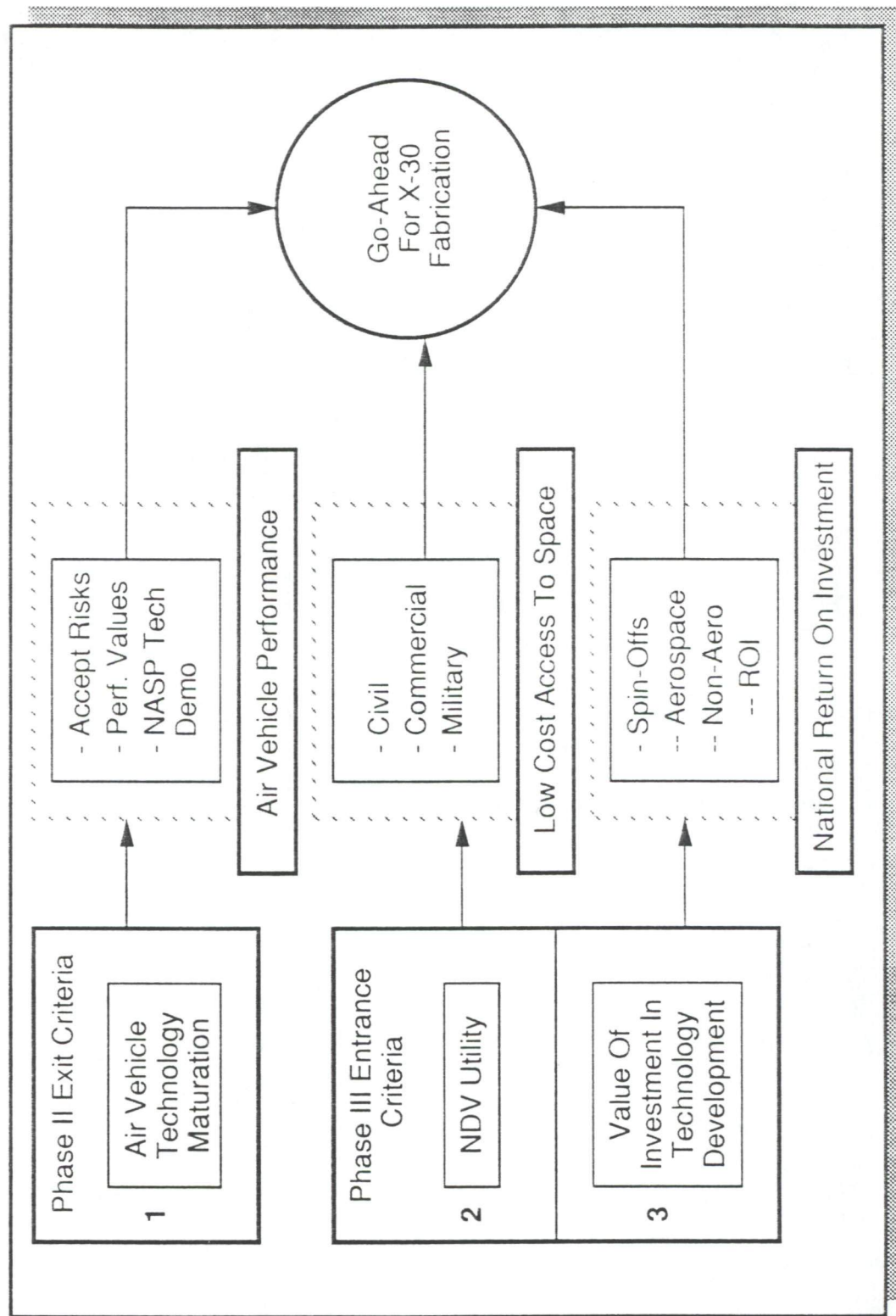
NASP TECHNOLOGY TRANSFER

Background And Objectives



NASP TECHNOLOGY TRANSFER

Phase III Go-Ahead Conditions



NASP Technology Development Must Satisfy
Three Conditions For Program Go-Ahead



NASP TECHNOLOGY TRANSFER

Objectives

- Provide National Return On Investment Of 5 Billion Dollars
- Maximize Leverage Of U.S. Technology Development Through Rapid, Direct, Introduction Of NASP Technologies To U.S. Commercial, Civil, And DoD Sectors
- Help To Maintain U.S. Lead In Aerospace Technologies
- Rigorize/Formalize The Technology Transfer Process To Provide The Most Efficient Means Of Transfer
 - Commercial, Civil Education Systems, National Security
 - Specific Applications And Transfer
 - Measurement Of Technology Transfer Success Development



NASP TECHNOLOGY TRANSFER

Outline

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NASP TECHNOLOGY TRANSFER

Technology Transfer - General



NASP TECHNOLOGY TRANSFER

Technology Transfer - Definitions

1. Transfer Of Intellectual Property Such As A Patent, Trade Secret, Etc.
2. Transfer Of Some Piece Of Technical Information, Knowledge, Know-How Or Wisdom That Reduces Uncertainty And/Or Risk, And Assists The Recipient In Making Quicker And Better Technical Decisions



NASP TECHNOLOGY TRANSFER

Technology Transfer - Definitions (Cont'd)

<i>What</i>	<i>To Whom</i>	<i>Why</i>
3. "Oral Or Written Information Or Data, Hardware, Personnel Services, Facilities, Equipment Or Other Resources Relating To Scientific Or Technological Developments Of An Air Force RDT&E Activity...	Provided Or Disclosed By Any Means To Another Federal Agency, A State Or Local Government, An Industrial Organization, Including Corporation, Partnership, Limited Partnership, Or Industrial Development Organization, Public Or Private Foundation, Non-Profit Organization Including A University Or Other Person...	To Enhance Or Promote A Technological Or Industrial Innovation For A Commercial Or Public Purpose."



NASP TECHNOLOGY TRANSFER

"Despite the abundant lip service given the concept of technology transfer, this is no trivial undertaking that can be accomplished through facile slogans or good intentions."

Dr. Angel Jordan
Carnegie-Mellon University



NASP TECHNOLOGY TRANSFER

Technology Transfer - Legislative Background

- Bayh-Dole Act Of 1980
 - Applied To GOCO Labs - Allowed Granting Of Exclusive Rights To Contractor
- Public Law 96-480, Stevenson Wydler Technology Innovation Act Of 1980
 - Established Technical Transfer Uniformity For Government Agencies
 - Allowed Using .5% Of R&D Budget For Technical Transfer
 - Established ORTAs
- Federal Technology Transfer Act Of 1986
 - Delegated CRDA Authority To Federal Labs
 - Provided For Royalty Sharing Between Government And Inventor
- Executive Order 12591, Facilitating Access To Science Technology, 10 April 1987
 - Delegated CRDA Authority To Individual Labs
- DoD Regulation 3200.12-R-4, Domestic Technology Transfer Program, 27 December 1988
- Air Force Regulation 80-27, Domestic Technology Transfer, 31 January 1990



NASP TECHNOLOGY TRANSFER

Challenges Of A Unique Program Structure

*NASP Technology Base Is Multi-Dimensional
325 Organizations In 44 States*

Government
DoD SDIO NASA NIST DARPA 41 Organizations

Commercial
Major Aerospace Firms Aerospace Suppliers Specialty Firms 261 Organizations

National Labs
Los Alamos Oak Ridge Sandia

Educational Institutions
20 Colleges And Universities

*Program Structure Itself Will Enable Technology Transfer
To Some Degree*



NASP TECHNOLOGY TRANSFER

Outline

- Background And Objectives
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NASP TECHNOLOGY TRANSFER

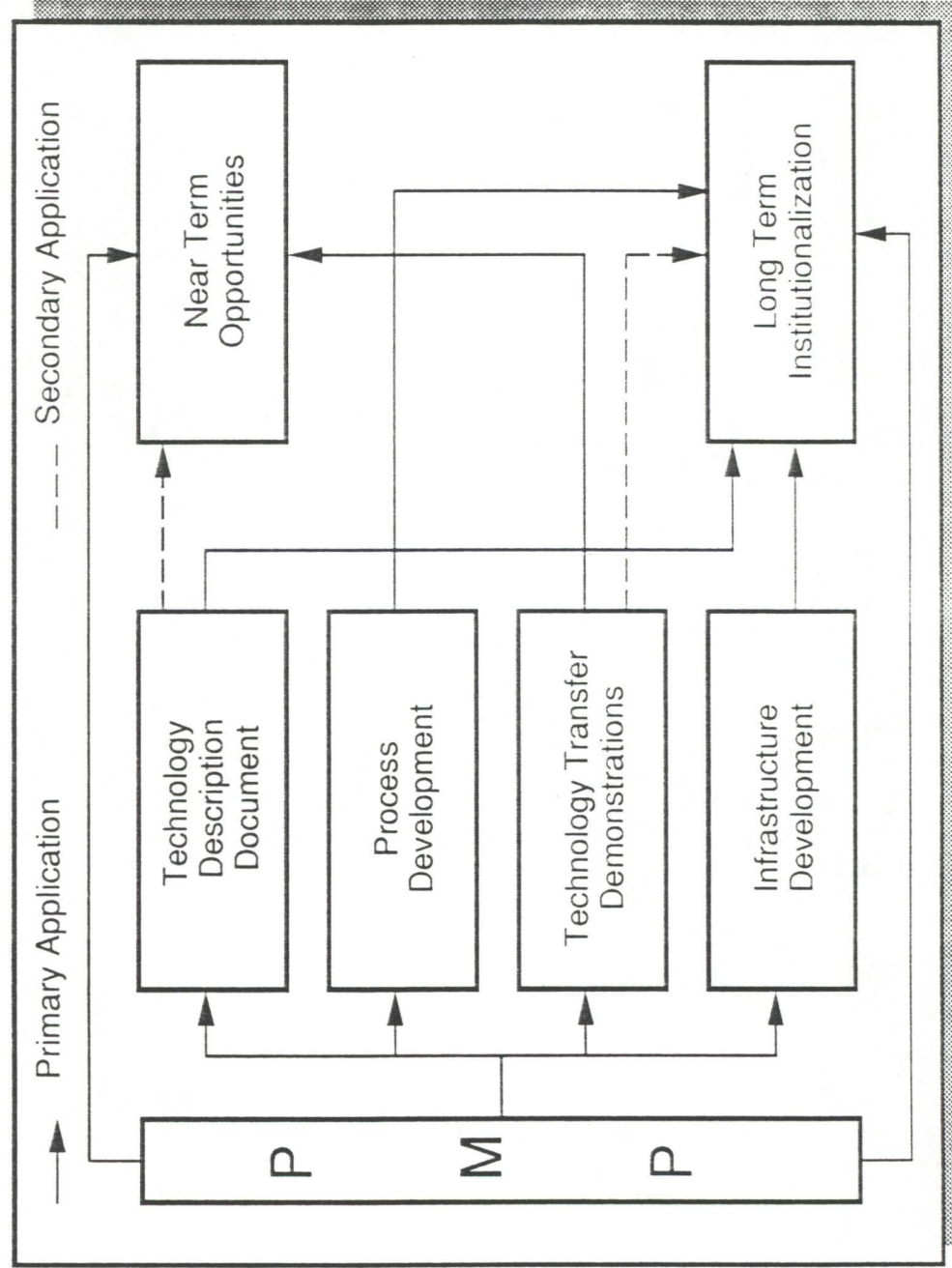
NASP T² Program



NASP TECHNOLOGY TRANSFER

Program Overview

Five Inter-Related Components





NASP TECHNOLOGY TRANSFER

Systems Approach To Technology Transfer

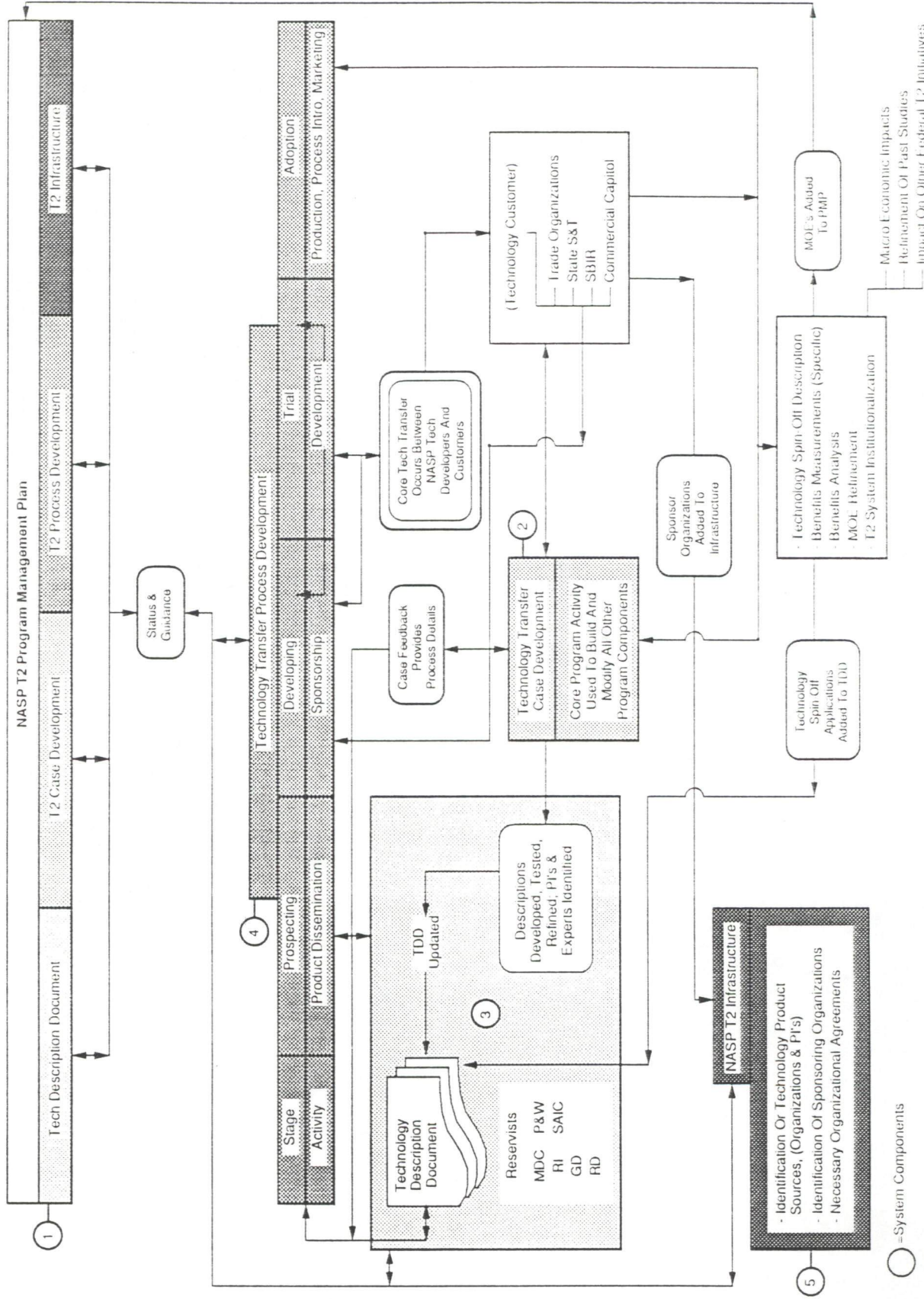
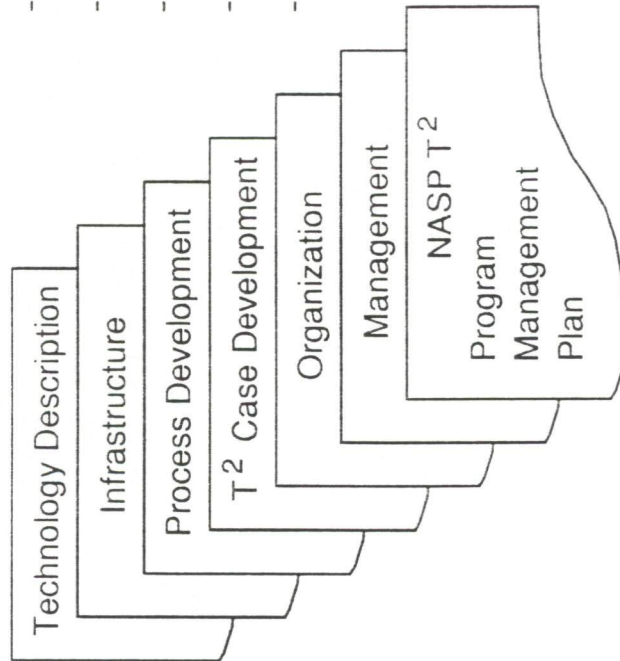


Figure Systems Approach To Technology Transfer



NASP TECHNOLOGY TRANSFER

Program Management Plan



- Details Management Of Entire Process
- Identifies All Participants
- Contains Detailed Schedules For All Actions
- Focal Point For Reviews By JPO
- Designed To Be Updated As Needed

The NASP T² PMP Will Be The Core Document To Be Used By The JPO To Control The Development And Operation Of The NASP Technology Transfer Program. It Will Be Directive Upon NASP Organizations And Contractors.



NASP TECHNOLOGY TRANSFER

Technology Baseline Document

- Essentially A Technology Marketing Tool
- Being Developed In Consonance With Industry
 - Face-To-Face Meetings With Industry Players To Determine Best Information Mix
 - Aim Is To Develop An Optimum Format For Multiple Users
 - Applications Examples Aimed At Seeding Innovation For New Processes/Products
- Will Be A Living Document
- Information Will Fall Under ITAR Restrictions
- Three Versions
 - Publicly Releasable
 - FOUO
 - Classified
- Goal To Have Information Interleaved With Infrastructure



NASP TECHNOLOGY TRANSFER

Technology Transfer Case Development

- Core Activity Driven For All T² Program Components
- Aimed At Near To Mid-Term
 - Near Term: 180 Days
 - Identify Transfers That Have Taken Place Or Are In Process As A Natural Result Of The NASP Program Structure
 - Mid Term: 18-24 Months
 - Pursue Set Number Of Opportunistic And Likely Cases
 - Utilize In-Place Organizations And Agreements To Max Extent
- Highlight And Publish Success Cases With Top Level Benefits Assessment
- Catalog Lessons Learned For Long Term Goals
 - Process Differentiation And Refinement To Satisfy Multiple Client Base
 - Infrastructure Development - "Membership Roles," Communications



NASP TECHNOLOGY TRANSFER

T² Process Development

- Objective Is To Develop "Standard" (Repeatable) Methods
 - Boilerplate Starting Point
 - Transfer Cases Used To Gather/Analyze Process Data
 - Results Added To PMP
 - Final Report Separate Document - "How To" Format



NASP TECHNOLOGY TRANSFER

Process Overview

Basic Objective:



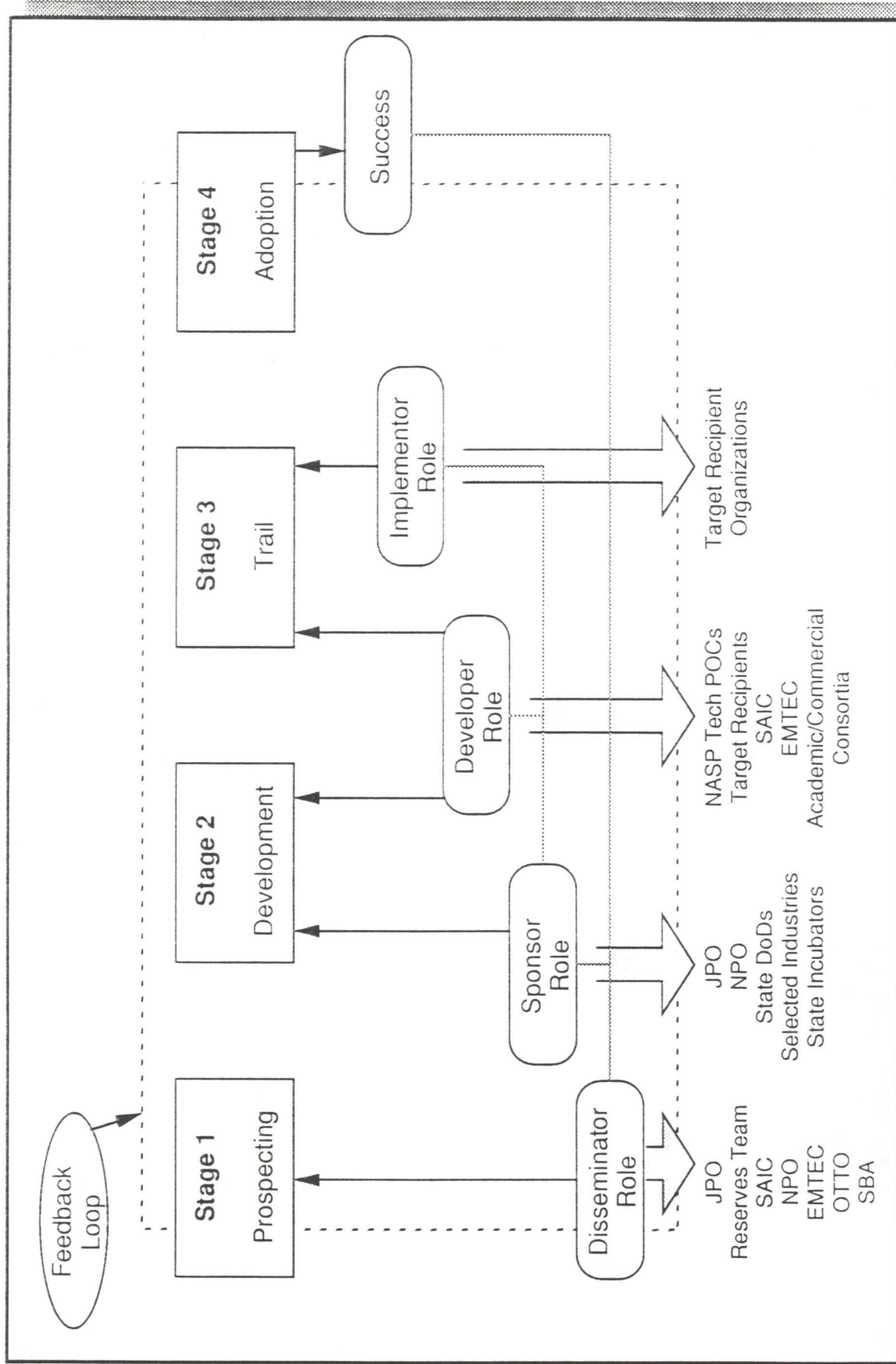
Process Requires:

- Access To Technology Base
- Identification Of Potential Applications
- Identification Of Real Technical Problems
- A Market Driven Imperative For A Solution
- Adaptive Engineering For Spin-Offs
- Funding Source(s) For Further R&D And Capital Investment
- Infrastructure To Support Entire Process



NASP TECHNOLOGY TRANSFER

Boilerplate Process - Stages/Roles/Participants





NASP TECHNOLOGY TRANSFER

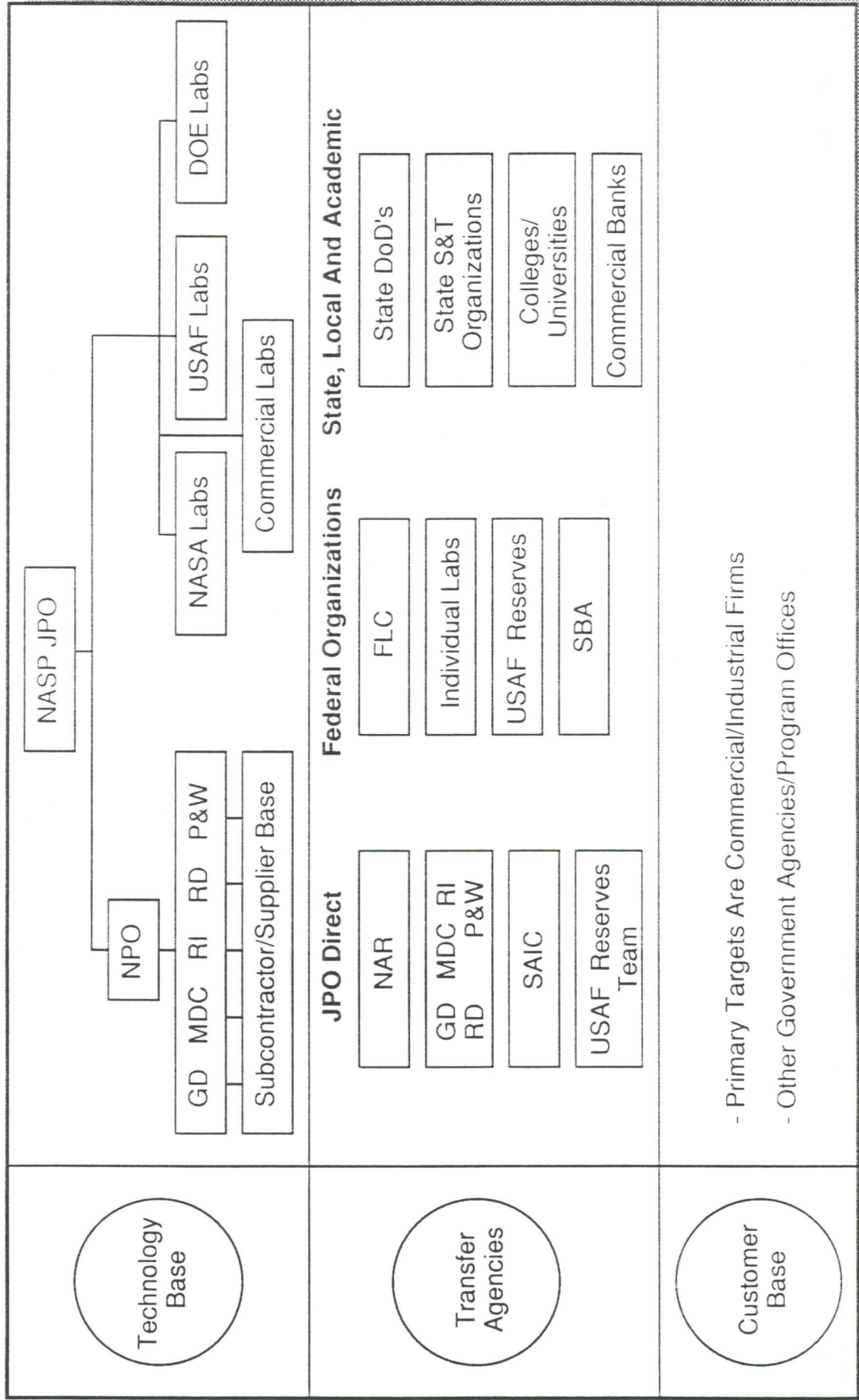
Infrastructure Development

- Identify
 - Sources Of NASP Technologies
 - Government Labs
 - Commercial Organizations
 - Primary Methods Are Surveys And Case Development
 - Pinpoint Locations And Principal Investigators
- Technology Transfer Organizations
 - JPO And Contractors
 - State, Local Government S&T
 - Commercial/Government Sponsorship Funding
- Customer Base
 - Government
 - Commercial
- Communications Requirements/Protocols
 - Data Base (e.g., SDIO TAIS)
- Document
 - "Directory" By Technology Transfer Organizations & Function



NASP TECHNOLOGY TRANSFER

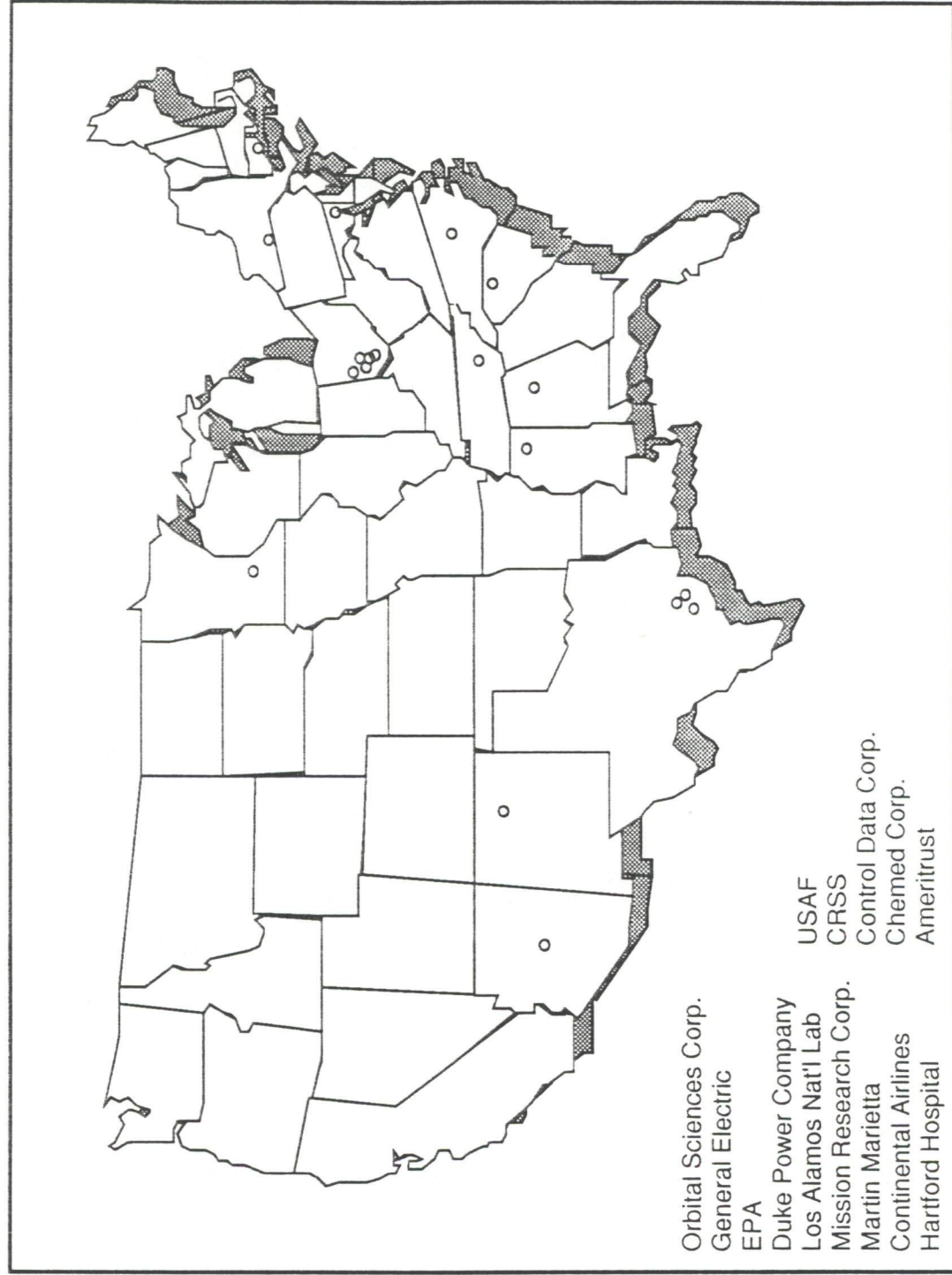
Basic Infrastructure





NASP TECHNOLOGY TRANSFER

Reserves Technology Transfer Team





NASP TECHNOLOGY TRANSFER

USAF Reserves Task Elements

- Perform Applications Assessments* Of NASP Technologies
 - Identify Potential Users (Maybe Their Employers)
 - Assist In Identifying Specific Source/Owner Of Technology
 - Identify/Quantify Potential Payback Of Transfer
 - Assist In Formulating T² Process Procedures
- Provide Summary Reports Of Findings
- Assess Role And Probability Of Participation Of Other Organizations In The NASP T² Process

*Definition: A Summary To Emphasize Potential Application Of Each Technological Development Having Potential Usefulness To State And Local Government Or Private Industry (AFR 80-27)



NASP TECHNOLOGY TRANSFER

Transfer Metrics

- In General, NASP Technology Transfer Occurs When NASP-Developed Technology Has Been Applied To A Non-NASP Product Or Process By A Government Or Non-Government Customer
- Measured In Terms Of MOE's Within Qualifying Condition

Qualifying Conditions

Product:	Workforce:
- Qualitative Improvement - Reduced Cost - Entirely New - Added Application	- Jobs Created - Jobs Saved - Increase In Tech Skills - New Industry Created
Process:	Others:
- Simplification - Error Reduction	- New Research Methods Enabled

MOE's

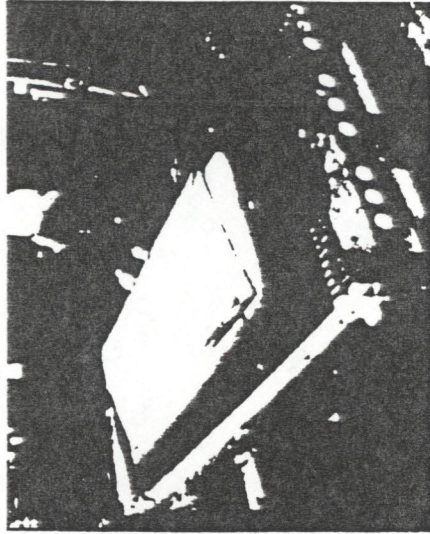
Product:	Economic:
- Decreased Cost - Decreased LCC - Increased Sales - Defect Reduction - New Products	- Δ Employment #'s - Royalties Received By Labs \$ - Tax Revenue Gains \$ - Exports/#'s, \$
Process:	Quality Of Life:
- Time Decrease - Quality Increase - New Process	- Environmental - Direct Health - Information/ Education



NASP TECHNOLOGY TRANSFER

Single Crystal Alumina (Al_2O_3) Fiber

SINGLE CRYSTAL ALUMINA FIBER



EXPERIMENTAL NASP SKIN PANEL

NASP MATERIALS PROGRAM

- SINGLE CRYSTAL SAPPHIRE FIBER POSSESSES A HIGHER COEFFICIENT OF THERMAL EXPANSION THAN SILICON-CARBIDE, DESIRABLE PROPERTY TO PREVENT MATRIX CRACKING.
- FUNDED REDUCTION OF SINGLE CRYSTAL SAPPHIRE SIZE TO 3 MILS.
- SINGLE CRYSTAL SAPPHIRE METAL MATRIX COMPOSITES (Ti) DEVELOPMENT DROPPED BECAUSE TITANIUM ALUMINIDES WERE TOO BRITTLE.

SHORT TERM



LESS EXPENSIVE
SINGLE CRYSTAL FIBER
COMPOSITES (PANEL)

LONG TERM



TURBINE ENGINE
COMPONENTS
(COMPRESSOR BLADE)

OTHER APPLICATIONS

- SHORT TERM BENEFIT TO FIBER USERS BY MAKING AVAILABLE WIDER SELECTION OF SIZES.
- SHORT TERM BENEFIT TO FIBER USERS BY TO REDUCING PROCESSING COSTS.
- LONG TERM BENEFIT THROUGH IHPTET TO MILITARY AND COMMERCIAL TURBINE ENGINES.

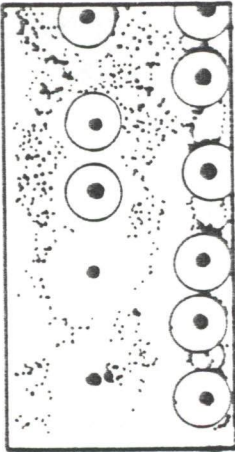
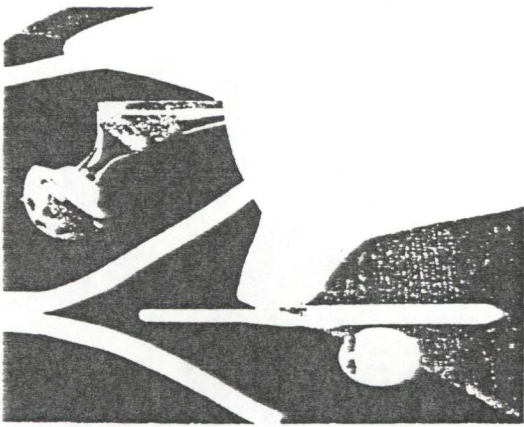


NASP APPLICATIONS AND DEVELOPMENT

- Titanium Aluminides Showed Promise For Multiple NASP Applications:
 - High Temperature/Strength Characteristics
 - Light Weight/Volume
- } Structures Skins
- NASP Research Addresses
 - Ductility Of MMC Alloys
 - Characterize/Control Interactions Of Matrix Fibers With Parent Metal
 - Fiber Development (Al_2O_3 - Alumina)
 - Fiber Coating Development
 - Matrix Alloy Fabrication Techniques
 - NASP Goal
 - Evaluate, Characterize, Develop, Demonstrate And Produce Advanced Material



NASP TECHNOLOGY TRANSFER BETA TITANIUM DEVELOPMENT

	<u>NASP DEVELOPMENT ENABLED:</u> ● FABRICABLE Ti ALLOYS WITH HIGH CORROSION RESISTANCE ● PRODUCTION OF COMMERCIAL SCALE BILLETS ● RESULTING PROPERTIES (HIGH MODULUS, CORROSION RESISTANCE, NO VANADIUM, REDUCED ALUMINUM CONTENT) MAKE Ti AL ATTRACTIVE IN MEDICAL APPLICATIONS
	<u>COMMERCIAL APPLICATIONS INCLUDE:</u> ● ORTHOPEDIC JOINT REPLACEMENT - BIOMET, ZIMMER, DEPUY - METAL IS NON-TOXIC - JOINT LASTS TWICE AS LONG - GREATLY REDUCED IMPLICATION TO ALZHEIMER'S DISEASE - CURRENTLY IN FDA EVALUATION CYCLE ● BENEFITS - POTENTIAL TO ELIMINATE APPROX 70 K SURGERIES/YR



NASP APPLICATIONS AND DEVELOPMENT

- NASP Requires A Replacement For Existing Titanium Alloy (Ti-15-3)
 - Ti-15-3 Has Excellent Fabrication Characteristics, Good Ductility, Strength And Fiber Compatibility

But:

- Ti-15-3 Has Poor Oxidation Resistance

- Alternate Alloy Of T-15-3 Required With Oxidation Resistance
- Alloys Baselined Were:
 - Ti-Cr And Ti-Mo With Additions Of Nb, Si And Al



TECHNOLOGY PATH FROM DEVELOPMENT TO SPIN-OFF

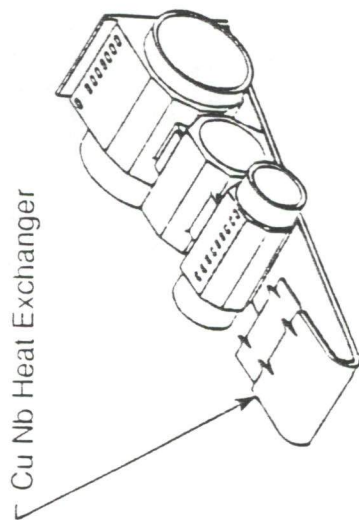
- MDC Given Task By NASP Materials ASAP
- MDC Subcontracted To TIMET To Develop Alloys
- The Resulting Beta 21S Alloy Exhibited
 - Comparable Fabricability To Ti-15-3
 - Better Creep Properties Than Ti-15-3
 - 100x The Corrosion Resistance Than Ti-15-3
 - Higher Tolerance For Hydrogen
- Final Beta 21S Characteristics Were Attractive To Orthopedic Implant Supplies
 - Current Implant Has Vanadium Which Is Toxic, While Beta 21S Has None
 - Beta 21S Modules Of Elasticity Is Better Match To Human Bone
 - Beta 21S Has Reduced Al Content Which Is Implicated In Alzheimers
- Beta 21S Implants Show Potential For Reducing Number Of Implant Replacement Surgeries
- Alloy Being Evaluated By FDA And At Least Three Implant Suppliers (Bio Met, Zimmer And Depuy)



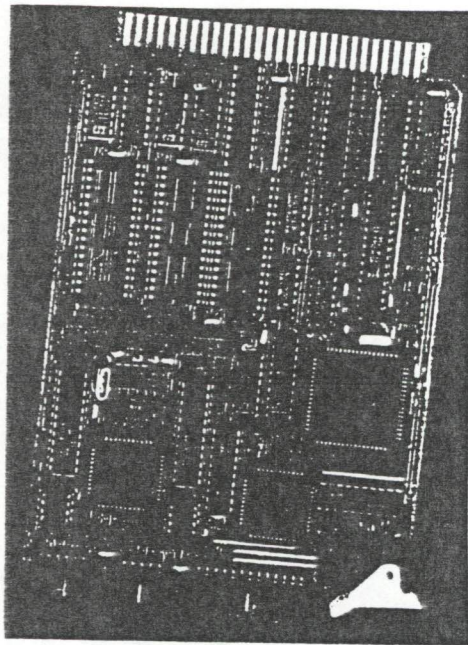
NASP TECHNOLOGY TRANSFER

High Conductivity Composites

NASP LEADING EDGE CROSS SECTION



Cu Nb Heat Exchanger



NASP MATERIALS PROGRAM PRODUCED:

- SCALE UP TO BILLET SIZE MATERIAL
- WORK ON ROLL BONDING TECHNIQUES FOR HEAT EXCHANGER COMPONENTS
- METAL EXHIBITED GREATER THAN PREDICTED STRENGTH
- COMBINATION ENABLES LOW COST (NO MACHINING) COMPONENTS FOR HIGH STRENGTH, HIGH CONDUCTIVITY APPLICATIONS

COMMERCIAL APPLICATIONS INCLUDE:

- TEXAS INSTRUMENTS EVALUATING:
 - HIGH STRENGTH PHONE WIRING FOR COMMERCIAL PHONE SYSTEMS
 - DURABLE AIRCRAFT WIRING
 - ELECTRONIC CIRCUIT HEAT TRANSFER COMPONENTS
- BENEFITS:
 - LOW/NO MAINTENANCE CRITICAL WIRING
 - NEW APPLICATIONS FOR CONDUCTIVE MATERIALS ENABLED



NASP APPLICATIONS AND DEVELOPMENT

High Conductivity Composites

- Class Of Materials Needed Primarily For Leading Edges And Engine Walls
- High Heat Flux In Those Areas Necessitate High Conductivity Materials
- Four Classes Of Materials Investigated:
 - Cu-X Microcomposites
 - Gr/Cu (Graphite Reinforced Copper)
 - Advanced Beryllium Materials
 - Aluminum Nitride
- NASP Program Drove Fabrication Techniques For New Classes Of Materials



TECHNOLOGY PATH FROM DEVELOPMENT TO SPIN-OFF

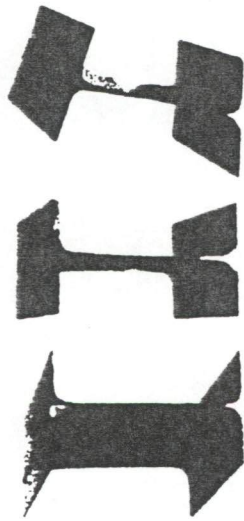
- Original Cu-Nb Work By NASA AMES
 - Characterized Material Based On Work Searching For Alternate Process For Production Of Cu-Nb₃Sn Superconductors
- Rocketdyne Work On Copper Lines For Shuttle Main Engines
- NRC Produced Commercial Scale Billets (Proprietary Process)
- TI Roll Bonding Process Used To Make Thin, High Strength Conductive Components (Proprietary Process)
- Spin-Offs Being Examined By TI Include:
 - Substrates For Electronic Circuit Boards
 - High Strength Configuration Cooling Coils
 - Durable Aircraft And Other Critical Wiring In Harsh Environments
 - Telephone Drop Lines (Pole To House) To Stand Up To Snow And Ice Loads



NASP TECHNOLOGY TRANSFER

Titanium Aluminide Castings

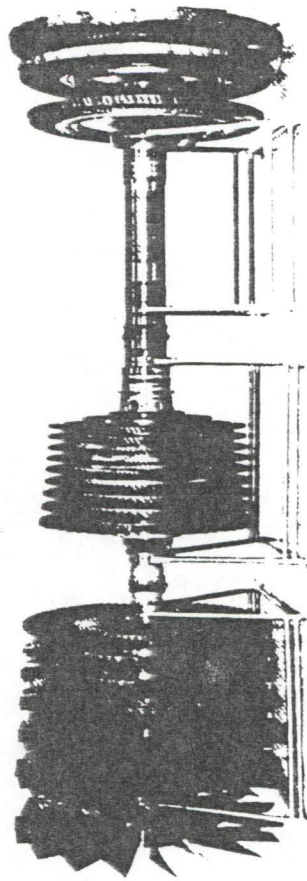
NASP CAST PARTS FOR STRUCTURAL MEMBERS



NASP MATERIALS PROGRAM PRODUCED:

- PRODUCTION FORMING METHODS INCLUDING: CASTING, FORGING, AND MACHINING
- Ti-Al PARTS EXHIBIT HIGHER SPECIFIC STRENGTH, STIFFNESS, AND TEMPERATURE RESISTANCE THAN COMPARABLE Ti-ALLOY PARTS
- NET SHAPE CASTING OF Ti-Al PARTS ELIMINATES THE DIFFICULT MACHINING PROCESS REQUIRED FOR PART TOLERANCES
- Ti-Al AND Ti-ALLOYS ARE LESS DENSE THAN 50% OF THE DENSITY OF CONVENTIONAL SUPER ALLOYS

AIRCRAFT/AUTOMOBILE PARTS



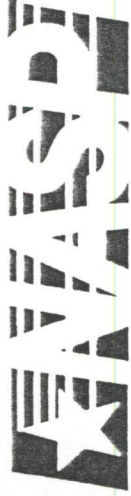
COMMERCIAL APPLICATIONS INCLUDE:

- LESS EXPENSIVE, LIGHTWEIGHT, HIGH STRENGTH, STIFFNESS AND TEMPERATURE RESISTANT TURBINE ENGINE COMPONENTS (GE)
- AFFORDABLE, LIGHTWEIGHT, HIGH STRENGTH, STIFFNESS AND TEMPERATURE RESISTANT AUTOMOBILE ENGINE COMPONENTS (GM)
- OTHER HIGH STRENGTH AND TEMPERATURE APPLICATIONS REQUIRING MINIMUM WEIGHT/MOMENTUM PARTS
- BENEFITS
 - BETTER AIRCRAFT/AUTOMOBILE ENGINE PERFORMANCE
 - LIGHTER WEIGHT AIRCRAFT AND AUTOMOBILES



TECHNOLOGY PATH FROM DEVELOPMENT TO SPIN-OFF

- Major NASP Players Are GE And WRDC Materials Lab
- Characteristics Of The Alloy Are Attractive To A Variety Of Applications - Automotive And Aerospace Turbomachinery
- GE And WRDC Both Members Of EMTEC, Ohio Materials Consortium
 - GM And 58 Other Members Interested In NASP Work
 - Current Project Is Underway To Adapt NASP Results To Produce Low Cost Net Shape Or Near Net Shape Castings



TECHNOLOGY PULL

Automotive

Brake Calipers

Brake Rotors

Brake Linings

Adhesives

Alternate Coatings

Metal Matrix Composites

Ceramics

Steering Knuckles

Brake Drums

Anti-Lock Brake System

19 Intersections Identified Locally



NASP TECHNOLOGY TRANSFER

Outline

- Background And Objectives
- Technology Transfer - General
- Technology Transfer - NASP



- Issues
- Actions



NASP TECHNOLOGY TRANSFER

Issues



NASP TECHNOLOGY TRANSFER

Issues

- Conflict Of Interest
- Ownership Of Intellectual Property
- Lack Of Rules With Respect To Contract-Developed Technology vs Government Lab Developed Technology
- Access To Federal Employee For Technical Information
- Brokering Commercially-Owned Technologies In A Competitive Environment
- Releasability/Sensitivity Of NASP Technical Data



NASP TECHNOLOGY TRANSFER

Intellectual Property

- In-House Government Development
 - Can Result In Government Patent
 - Government Can Grant Commercial Firm Exclusive Rights (Normally Tied To Calendar For Commercialization)
 - Royalties Back To Government Technology Source
 - Transfer Can Be Funded With R&D Dollars
- Government Funded-Commercial Development
 - Commercial Developer Takes Title To Property
 - Government Has Universal Use Rights
 - Commercial Firm May License, Or Otherwise Use Property To Their Own Advantage



NASP TECHNOLOGY TRANSFER

Outline

- Background And Objectives
- Technology Transfer - General
- Technology Transfer - NASP
- Issues



- Actions



NASP TECHNOLOGY TRANSFER

2D Actions

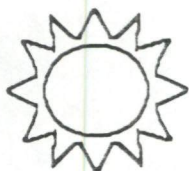
- Initiate Survey To Subs And Suppliers To Identify Post And In-Process Technology Transfer
- Collect/Assimilate Survey Results
- Report Results - Include Benefits Analysis/MOEs
- Review/Assess PMP
- Review/Assess TDD
- Produce Detailed Technology Descriptions



NASP Technology Transfer Report

THE SKY IS NO LONGER THE LIMIT!

August 1991 Edition



The "dog days" of summer are upon us, and proof positive is the "hot" time we had at the NASP Reserves Technology Transfer Team August Seminar. Look for the "sizzling" details in this edition of the Report.

August Reserves Seminar - New and Improved

--Mr. Adrian DeNardo, SAIC

In an effort to get the Reserves Team members better acquainted with the NASP, as well as organizations that can assist in transferring NASP technologies, the August seminar was formatted to allow for more direct experiences within both categories.

The tours of the Wright Laboratories' Flight Dynamics Lab and Materials Lab gave all who attended a first-hand look at some actual NASP components being tested. In the Flight Dynamics Lab, Team members witnessed two structural components being rigged for testing, while in the Materials Lab, members observed high temperature testing of small samples of NASP metal matrix composite material.

The visits to the Edison Materials Technology Center and the Ohio Advanced Technology Center served to acquaint the Team with representative state-sponsored organizations which foster technology transfer. Discussions with the respective heads of these organizations offered much insight as to the real technology imperatives which drive commercial enterprises.

Based on the success of this seminar, we will continue to work at getting more of this same kind of interaction in future seminars. For upcoming events we will also try to have NASP technologists accompany the Reservists to the technology transfer organization, as well as have the members of the technology transfer organization or representative industry accompany the Team members to the NASP technology location. By conducting this type of exchange, we hope to gain two things:

1. The respective Government and commercial technologists will gain a solid appreciation of respective goals and technology needs.
2. The Reserves Team members will gain an understanding of these mutual interests and will be able to export the process to their home locations.

Overall, the seminar's blend of tours through the various Wright Laboratories, interactions with the Ohio-sponsored technology transfer organizations, and exchanges between the respective Reserves Detachments is what contributed to the success of the seminar.

DAYTON MANAGEMENT GROUP CORNER

August Tour Seminar

--CPT Mary Slenski, Dayton Management Group

The third NASP Technology Transfer Reserve Seminar was held on 7 through 9 August 1991. The focus of this seminar was different than the two previous--after a year of work, the objective was to update and share progress. Sixteen Reservists attended--five of them for the first time. Highlights were presentations on the Edison Materials Technology Center and the Ohio Advanced Technology Center and briefings by Reservists to the JPO describing their technology transfer projects. Dayton, Los Angeles, Houston, Tullahoma, and Andrews each reported their project status and future plans. The Detachment briefings were attended by Mr. Dick Culpepper, NASP Special Assistant for Technology Transfer.

It was obvious that much had been accomplished by the Reservists, the JPO, and SAIC. Technology descriptors are becoming available in hard copy, approved for public release at Level II, and in greater detail for parties having DLA certification. The technology transfer "tools" which were identified at last August's seminar are now clearly defined and many of the Reservists' questions on "how to" now have more definitive answers.

The NASP Technology Transfer Reserves Projects continue to be a high visibility effort. COL Phil Bruce, the new Deputy Program Director, opened the seminar and returned to informally discuss technology transfer and our projects. BRIG GEN Jerry White was updated on all of the Reservists' Technology Transfer Projects, and our work continues to have his support.

NASP Article in Design News

--MAJ John Thomas, NASP JPO

An article entitled, "NASP: A Leap Into the Unknown," appeared in the 26 August 1991, edition (Vol. 47, No. 16) of *Design News*. The article was based on a series of interviews conducted with JPO personnel, including Dr. Robert Barthelemy, Program

Director; **Mr. Robert McGuffee**, NASP Contractor Team's National Program Office; and **MAJ John Thomas**, NASP JPO.

The article provides a good overview of the technical challenges in building the X-30. The spinoffs of NASP-developed technologies are also discussed, including potential materials applications, uses of high-temperature instrumentation, computational fluid dynamics, and the movement toward use of hydrogen as an energy source. One of the aspects of the NASP program that caught the interest of *Design News* was the teaming arrangement that led the program to join the three airframe contractors (General Dynamics, Rockwell, and McDonnell Douglas) and the two propulsion contractors (Pratt & Whitney and Rockeydyne) into a Contractor Team to design the X-30 vehicle.

For an update on the NASP program, this article is an excellent one to read.

Reservists Provide Representation From 22 States

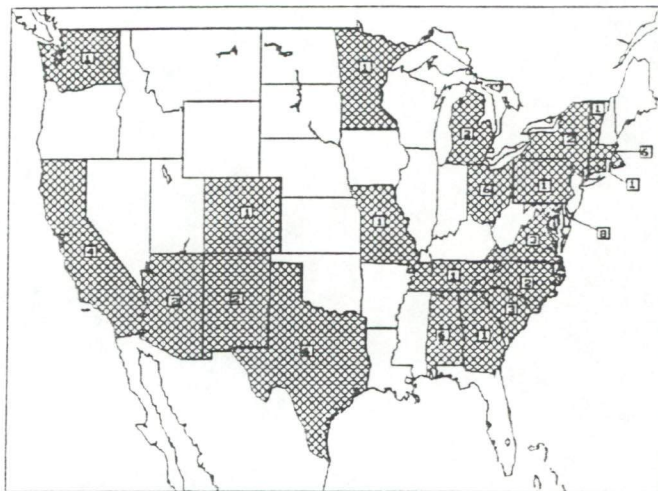
--Mr. Adrian DeNardo, SAIC

The map accompanying this article shows those states in which Reservists are currently working on NASP technology transfer projects. As of this writing, there are 61 individuals representing 22 states (14 Navy, 47 Air Force). These numbers are not 100 percent accurate because we have not yet received the "home ports" of our newest team members from the Navy. Once we have, I will update the map accordingly. The number shown in each state indicates the total of Reservists residing there.

One reason for our looking at states coverage by team members relates to an initiative which we began a few weeks ago. As mentioned in this *Report* last month, we sent a letter to each state's technology transfer organization requesting information about their policies and programs. By doing so, we have been obtaining organizational information to use for technology transfer. Most state Departments of Development have set up or identified an agency or multiple agencies to act as "intermediate" or sponsoring agencies for technology transfer efforts. During the August seminar, we visited three such Ohio-sponsored organizations--the Edison Materials Technology Center, the Center for Artificial Intelligence Applications, and the Ohio Advanced Technology Center.

Although we have not received information from all states, our intent is to begin sending information packets to the Detachments as soon as we receive information from a state with a coresponding Reservists representative. By using this information, each of you will be able to find organizations similar to the Ohio organizations the August group visited and utilize them as part of your technology transfer project. This method saves time and effort on your part and will assist you finding those people who truly have a stake in using the technology.

To date, we have received information from 16 states. We will determine those states which have matching Detachments and forward the information to those Detachments to get the ball rolling. We will continue to pass the information as we receive it and keep you apprised of our progress. You, in turn, must keep us updated of any success you achieve as a result of this interaction.



FYI . . .

The TDD has made its way through the public affairs approval process, and is now being revised for the public release version. Copies will be forwarded to each Detachment upon completion.

NASP JPO Visits NASA HQ

--MAJ John Thomas, NASP JPO

A meeting was held on 21 August 1991, between JPO personnel (Mr. Dick Culpepper, Mr. Bill Powell, and MAJ John Thomas) and a group of NASA personnel representing NASA's programs for technology transfer. The first objective was to exchange information on each others' technology transfer programs. MAJ Thomas gave an overview of the various initiatives the NASP program has undertaken to proactively stimulate applications of NASP-developed technologies. The activities of the NASP Contractor Team in this task were described, as were the JPO Technology Transfer Reserves Projects, the planned cooperative effort with SDIO involving the Technology Applications Information System (TAIS) data base, the AIAA applications assessment study of NASP technologies, and the efforts of the NASP support contractor, SAIC. The JPO's process for providing technology information to domestic firms certified to have access to ITAR restricted material was also explained in detail. In turn, the NASA personnel described their major technology transfer efforts, including the *NASA Tech Briefs* magazine, the functions of the Technology Utilization Offices at the NASA Centers, the Technology 2001 Conference sponsored by NASA, and the hosting of industry

workshops by the NASA program for application engineering.

In the course of these discussions, it became evident that there are several areas in which cooperation would be of mutual benefit. A series of action items were agreed upon to foster this cooperation, as follows:

1. A second meeting was tentatively planned for mid-October to begin incorporating NASP technology write-ups into the *NASA Tech Brief* magazine. An overview article on the NASP program and its technology transfer effort is also planned.
2. Mr. John Cleland, Manager of Industrial Applications at the Research Triangle Institute, will write a description of an industry workshop on NASP Technologies to be hosted by NASA Langley's Technology Utilization Office next year. The workshop would provide an opportunity for a focused group of industry representatives to see first-hand the NASP technologies under development at NASA Langley, and would make them aware of opportunities for marketing products based on these technologies under Cooperative Research and Development Agreements (CRDAs) with the Center.
3. Mr. Dick Culpepper intends to support the next NASA Technology 2001 Conference in December with a NASP booth to be manned by JPO personnel.
4. MAJ Thomas will provide Mr. Ray Gilbert (NASA Code C) a list of the Air Force Reserves Officers who have been in contact with several of the NASA Technology Utilization Offices. Mr. Gilbert intends to make sure that they are well supported.
5. MAJ Thomas will also provide Mr. Gilbert additional documentation on the NASP technology transfer effort.

It has taken time for the NASP technology transfer effort to gain momentum. We continue to seek every possible avenue to make NASP technologies available to U.S. commercial and defense-related businesses. We have, thus far, added many stars (USAF and USN Reservists, AIAA, SAC, etc.) to the NASP technology transfer flag. This NASA cooperative is yet another star illuminating this venture.

"Enthusiasts" are the ones needed to see a transfer through to completion since doing so is often a time- and energy-consuming process.

Kwai-Cheung Chan, Before the Subcommittee on Technology and Competitiveness
Committee on Science, Space, and Technology - House of Representatives

CAROL'S CORNER CAROL'S CORNER CAROL'S CORNER

Tech Transfer Tidbits

--Ms. Carol Lohman, SAIC

Just prior to the August Reserves Seminar, I had the fortunate opportunity to attend the AIAA Workshop held at Rocketdyne's facility in Westlake, California, on 5 and 6 August. An article, with complete details is presented in this edition of the *Report*.

A quick update--we have not had a whole lot of time to get the backlog of information entered into the technology transfer data base; but we are still working on it bit-by-bit. We hope to have the backlog entered by the end of October, or sooner. Maybe next month the effort will have progressed to the point that we can report an improved status.

SAIC and the NASP JPO will be hosting an orientation for several Navy Reservists from NAS South Weymouth, Massachusetts, on 28 and 29 September 1991. We expect to present the same type of information at this orientation as was presented at the first two Air Force Reserves Technology Transfer Team Seminars.

Information is still rolling in from the various states in response our request for their technology transfer policies and programs. We will be contacting Detachments, when we match up the state responses, to coordinate Reservists interaction with the appropriate agencies.

Finally, every now and then we pass information through the AMS E-Mail system. Be sure to check your messages regularly.

Be sure to catch *Carol's Corner* next month for more Tech Transfer Tidbits.

CAROL'S CORNER CAROL'S CORNER CAROL'S CORNER

AIAA Workshop

--Ms. Carol Lohman, SAIC

The AIAA-sponsored Workshop was held on 5 and 6 August 1991, at Rocketdyne's facility in Westlake, California. It was attended by Mr. Terry Kasten, NASP JPO, and Ms. Carol Lohman, SAIC.

The purpose of the AIAA task, in general, is to identify other aerospace applications for technologies developed in support of NASP. Basically, it is a brainstorming effort with the focus on the diversity of aerospace applications other than NASP-derived vehicles (NDVs). In attendance were approximately 30 AIAA members, representing various aerospace companies and NASA centers, along with many NASP technical experts (both contractor and Government) who gave presentations on NASP technologies.

The workshop was divided into five working groups: systems, materials and structures manufacturing processes, propulsion, subsystems, and aerothermodynamics. The objectives of the first workshop meeting were to define the working group organization (members, chair, liaisons to other working groups, charters, etc.), and to familiarize working groups with NASP technologies through the technical presentations. The *Systems* presentation was given to the entire workshop attendance, with the remaining presentations running in parallel. Hardcopies of the presentations will be provided to each Reserves Detachment or Center once they are received at SAIC. Currently, we have the *Materials and Structures* presentations, and it will be sent with the next Detachment mailing.

AIAA will be collecting working group inputs and compiling them into a report and presentation to the NASP team (JPO and NPO) sometime in January 1992. Working groups are requested to identify the potential area or system for application, determine the "need date" for the technology, ascertain the state of maturity of the technology, identify and describe the remaining effort needed to bring the technology to readiness, and identify and define cost and schedule risks, where possible. The second workshop meeting is tentatively scheduled for early December to coincide with the AIAA Third International Aerospace Plane Conference in Orlando, Florida.

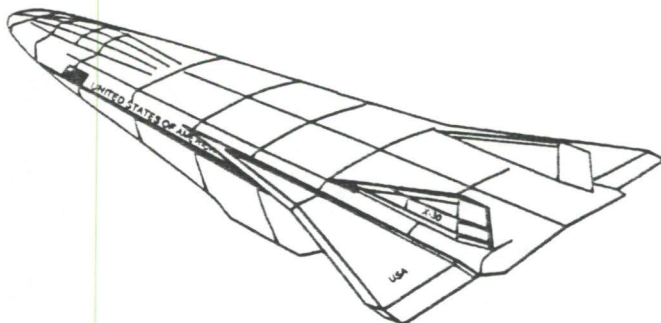
You can be sure we will keep you abreast of the progress and results of this task.

NASP Receives Coverage by Local News

--Mr. Adrian DeNardo, SAIC

The *Beavercreek Daily News* highlighted the NASP program in a recent article (17 August 1991). This article evidenced the achievements of the materials and structures engineers supporting the NASP development. It is reprinted below for your enjoyment.

This type of coverage is a "small step" for NASP, but a "large step" toward just what is needed to make the X-30 a household word.



The Chatter Box

ASD/NAR

Mr. Terry Kasten	(513) 255-3165
MAJ John Thomas	(513) 255-9977
CPT Joel Bryan	(513) 255-9977

USAFR

LTC Frank Foegler	(513) 762-8292
Financial Sponsorship	
CPT Mary Slenski	(513) 429-9496
LTC Charles Darvin	(919) 383-1367
Patent/Licensing	

Contractors

Mr. Mike Wharton	(817) 777-5547
Consortium Contractor	
POC	

SAIC

Mr. Adrian DeNardo	(513) 429-6608
Ms. Carol Lohman	(513) 429-6658
Mr. Jim Batka	(513) 429-6644
Mr. Dick Smith	(513) 429-6729
Ms. Kaye Coates	(513) 429-6621
Ms. Angie Hargrave	(513) 429-6664

NASP engineers receive honors

The National AeroSpace Plane (NASP) program director, Dr. Robert Barthelemy, recognized a number of Wright Laboratory (WL) engineers at a recent NASP Symposium.

They were recognized for their contributions to the NASP materials and structures technology, through their management of the NASP Materials and Structures Augmentation Program (ASAP). Those honored included Steve Balsone, Bill Kerr, Paul Smith, Steve Szaruga and Larry Hjeim of the Materials Laboratory, Cris Clay and Don Paul of the Flight Dynamics Laboratory, and Ted Norbut of the Aero-Propulsion and Power Laboratory.

The NASP Materials ASAP, which will be completed this year, is a \$140 million, three year, NASP technology program intended to ensure that the critical materials and structures technology will be in place to build the X-30, if a go-ahead decision is made in 1991.

This was accomplished through a NASP Contractors' "Consortium," which accomplished the program with unprecedented cooperation among then competing companies.

The WL team brought together a national team of experts from Air Force, NASA, and Navy organizations which operated as an effective technical team, which strongly contributed to the success of the program.

The overall team was national in scope, consisting of NASP contractors, subcontractors, universities, research institutes, vendors, suppliers, fabricators, national laboratories, and Air Force NASA, and Navy Laboratories and Centers. The program has been very successful in establishing the critical NASP material technologies and in establishing the baseline materials for the X-30 vehicle — a real example of team work on a national scale, led by the WL team.

NASP JOINT PROGRAM OFFICE

ASD/NAR

WRIGHT-PATTERSON AFB, OHIO 45433-6503



SCIENCE APPLICATIONS INTERNAT'L CORP.
1321 RESEARCH PARK DRIVE
DAYTON, OHIO 45432



NASP Technology Transfer Report

THE SKY IS NO LONGER THE LIMIT!

July 1991 Edition



Happy 4th of July!!!

Just as our great country has acclaimed independence for 215 years, we want you to be independent in your quest for technology transfer successes. Liberate your mind, be creative, and devise new ideas or projects to advance the technology transfer effort. You have the freedom to direct the path that technology transfer takes to the commercial sector. It is up to you.

NASP CFD Codes for Diverse Applications

—MAJ John Thomas, NASP JPO

NASA Langley engineers are managing NASP Government Work Packages (GWPs) to develop improved computational fluid dynamics (CFD) codes to satisfy NASP simulation requirements. In particular, two codes have been developed to the point that they provide substantial new capabilities. CFL3D is a general purpose code capable of three-dimensional flow simulations involving the full Navier-Stokes equations for capturing the full spectrum of physical effects present in complex flows. SPARK is a CFD code tailored for combustion simulation. These NASP codes have wide applicability in many areas, such as internal combustion engines, chemical engineering processes, automobile design, etc.

These codes have already been disseminated to more than 30 users external to the NASP program. Recipients of the codes have included companies, such as Rohr Industries, Inc., Cray Research, Sverdrup Technology, Inc., and Alpha Star Corporation; universities, such as Purdue, Ohio State, Brown, and UCLA; and other Government laboratories, such as the Naval Air Test Center, Argonne National Laboratory, and the David Taylor Research Center. Applications being pursued by these users include such areas as F-18 aerodynamics, propulsion airframe integration, F-16 XL transition control, cavity flows, code optimization, missile aerodynamics, combustor analysis, and many others.

If you are aware of a R&D organization that might have an interest in these codes, there may be an opportunity to negotiate access with the custodians at NASA Langley. The appropriate first step would be to provide a description of the intended use of the code, the name(s) of the principal users and their institution/company, and a description of the computer facilities available. The JPO will arrange for access to the codes. It

is possible that the use of the codes may involve remote access to the Langley computer facilities or other appropriate facilities where the codes currently reside. If there is sufficient interest and need, the JPO would negotiate for some additional computing time for users with an interesting technology application for the codes. In addition, institutions with potential CFD applications may not have the expertise, in-house, to modify the codes to make them suitable for the applications. In such cases, the JPO could provide Government CFD experts who could assist in this effort. We are looking for CFD technology transfer demonstration cases we could support in this way. We would like your help in identifying some promising examples.

A list of current users of these NASP CFD codes will be distributed to each of the ASD detachments working the NASP Reserves Project. For those of you who will be attending the upcoming Reserves Seminar on 7 - 9 August, this idea of generating applications of NASP CFD codes, and of providing assistance in adapting the codes, will be a topic of discussion. Come with some ideas in mind!

Tulahoma Detachment Identifies Transfer Potentials

—Mr. Adrian DeNardo, SAIC

Earlier this month, SAIC received three requests for NASP information to help solve technical problems in the private sector. Of the three, it turns out that only one of the firms was eligible to receive the NASP technical information. For that firm, we supplied several Level III descriptions which we felt were germane to the problem described. For the other two, we forwarded DD Forms 2345, Militarily Critical Technical Data Agreements, so that they can get a DLA-provided certification number and receive appropriate NASP technology information. The next step is for the technology principals involved to begin exchanging data, and hopefully, make a technology transfer happen.

The nature of the transfer will be dependent on the source of the technology. If the source is a Government organization, the source will have to follow the procedures established for his particular agency, while a commercial source will have to negotiate an agreement based on ownership of the intellectual property. Regardless of the final outcome, a report will be compiled, per the *Integrated Plan*.

For those of you who wish more details on this project, please contact LTC Bob Kirschner, of the Tullahoma Detachment, at (205) 536-8581, ext. 242. Our thanks to Bob and the others involved in the project. Keep up the good work!

CAROL'S CORNER CAROL'S CORNER CAROL'S CORNER

Tech Transfer Tidbits

--Ms. Carol Lohman, SAIC

Data entry in the NASP Technology Transfer Data Base is coming along quite well. Our tally, so far, includes:

262	Technologies
288	Points of Contact
78	Organizations
4	Reservists (entered)
30	Cases
63	Surveys

As you can see, we do not have all of the data entered yet, especially all of the Reservists data. There are about 60 Air Force and Navy Reservists now involved in this project, representing ten USAFR Detachments, and thus far, one USNR Center. In an effort to match the Reservists' areas of expertise with potential transfer cases occurring in your region of the U.S., we are requesting that you fill out and return to us the attached form. (Yes, another one!!!) We realize that we have asked for some of the same information before, and we apologize should this request be an inconvenience to you.

As the May NTTR indicated, we are in the process of bringing on board several U.S. Navy Reservists from the Naval Air Systems Command. MAJ John Thomas recently spent some time on the West Coast trying to recruit more USN Reservists from the Naval Surface Systems Command. A short orientation is tentatively scheduled for them on 28 and 29 September 1991, and will be hosted here, at SAIC.

Finally, we sent a letter to each state's technology transfer organization requesting information about their policies and programs. With the letter just barely distributed a week, we have already heard from two states--Oregon and Maryland. They are both very intrigued with the NASP program and the technologies it has to offer. We are anticipating responses from more states, as time goes by, and would like to involve interested Reservists in coordinating with these organizations. So, if you are interested, please let us know.

Be sure to catch Carol's Corner next month for more Tech Transfer Tidbits.

CAROL'S CORNER CAROL'S CORNER CAROL'S CORNER

Dayton Area to Serve as Host for NASP T² Demo Case

--Mr. Adrian DeNardo, SAIC

As a follow-up to the "Technology Transfer Session" conducted at the April 1991, SAE Aerospace Atlantic Symposium, the Technology Transfer Committee of the Dayton Area Technology Network

NASP Technology Transfer Team Grows

--Ms. Angie Hargrave, SAIC

CPT Joel Bryan joined the NASP JPO's Applications Directorate in October, 1990, and has recently broadened his scope with an assignment to the NASP Technology Transfer project. CPT Bryan matrixed from HQ AFSPACECOM/XRSD, Space Support Development, and his responsibilities include insuring HQ AFSPACECOM personnel are aware of JPO activities which pertain to the AFSPACECOM mission, staffing AFSPACECOM requests for information on NASP Derived Vehicles (NDVs) for use in AFSPACECOM planning efforts, and supporting a wide range of Applications Directorate activities as necessary. Currently, he is POC for payload containerization concept issues and associated contract elements.

CPT Bryan received his B.S. in Aeronautical Studies from Embry-Riddle Aeronautical University, Florida, in May, 1985, and completed Mobile Satellite Communications II Commander IQT at Holloman AFB, New Mexico, in March, 1986. In addition, he completed the Space Operations Environment course in December, 1985, and the Space Operations Officer course in January 1986, both at Lowry AFB, Colorado. He is currently working on a M.S. in Space Operations at the Air Force Institute of Technology, at Wright-Patterson AFB, Ohio.

Among his other accomplishments, CPT Bryan served as Space Systems Field Commander, 4SCS Mobile, and Space Systems Crew Commander, 4SCS Mobile, at Holloman AFB, New Mexico. Joel received the Air Force Commendation Medal, in May, 1989, the Air Force Achievement Medal, in February, 1989, and the Combat Readiness Medal, in April, 1988.

We wish to extend a warm welcome to CPT Joel Bryan. We look forward to utilizing his expertise to contribute to the NASP Technology Transfer project and are confident that he will be an asset to this effort. You will now find his number listed in *The Chatter Box*.

FYI . . .

The AIAA will sponsor a workshop to be held on 5 and 6 August 1991, at Rocketdyne, in Westlake, California. This workshop will involve industry and Government experts in the examination of the applications of technologies developed for NASP to other aerospace sectors. It will be attended by Terry Kasten and Carol Lohman. Be sure to watch for an article in this Report next month with their findings.

(DATN) is making plans to assemble a "road show" tutorial on technology transfer for presentation to both commercial and Government organizations. As part of the T² Committee, I suggested that the briefings would have more credibility if an actual transfer was undertaken and real world experience could be infused

into the presentations. The Committee has agreed, and such a project is now underway. It is hoped that this project will lead to similar efforts within the realm of technology transfer in other states.

The DATN is composed of some 80 companies in the greater Dayton area, founded with the purpose of making the members aware of technologies available to them in the local area, informing the membership on processes available to reach it, and finally, facilitating the process. Since the NASP has a system largely ready to serve such a charter, we will offer the NASP technologies and transfer methods to the DATN membership. In addition, a DOE facility, EG&G Mound Laboratories, will also be involved, as will other Wright-Patterson AFB organizations.

We will continue to keep you posted on this effort as it progresses.

August Reserves Seminar Update

--Mr. Adrian DeNardo, SAIC

Included with this issue of the NTTR is the Agenda for the August Reserves Seminar. Based on your feedback to us on content and format, we have modified this seminar accordingly. During this seminar, we will try a novel approach and take the opportunity to visit local organizations involved in both technology development and technology transfer.

First, we have scheduled visits with two Wright Laboratories, at Wright-Patterson AFB, to get a first-hand look at some of the NASP technology development base and talk to the local experts about their work. We feel that such insights will help all of us develop a focused perspective on the work and the progress NASP is making in this technology development effort.

Second, we will visit with two State of Ohio Science and Technology Organizations (the Ohio Advanced Technology Center and the Center for Artificial Intelligence Applications) to get an idea, from their directors, of why they exist, how they operate, and some grass roots exposure to technology transfer from local technology transfer agents.

The Chatter Box

ASD/NAR

Mr. Terry Kasten	(513) 255-3165
MAJ John Thomas	(513) 255-9977
CPT Joel Bryan	(513) 255-9977

USAFR

LTC Frank Foegler	(513) 762-8292
Financial Sponsorship	
CPT Mary Slenski	(513) 429-9496
LTC Charles Darwin	(919) 383-1367
Patent/Licensing	

Contractors

Mr. Mike Wharton	(817) 777-5547
Consortium Contractor	
POC	

SAIC

Mr. Adrian DeNardo	(513) 429-6608
Ms. Carol Lohman	(513) 429-6658
Mr. Jim Batka	(513) 429-6644
Mr. Dick Smith	(513) 429-6729
Ms. Kaye Coates	(513) 429-6621
Ms. Angie Hargrave	(513) 429-6664

Finally, we have built in a considerable amount of time for Reservists feedback, questions, and discussions. It is a time for us to take some notes and actions on your experiences in an effort make the NASP technology transfer process a clear-cut success for the NASP program and the Reserves Team. As before, we will provide up-to-date information on NASP programatics and technology transfer development, along with a packet of information useful to you in your work.

We look forward to seeing all of you at the Seminar in August.



NASP JOINT PROGRAM OFFICE
ASD/NAR
WRIGHT-PATTERSON AFB, OHIO 45433-6503



SCIENCE APPLICATIONS INTERNAT'L CORP.
1321 RESEARCH PARK DRIVE
DAYTON, OHIO 45432

**NASP Reserves Technology Transfer Team
August Seminar**

Agenda

Dates: 7 - 9 August 1991

Day 1 - Wednesday, 7 August 1991

Morning Session:

Location: Science Applications International Corporation (SAIC)
1321 Research Park Drive
Dayton, OH 45432

0830 - 0845	Registration/Administrative Announcements	MAJ John Thomas ASD/NAR
0845 - 0900	Welcoming Remarks	COL Phil Bruce NASP AF Deputy
0900 - 1000	NASP Program Update	MAJ John Thomas ASD/NAR
1000 - 1015	Break	
1015 - 1115	NASP Technology Transfer Program Update	Adrian DeNardo SAIC
1115 - 1130	Introduction to "Intermediate" Organizations	Adrian DeNardo SAIC
1130 - 1300	Lunch	

Afternoon Session:

Location: Edison Materials Technology Center (EMTEC)
3171 Research Blvd.
Kettering, OH 45420

1300 - 1345	EMTEC Briefing	Dr. Frank Moore Director, EMTEC
1345 - 1430	Questions/Discussion	All
1430 - 1515	Center for Artificial Intelligence Applications (CAIA) Briefing	Mr. Phil Bouchard Director
	Ohio Advanced Technology Center (OATC) Briefing	Mr. Phil Bouchard Director
1515 - 1600	Questions/Discussion	All
1600 - 1630	Wrap-Up/Introduction to Day 2 Activities	MAJ John Thomas ASD/NAR

Day 2 - Thursday, 8 August 1991

Morning Session:

<u>Location:</u>	Wright Laboratories Wright-Patterson AFB, OH 45433	
0800 - 0900	Flight Dynamics Lab Area B, Bldg. 450 Tour - CFD/Wind Tunnel Orientation	Tentative
0900 - 1030	Flight Dynamics Laboratory Area B, Bldg. 65 Tour - Structural Test Facility, NASP Thermo-Mechanical	
1030 - 1200	Materials Laboratory Area B, Bldg. 655 Tour	
1200 - 1330	Lunch	

Afternoon Session:

<u>Location:</u>	SAIC	
1330 - 1400	CFD Briefing	MAJ John Thomas ASD/NAR
1400 - 1430	Questions/Discussion	All
1430 - 1445	Data Access and Control Briefing	Adrian DeNardo SAIC
1445 - 1500	Break	
1500 - 1630	NASP Case Development	ASD/NAR SAIC

Day 3 - Friday, 9 August 1991

Morning Session:

<u>Location:</u>	SAIC	
0830 - 0930	Reserves Project Briefing #1	Houston Detachment
0930 - 1000	Questions/Discussion	All
1000 - 1015	Break	
1015 - 1115	Reserves Project Briefing #2	Andrews Detachment
1115 - 1145	Questions/Discussion	All
1145 - 1300	Lunch	

Afternoon Session:

1300 - 1400	USAF Staff Judge Advocate's Office	Mr. Tom Kundert USAF/JACPD
1400 - 1430	SDIO/TAIS NASP Technology Abstracts	All
1430 - 1530	Action Planning	All
1530 - 1545	Break	
1545 - 1630	Final Wrap-Up	

Data Base Information

Name:

Home Address:

Phone:

Employer:

Employer Address:

Phone:

Fax:

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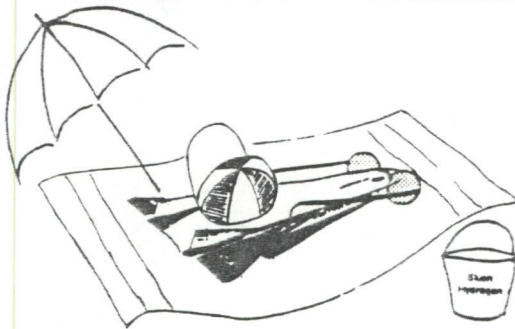
Areas of Expertise:



NASP Technology Transfer Report

THE SKY IS NO LONGER THE LIMIT!

June 1991 Edition



Spread the beach towel and pass the suntan lotion! The NASP has been on a NDV (Notably Deserved Vacation)! Due to June vacation schedules, this edition of the *Status Report* will be short, but sweet (and a little late). We hope to be on full schedule next month and bombard you with new technology transfer information.

AIAA Workshop Update

--Mr. Adrian DeNardo, SAIC

In our last *Status Report*, the dates for the AIAA workshop on NASP technologies was tentatively set for 17 and 18 July 1991, with some anticipation that the dates might slip. Well, they did slip, and the new dates for this workshop are 29 and 30 July.

The workshop will be conducted at the Rocketdyne facilities in Westlake, California. At the time of this writing, there are six separate working groups being formed to consider NASP technology spinoff potential in the following areas: materials and structures, aerothermodynamics, propulsion, systems, subsystems technology, and manufacturing processes. Each panel will receive technology briefings from a contractor expert and then produce assessments as to the spinoff potential of the given technology. It is hoped that these workshops will have important ramifications for the aerospace industry.

FYI . . .

We are pleased that Carol Lohman has returned from Military Leave, and we wish to welcome her back. She is anxious to begin working again on the technology transfer effort and is now available to receive your calls. Her number is listed in *The Chatter Box*.

Tech Description Details Received

--Mr. Adrian DeNardo, SAIC

Information which will form the basis of our Technology Description Document (TDD) Level III descriptors has been flowing in from the Tech Maturation Symposium. At this time, we have 65

CAROL'S CORNER CAROL'S CORNER CAROL'S CORNER

Tech Transfer Tidbits

--Ms. Carol Lohman, SAIC

Hi! It's great to be back at SAIC after 16 weeks at Keesler Technical Training Center in Biloxi, Mississippi, and three weeks in England, completing my USAF Reserves AT. (It was a tough assignment, but, what else should I say?)

The NASP Technology Survey results have been entered into the data base, along with basic information about NASP technologies, the various POCs (technical and management), and organizations associated with the technologies. Not all of the information has been entered, but we are "plugging and chugging," and hope to have the entire stack entered by next month so we can spend more time finding and pushing those "real" technology transfer cases.

We have received 65 percent of the final summaries from the NASP Technology Maturation Plan which will be used on the Level III Descriptors in the Technology Description Document (TDD). The Level I and II volume of the TDD is still making its way through the DoD public affairs approval process. We hope to have this back before the first flight of the X-30!!!

Finally, we are working on putting together a series of briefings to present to you during your August AT. I have been in contact with the Detachment POCs to see what kind of information you would like to hear about as we would like to tailor this workshop around your interest and needs. One suggestion offered is for each Detachment to present their progress and/or actions during the first year. If you have any other suggestions, feel free to call me. See you in August.

Be sure to catch Carol's Corner next month for more tech transfer tidbits.

CAROL'S CORNER CAROL'S CORNER CAROL'S CORNER

percent of the technology work packages identified in the TDD in hand. The remainder should be available by the time you receive this *Status Report*. This is particularly good news as these descriptors form the basis for the initial response to a request for NASP technology information. In fact, we have used a few of them to get some information to a client of our Huntsville, Alabama, Reservists. Once all of the descriptors are in, we will add a second volume to the TDD and update your TDD copies.

. . . And, speaking of the TDD . . .

A copy of the document (actually 12) has been in the public release cycle for some time. The reason for getting the TDD (or a modified version of it) cleared for public release is so that we can build a small package of materials to be used by you as "product brochures" for general audiences, regardless of DLA certification status. Using publicly releasable materials allows us to get to general audiences and broaden the client base for transfer. Naturally, once a company or individual becomes interested in NASP technology, additional information will fall under the ITAR/MCTL restrictions and require DLA certification. Should the interested party need DLA certification, a form will be included in the package which can be completed and sent directly to DLA. We should have this package ready to go by the end of the summer, and of course, we'll provide each of you with copies you can use with your own outreach activities.

The Chatter Box

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Ms. Angie Hargrave (513) 429-6664

VACATION BRAIN TEASER

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Aerodynamics

CCC

Ceramic

CFD

Coatings

Cryogenics

Flight Systems

HCC

Hypersonic

Inlet

JPO

Materials

Matrix

NASP

NDV

Nozzle

Propulsion

Ramjet

Refractory

Reserves

Scramjet

Slush Hydrogen

Sonic

Spinoff

Strain Gage

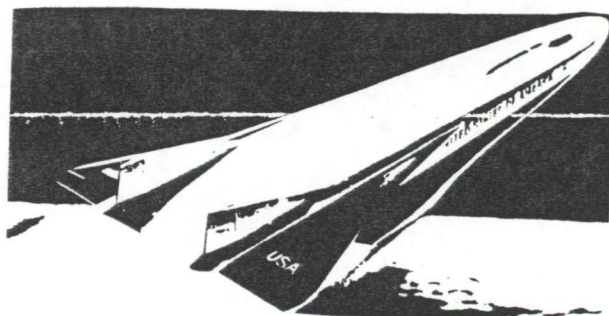
Structure

Technology

Thermal

Titanium

Transfer



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DAYTON, OHIO 45432



NASP Technology Transfer Report

THE SKY IS NO LONGER THE LIMIT!

May 1991 Edition



Memorial Day is a patriotic holiday to honor American men and women who gave their lives for this country. This Memorial Day was very special because some of those individuals serving in Desert Storm were added to this distinguished list.

In addition, there were numerous celebrations in tribute welcoming troops home from Saudi Arabia. We are indeed grateful for these men and women allowing us to remain the strongest nation in the world.

AFSC IG Recommends Implementation of NASP Reserves Project

--MAJ John Thomas, NASP JPO

In March of this year, an AFSC IG team visited the NASP JPO as part of a Process Effectiveness Review. They were particularly interested in identifying tools and metrics, employed by ASD Program Offices, which aid in risk management. One of the tools briefed by the JPO to the IG team was our utilization of Reserves officers in the NASP Technology Transfer project. A key purpose of this effort is to decrease program risk by encouraging commercial spinoffs of unclassified advanced technologies. This serves to mature manufacturing and increase production capacity of such advanced technologies as the novel high temperature, light weight, and high strength materials developed by the NASP program. It can also provide information to the JPO on issues regarding the suitability of certain geometries and part sizes for the new NASP materials.

The IG team was excited about the Technology Transfer project because of its applicability to any program with requirements beyond current state-of-the-art technology. As a result, the Reserves project will be recommended to GEN Ronald W. Yates, Commander, AFSC, for rapid command-wide implementation. We will keep you informed about further developments on this issue.

NASP Technology Surveys Update

--MAJ John Thomas, NASP JPO

We have previously informed you about the NASP technology surveys being conducted to gather information from the NASP contractors and Government members of the technology transfer effort (see "NASP Technology Surveys Underway," April 1991 Edition). The surveys are now coming in, and they are available for use on your Reserve project. Contact SAIC if your Detachment would like copies.

RESERVES RAP

NASP Technology Transfer: A Unique Opportunity

LTC Chuck Darwin, USAFR

The NASP Technology Transfer program presents a unique opportunity to provide to this nation a wealth of new technological advancements brought about through the research and development activities required for this program. The U.S. has suffered over the last 20 years from a stagnation of technical advancements to improve production efficiencies and product quality in the commercial industry. Although this country has continued to lead the world in research and high technology successes, such as the Saturn V and Space Shuttle programs, the technologies developed during these programs have been slow in reaching the domestic industry. Our industrial competitors, however, have been quick to apply U.S. developed technology to commercial products. The effort of the NASP program to promote technology transfer is a welcome departure from past practices.

Why is technology transfer important? As an example, let's look at one industrial classification--the metal fabrication and coatings industry. The U.S. has over 40,000 small companies and entrepreneurs in this category, including operations such as bicycle shops, auto body shops, and electroplating shops; and larger operations, such as metal forgers and machine tool manufacturers. These operations may have as few as two or three employees to several hundred employees. More importantly, however, is that most of these operations have neither the technical expertise or research resources to develop new manufacturing technologies, materials, and products. They are also unable to address continuing industrial problems, such as increasing production efficiency and pollution abatement. However, it is these operations that are the industrial backbone of the country. These companies produce the nuts and bolts that hold our automobiles together; produce the rivets that hold our aircraft and buildings together; and produce the many small items that go into heavy industry manufacturing machinery. These are the companies that will benefit most from NASP technology transfer.

With the acceleration of the transfer of the NASP program technology developments, and other Government-sponsored developments, the whole nation will benefit. Improvements in productivity and product quality will increase the standard of life for all Americans.

A very special thanks goes out to Chuck Darwin from the Shaw Detachment. Chuck gets the Reserves Rap Initiative Award for submitting the very first article to appear in this new column. Yeah Chuck!!



The surveys have revealed a great deal of information about potential spinoffs of the NASP technologies. As an example, Honeywell mentioned a helmet-mounted display, developed for the NASP program, which they believe would be useful for head/eye movement and coordination tracking for the handicapped. Other potential applications identified included a risk management methodology for technology development programs, high temperature and cryogenic valves, carbon brakes for aircraft and autos, high temperature flexible ducting joints, low-cost pressure vessel liners, and threaded fasteners for high temperature applications. As well as ideas from the contractors about potential aerospace and non-aerospace applications, the surveys also offer other valuable data, including technology transfer points of contact and intellectual property rights information on various technologies.

In addition to the surveys, the list of patent/invention notifications reported by the prime contractors on their NASP contractual efforts has been provided to the JPO by the Air Force Contract Law Center located at Wright-Patterson Air Force Base. The list totals more than 150 separate notifications. The inventions include such examples as high temperature seals; heat exchangers; acoustic transducers; embedded fiber optic sensors for structures; composite cryogenic lines, valves, and vaporization systems; insulation; materials processing techniques; coatings; mixing devices; flameholders; fuel injectors; liquefaction systems; and ceramic coated fibers. This patent/invention list is also available to Reservists looking for more information on the NASP technologies maturing for potential applications.

FYI . . .

SAIC, the Dayton Management Group, and the JPO are planning the agenda for the next USAF Reserves Task Force NASP Technology Transfer Symposium scheduled for August. It is hoped that this Symposium will be held at the new NASP JPO facilities at WPAFB, OH. Please plan to attend.

Technology Topics Needed for August Symposium

--Adrian DeNardo, SAIC

The next USAF Reserves Task Force Technology Transfer Symposium has been scheduled for 7 - 9 August 1991, and will be of three-day duration. During the planning process, it was decided to expand the August Symposium to a three-day format to present more detailed and focused technologies briefings. This additional day will also allow time for more feedback from all Reservists to relate their experiences, to date, to the group. As we are still formulating an agenda for this symposium, we would appreciate your input now as to what technology topics you may be interested in.

Therefore, we would like you to think about your own efforts in technology transfer, and come back to us concerning your requirements for additional technology information.

As a general rule of thumb, use the major areas of NASP technology as broken out in the Technology Description Document as a frame for your request. Working from that general information, we can search for the right speaker to address your needs. Don't hesitate in asking for some very detailed and pointed information. In cases of actual technology transfer, this is the most likely level of detail to be used. Just remember that you are limited to the technology set of the NASP, and you are not likely to get a good briefing on gene splicing, but are very likely to get excellent information, for example, on how to characterize fiber/matrix boundaries in advanced composite metallics. Naturally, you should try to make your request one which satisfies your personal targeting in the NASP technology transfer effort.

Because the briefers are likely to have full schedules, we would like to hear your ideas and requests no later than 5 July 1991. This will give us plenty of time to get the briefers on your calendar for August. A Technology Topic Preference form is presented on the last page of this Status Report for your convenience. Please complete it and return it, to the attention of **Mr. Adrian DeNardo** at SAIC, by the requested date. We are looking forward to rounding up the experts for you. See you in August.

AIAA - NASP Technology Assessment

--MAJ John Thomas, NASP JPO

An opportunity exists for Reservists to benefit from an AIAA-managed, JPO-funded, aerospace applications project. The AIAA is in the process of forming working groups, consisting of industry, academic, and Government aerospace experts who will assess the potential aerospace applications of NASP technologies. Working groups are being formed in the areas of structures and materials, aerothermodynamics, propulsion, subsystems technology, manufacturing technology, and possibly others. The members of the working groups will receive detailed NASP technology briefings, including a general overview, as well as specific briefings on the technology covered by their panels. Each working group will be asked to document, in a final report, NASP technologies identified as having other aerospace applications, status of the maturity level of the technologies, and issues bearing on the viability of the technology applications.

The Steering Committee for this effort has already met and will nominate the working group memberships. Interested Reservists may attend the first workshop and take advantage of the detailed technology briefings on NASP technologies. Depending upon the judgement of the AIAA Chairperson and your

individual industry position and knowledge, individual Reservists may have an opportunity to contribute to the workshop. Since this is a contracted effort with specific deliverables, AIAA will decide on formal Reservists participation.

The first workshop is tentatively scheduled for 17 and 18 June 1991, in the Los Angeles area, but it is anticipated that the dates may slip by a few weeks. Any interested Reservists would participate as a representative of their civilian employer. The AIAA is unable to reimburse travel expenses or per diem costs. It is hoped that corporations will share our belief that the results of these workshops will have important ramifications for the aerospace industry and that they will, therefore, support employee participation. Time is getting short for this effort, so if you are interested in participating, you should get in contact soon with either MAJ John Thomas or Mr. Adrian DeNardo.

In a continuing effort to broaden the scope of the NASP Technology Transfer Program, Navy Reservists have now been recruited and have joined the Reservists Team. We wish to welcome them aboard! We are confident that their participation and contributions to the technology transfer effort will be a valued asset and lead to many successes.

NASP Briefing to Navy Reservists

--MAJ John Thomas, NASP JPO

At the invitation of CPT Juan Garcia, USNR, LCDR Bob Kopp and MAJ John Thomas, of the JPO, briefed the 250 attendees at the U.S. Naval Reserve Air Systems Program East Coast Symposium. The Symposium was held on 4 and 5 May 1991, at the Air National Guard facilities located at Andrews Air Force Base. The attendees were predominately Naval Reservists assigned to a variety of Naval Air Reserve Detachments.

The purpose of the presentations was to provide an introductory briefing to the Navy Reserve on the National Aero-Space Plane Program and to inform them about the NASP Technology Transfer Reserve Project. Aside from a few comments wondering why the NASP vehicle does not have a tail hook for carrier landings (Navy humor), the response was very positive. About a dozen packages on technology transfer were sent out to the Reservists in attendance who expressed an interest in working a similar NASP Naval Reserve Project. A NASP Project Manager, at the Naval Air Development Center in Warminster, Pennsylvania, has organized several of these Reservists and is establishing a formal Naval Reserve Project. We are anticipating a report from this group on their progress in a few months.

Los Angeles Reserves Detachment Project

--MAJ John Thomas, NASP JPO

The Los Angeles ASD Reserves Detachment has prepared a plan for their NASP Technology Transfer project and submitted it to the JPO for review and comment. The JPO has strongly endorsed the plan. The basic idea is to prepare and conduct NASP technology seminars targeted at appropriate industries. The Reservists would research and identify candidate industries for the seminars, elicit their interest, and help organize the seminars. The JPO would provide support by lining up NASP researchers to speak on the NASP technologies targeted for that particular industry group.

In addition, the NASP contractor technology transfer points of contact would be available at the seminars to brief the technology transfer effort and such issues as opportunities for obtaining licenses for the use of NASP technologies. The NASP contractor team is already tasked to support such efforts under the Phase 2D portion of the contract and are incentivized by a technology transfer award fee criterion tied to support activities of this kind. The first seminar is tentatively scheduled to occur this fall.

Houston Reserves Detachment Project

--MAJ John Thomas, NASP JPO

A group of Reservists at the Houston Reserves Detachment have developed their own Technology Transfer project. Several are employed at the Johnson Space Center, and are therefore, familiar with NASA's various technology transfer efforts. One of these efforts included NASA Technology Utilization Offices located at various NASA centers, with a Central Office in Baltimore, Maryland. Since the NASP program is a joint DoD-NASA effort, it is only natural that we utilize existing NASA technology transfer mechanisms to help facilitate spinoffs.

The idea of the Houston ASD Detachment is to use the NASA Technology Utilization Office's data base to help identify domestic corporations which may have a specific interest in the NASP technologies. The Detachment plans to act as a liaison between these companies and the NASP program to help provide appropriate information on the NASP technologies which the companies may want to utilize. Naturally, the companies will have to be DLA certified so that we can provide information on the NASP technologies, many of which fall under ITAR restrictions. However, this prerequisite can easily be handled by helping individual firms determine whether they are DLA certified, and in cases where they are not, by assisting them in the application process. We applaud the Houston Detachment for their initiative and wish them much success in this technology transfer effort.

Electronic Technology Transfer

--Mr. Adrian DeNardo, SAIC

During the next few weeks, both the NASP JPO and SAIC will be arranging connections to the ASD local area network (AMS). With this capability, we will be able to communicate directly with you through your Detachment hook-ups. This will enable use to exchange information on a more timely basis.

As the Dayton Management Group explained to us, we understand that the physical locations for your electronic links may vary from common Detachment sites to individual residences. While we are awaiting our network password, we would appreciate you supplying us with some information that will be necessary for us to begin our electronic dialogues. Answers to the following questions will guarantee that, when we are able, we will be ready to start networking.

- Do you have access to the AMS net?
- If yes, what is your electronic address?
- Do you have access through your home terminal?

Please direct this information to SAIC via mail, at the address listed below, or contact Ms. Angie Hargrave at (513) 429-6664. You may also contact Mr. Adrian DeNardo, whose number also appears in *The Chatter Box*.

Science Applications International Corporation
1321 Research Park Drive
Dayton, OH 45432

*The Chatter Box*ASD/NAR

Mr. Terry Kasten	(513) 255-3165
MAJ John Thomas	(513) 255-9977

USAFR

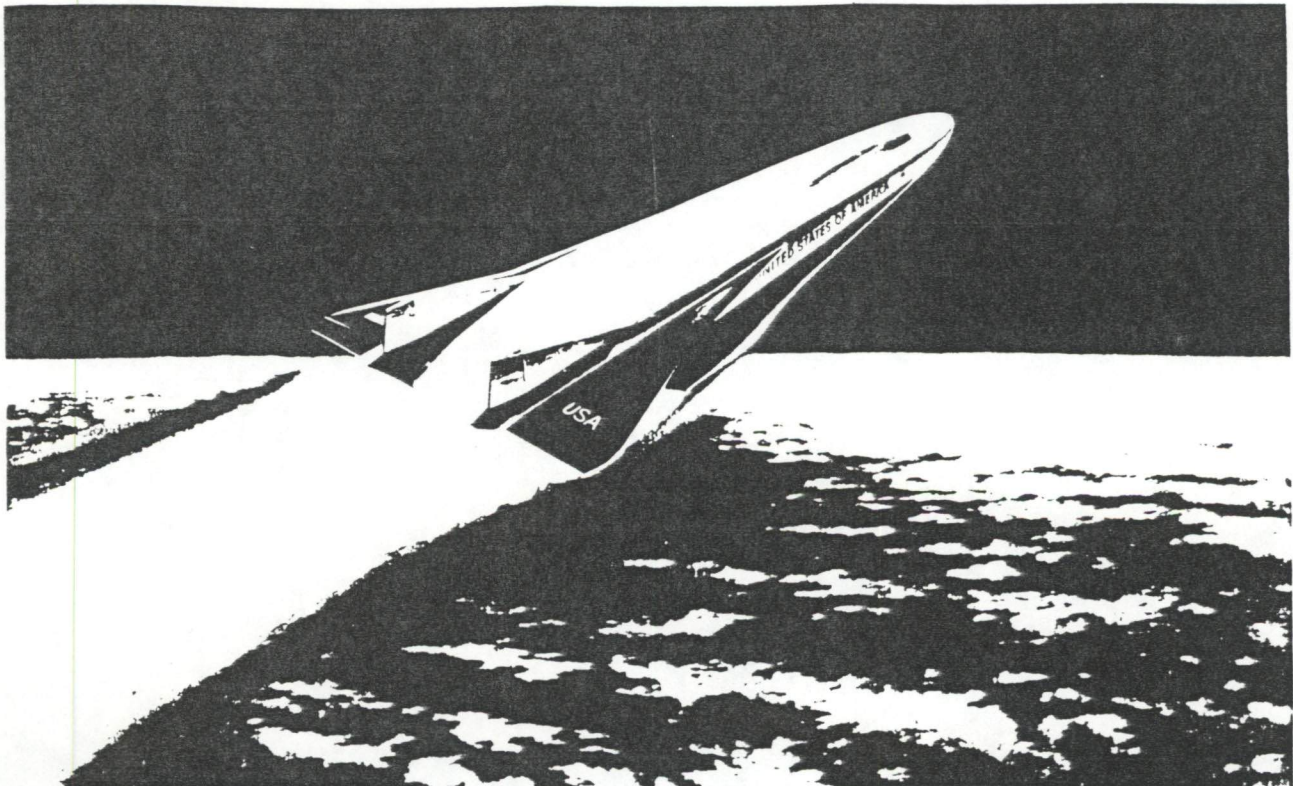
LTC Frank Foegler	(513) 762-8292
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Mr. Dick Smith	(513) 429-6729
Ms. Kaye Coates	(513) 429-6621
Ms. Angie Hargrave	(513) 429-6664



Detachment: _____

☐ Propulsion

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•Technology Topic Preference

SCIENCE APPLICATIONS INTERNAT'L CORP.
1321 RESEARCH PARK DRIVE
DAYTON, OHIO 45432



NASP Technology Transfer Report

THE SKY IS NO LONGER THE LIMIT!

April 1991 Edition

Have you noticed . . .

We have done it again! Once more we have changed the name of this publication.

The change from "Air Force Reserves Technology Transfer Status Report" to "NASP Technology Transfer Report" will allow us to pursue a more general and broader distribution area.

Copies of this "Report" will now be available to a wider audience, to include officials throughout the Government, as well as members of the NASP Technology Transfer team.

Just another attempt to broaden the scope of your NASP technology transfer efforts to all branches of the Government, and eventually, to the community at large.

NASP Technology Surveys Underway

--Maj John Thomas, NASP JPO

A NASP technology survey has been developed to identify key players and assess the current status of the NASP technologies. At the beginning of April, the surveys were sent to NASP contractors and Government team members. Mr. Mike Wharton, of General Dynamics, is the consortium contractor team focal point for the technology transfer task. He has compiled a distribution list consisting of more than 250 NASP contractors, subcontractors, and vendors located in 44 states.

The survey form is intended to be completed by the NASP Technology Development Task Leaders. The first part of the survey requests general contract information associated with the technology transfer task and whether the technology is protected via Government patent or some other form of intellectual property protection. The rest of the survey is dedicated to obtaining information about potential and on-going technology transfer data. A similar survey tailored for Government technology developers was also distributed to the NASP Government Technology Project Leaders.

By mid-May, we should have most of the raw survey results in hand. Adrian DeNardo of SAIC will be seeking assistance from Reservists involved in the NASP project to begin the process of assessing this data and analyzing the results from these surveys. He will lead this effort by attempting to match up portions of the survey with the appropriate Reservists. In the meantime, if you would like to be involved in this aspect of the NASP technology transfer effort, feel free to contact Adrian and inform him of your particular interests.

Another approach is being taken at gathering information on the NASP technology efforts of our contractors. As you are probably aware, defense contractors are required to report their intention to pursue a patent or invention based on technology developed under contract. A special office at ASD collects, processes, and records this information for all ASD contracts, including those representing the NASP effort. We have contacted this office and requested them to provide a listing of these patent and invention notifications for more than a dozen major contracts representing the bulk of the contracted NASP technology development effort. This information will include the title of the patent or invention, the name of the principal engineer, the name of the inventor, and the status of the patent/invention. While this data may be duplicated, in part, by the results of our contractor survey, it should serve as a quality check on what is reported under the survey.

The outcome of these surveys should be an extensive data base on the NASP technology effort, with points of contacts and potential, as well as actual spinoff cases identified. The patent and invention notification listing should provide a good qualitative assessment as to which NASP technologies are maturing rapidly enough to spur contractor efforts to protect their property rights via the patent/invention mechanisms available to them. We anticipate that these are only the first steps in an extensive information gathering and technology assessment process.

RESERVES RAP

We are looking for hot items from individuals and/or Detachments to be published in this new column.

This is the place to share all exciting tech transfer accomplishments!

We hope to feature a different Detachment each month.

So, don't think . . .
You can't touch this!!

Editors, Educators, and Analysts Meet to Debate Impact of the NASP

--Adrian DeNardo, SAIC

On 17 April 1991, the United States Space Foundation conducted a mini-symposium, "American Aerospace in the 21st Century: The Impact of the

National Aero-Space Plane." This symposium examined the potential effect of the NASP on U.S. Space Policy, as well as the general role of NASP technologies on the country's economy. Held in Colorado Springs, Colorado, the symposium forum consisted of two distinct panel sessions. The first panel addressed the broad issue of the NASP as a space plane and the resulting effects, if any, a family of NASP derived vehicles could have on the U.S. space policy and program. The second panel examined the role and impact of the NASP as a technology development program from an innovative way of conducting such a program (the NASP Consortium) to the effects of the technologies themselves.

Representing academia, scholarly journals, and popular technical and scientific periodicals, the panel members and invited guests provided the Program Director, **Dr. Robert Barthelemy**, and the Director of Applications, **LTC George Matthews**, an independent evaluation of the program, in both space policy and economic/technological terms. During the proceedings, Dr. Barthelemy presented a program overview for the panelists which gave them greater insight into the program's objectives and technical challenges. For many of these participants, this was the first inside look into the NASP program. As a general rule, the panelists agreed that the NASP was a beneficial project which had potentially positive impacts on each issue discussed.

FYI . . .

Keep your eyes peeled for an upcoming edition of Aviation Week and Space Technology. The NASP JPO will be interviewed in early May about NASP technology. The role the Reservists play in the NASP technology transfer effort will be mentioned.

10th National Aero-Space Plane Symposium

--*Maj John Thomas, NASP JPO*

On 23 April 1991, **MAJ John Thomas**, of the NASP JPO Applications Directorate, gave a presentation on the NASP technology transfer effort to more than 400 attendees at the 10th National Aero-Space Plane Symposium held in Monterey, California. This Symposium was intended to be the last in a series that has focused on the NASP technology maturation effort. The NASP Technology Maturation program has been underway for the past three years, involving technology development principally at DoD and NASA research facilities.

The presentation at the Symposium served several purposes. First, it made NASP Government and contractor technology team members aware of the NASP technology transfer effort. This effort is targeted at adapting the NASP technologies both for applications aimed at other Government aerospace efforts, as well as for commercial spinoffs throughout the domestic industry. Furthermore, it introduced the potential for

DAYTON MANAGEMENT GROUP CORNER

Dayton Detachment April Weekend

--*LTC Robert McDonald, Dayton Management Group*

During the Dayton Detachment April Weekend, we discussed a few potential changes of seminar format for the August Tour. We haven't yet had them approved by the NASP JPO, but we want to share them with you and get your ideas as well.

For the August Tour, we may ask for more detailed information on a few specific technologies, as well as briefings by individual detachments on their efforts. We may also request the JPO to move the seminar to the first week of the Tour and have individual Reservists, or small teams, work actual technology transfer issues the remainder of the Tour. This would entail requiring the Reservists to make contact with companies or other organizations involved in these technologies. We solicit your opinions on additions, deletions, or other changes or improvements we can make in August, including whether you would like to work technology transfer the entire two weeks.

We also need information on activities in each detachment. The Dayton Detachment can then summarize any recent accomplishments in the Reserves Article for the Dayton Management Corner of this publication. However, we need your inputs--positive or negative! Even if transfer has not occurred, what about potential contacts, brainstorming results, etc., that might give other detachments ideas. If you have had major successes, or have other sufficient information from your detachment, we urge you to submit an entire article, if you wish. Use the AMS to get inputs to **CPT Mary Slenski**. The NASP Joint Program Office needs to know how we are doing.

NASP technology transfer opportunities to a variety of non-NASP industry representatives. Finally, it enabled the JPO to highlight some unique aspects of the NASP technology transfer effort, including the Reserves project. Symposium attendees, from all of the communities described above, were informed on how they could participate in the technology transfer effort or learn more about the NASP technologies.

Shortly after the conclusion of this Symposium, the leaders of the Government tasks were required to submit a summary of the technology accomplishments under their respective efforts. These summaries should provide some interesting data for our technology transfer effort. It is anticipated that these summaries

will total more than 1,000 pages covering about 125 separate tasks. After collecting and editing, these summaries are expected to be made available to us as rapidly as possible.

**NASP Technology Transfer Presented at
Aerospace Atlantic Conference**

--Adrian DeNardo, SAIC

We are happy to report that the 1991 SAE Aerospace Atlantic Conference came off as planned, and we had the opportunity to present the NASP T² program to the many attendees. A unique aspect of this conference was the inclusion of automotive industry data, as well as aerospace community data, to form an incomparable synergism of technical information. During the Aerospace Technology Transfer Session, on 25 April 1991, representatives of aerospace and non-aerospace industries heard presentations covering the entire gamut of technology transfer. More importantly, the audience was introduced to the use of the USAF Reserves team as an integral part of the transfer program.

The scope of the Aerospace Technology Transfer Session focused on various aspects of technology transfer, ranging from the legislative background, to legal concerns, to actual case histories, to future requirements. The forum was a combination of individual presentations, panel discussions, and guest speaker addresses. The selected topics were "The Imperative for Technology Transfer," "Intellectual Property--Legal and competitive Issues," "Technology Transfer Examples," and "Technology Transfer--Future Needs."

This was our first opportunity to get the NASP into this type of forum, and we don't envision it as the last. In fact, we are going to pursue this avenue as a method of outreach for technology transfer. However, in the future, we will try to stay away from the aerospace symposiums, as they tend to limit our prospects to the field in which we circulate daily rather than allow us to venture into new areas within the manufacturing and industrial community.

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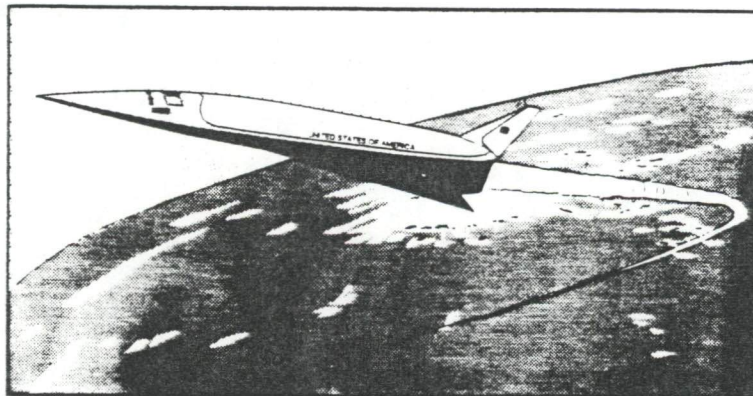
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If any of you know of, or belong to, professional and/or trade organizations that fall into categories representing industries other than the aerospace community, please inform us of any symposia they may be sponsoring. These events serve as the ideal vehicle for us to use to introduce NASP technologies to the community at large. In addition, they can provide us with a means to develop contacts of potential NASP technology customers. Call us, or drop us a line, if you have any ideas and would like to get involved in this kind of activity.



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AIR FORCE RESERVE TECHNOLOGY TRANSFER STATUS REPORT

THE SKY IS NO LONGER THE LIMIT!

March 1991 Edition

SPRING IS HERE !!

So, spring into action! Use the *Status Report* as a forum to report on all of your technology transfer efforts.

We are especially interested in articles addressing specific technology transfer success stories. This is an invitation for you to submit articles which highlight any spinoff that you have uncovered as a result of your endeavors to promote NASP technologies.

Send your articles to SAIC, addressed to the attention of **Angie Hargrave**. Catch the spring fever, and make a contribution to your *Status Report*!

Reservist Access to SDIO Data Base

--Maj John Thomas, NASP JPO

On 27 March 1991, **Mr. Terry Kasten** and **MAJ John Thomas**, ASD/NAR, and **Mr. Adrian DeNardo**, SAIC, held a meeting in Washington, D.C., with SDIO to discuss the inclusion of NASP technologies into their technology transfer data base. Articles on SDIO's Technology Applications Information System (TAIS) data base have previously appeared in the November, 1990, and February, 1991, editions of the Reserve Status Report.

The latest development is that SDIO has agreed to merge our efforts by incorporating NASP technologies into the TAIS. This system is accessible by DLA-certified domestic corporations to obtain information on SDIO technologies. More than 1500 abstracts are provided. If additional information beyond that available in the abstract is desired, users can initiate a request for such information during their session on the TAIS. Some initial scoping of the task of integrating NASP technologies into the TAIS was accomplished at the 27 March meeting.

As Reservists actively working on the NASP technology transfer project, you will be provided special access to this data base. In addition to being able to scan the abstracts on NASP and SDIO technologies, we plan to include, for Reservists users of the TAIS, an additional layer of information on NASP technologies. This additional layer will consist of about 500 pages of material summarizing NASP technology accomplishments as provided by NASP scientists and engineers. Points of contact for additional information will be available to you as well.

The integration of NASP technologies into the SDIO TAIS data base will occur over the next several months. In the interim, we will provide SDIO with the list of Reservists currently working on the NASP

technology transfer project. They will provide each Reservist with an access code, access instructions, and information regarding the utilization of the TAIS system. We hope that this system will prove to be a useful tool to you in getting rapid access to NASP technology data and in having points of contact available for additional information.

FYI . . .

The 1991 SAE Aerospace Atlantic Conference will be held 22 - 26 April, at the Dayton Convention Center in Dayton, Ohio. The purpose of this conference is to promote the interchange of technical data in the international aerospace community and will specifically focus on "Global Competitiveness Through Technology."

Reservists Technology Transfer Conference

--Mr. Adrian DeNardo, SAIC

The second NASP Technology Transfer Conference for ASD Reservists was held on 12 and 13 March 1991, at the NASP JPO and SAIC facilities. Attended by 18 participants, including 12 new NASP Technology Transfer Reserves Task Force members, the conference followed the same basic format as the August's conference, with some minor changes and improvements.

Mr. Terry Kasten began the conference with a briefing highlighting NASP technical and programmatic achievements. This was followed by an updated cryogenics briefing given, this time, by **Mr. Stephan Wolanczyk** of the NASP JPO. **Mr. Terry Ronald** followed with a NASP materials briefing, and then the NASP Technology Transfer briefing was presented to the group by **Mr. Adrian DeNardo**.

New this year was a briefing on computational fluid dynamics (CFD), given by **Dr. Dale Carlson** of SAIC's Fort Washington, Pennsylvania operation. (Dr. Carlson works out of SAIC's Dayton, Ohio, location.) **Mr. Tom Kundert**, a lawyer with the Air Force Judge Advocate's Patent Office at Wright-Patterson AFB, returned with another fruitful discussion to help clarify intellectual property issues. **CPT Mary Slenski** presented the final briefing with a review of the Reserves role in the technology transfer process.

Before and after the conference, several Reserves members of the technology transfer team spent time at SAIC's facility reviewing available NASP technical documentation and writing suggested Level III

technology descriptors for the Technology Description Document (TDD). These have been added to the TDD and distributed to all Reservists for review and comment. As before, packages of information and briefing hard copies were given to all conference attendees. SAIC is in the process of compiling additional materials, which include a new cryogenics briefing, a new materials paper, the CFD briefing, as well as an information packet on intellectual property developed by Mr. Tom Kundert (USAF/JACPD), to be mailed to each Reservist. In those cases where the information received by the first and second group of Reservists do not coincide, SAIC will mail the appropriate material(s) to the group requiring the update.

Once again, it was a pleasure for all of us to work with you, and we look forward to even more involvement in the future as the NASP technology transfer effort unfolds.

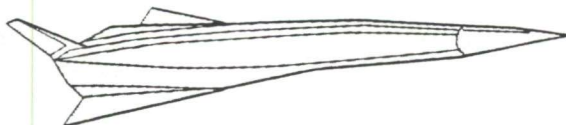
**NASP Technology Transition
Briefed to Chief, Air Force Reserves**

--Maj John Thomas, NASP JPO

MAJ GEN John J. Closner, III, Chief, Air Force Reserves, and BRIG GEN Jerry White, ASD/CR, visited the NASP JPO on 6 March 1991, for briefings on the NASP Technology Transfer Reserve Project. Mr. Terry Kasten of ASD/NAR gave the visitors an overview of the NASP program, describing the technology maturation efforts to date, the design efforts of the NASP contractor team, and the goal of building a vehicles that will demonstrate a single-stage-to-orbit capability by 1999.

Mr Kasten also covered the NASP technology transfer efforts and their importance in providing a national return on the investment in the NASP program and leveraging U.S. technology development. He described the key role in this effort provided by the team of Air Force Reservists working on the NASP Technology Transfer Project. The efforts of the Reservists uncovering some actual spinoffs of NASP technology in progress to date, and the identification of high payoff application targets for the technologies was highlighted. CAPT Mary Slenski, USAFR, briefed the General Officers from the Reservist's perspective on how the technology transfer process works and the role the Reservists play in facilitating that process.

The visit by MAJ GEN Closner and BRIG GEN White to the JPO is a major indicator of the high-level interest being shown in your Reserve project by the senior Reserve leadership.



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**Presentation at the 2nd Annual
U.S. Hydrogen Meeting**

--Maj John Thomas, NASP JPO

MAJ John Thomas of ASD/NAR attended the 2nd Annual U.S. Hydrogen Meeting, sponsored by the National Hydrogen Association (NHA), on 14 March 1991, in Washington, D.C. He presented a paper, entitled, "NASP: Enabling a Twenty-First Century Vision," the text of which was written by Mr. Terry Kasten of ASD/NAR. This paper, given during the "Hypersonic Vehicle Fuel Requirements of the Future" Session, presented the impact of hydrogen fuel on hypersonic transport designs and described a first generation hydrogen fueled operational vehicle.

MAJ Thomas emphasized the critical role of the Reservists as part of the NASP Technology Transfer Team. Following the presentation, Mr. Jeffrey Serfass, President of the National Hydrogen Association, spoke with MAJ Thomas about supporting the NASP program as part of his Association's thrust in advocating hydrogen-fueled transportation systems of the future. Several industry members of the NHA are invitees to the 10th National Aero-Space Plane Symposium to be held in Monterey on 23 - 26 April 1991. Some preliminary discussions are planned at that time to determine a strategy of mutual benefit to NASP and the NHA.

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AIR FORCE RESERVE TECHNOLOGY TRANSFER STATUS REPORT

THE SKY IS NO LONGER THE LIMIT!

February 1991 Edition

Consortium Contract Brings Contractor Teaming To Technology Transfer Effort

--Adrian DeNardo, SAIC

With the development of the formal consortium approach for the NASP program, the NASP JPO has implemented another part of the NASP Technology Transfer Program Management Plan by incentivizing the NASP contractor technology base. Within the Applications Directorate portion of the teaming agreement contract is a clear mandate to develop technology transfer procedures and to execute major portions of the NASP Technology Transfer Program Management Plan. Briefly, the contractors involved, (General Dynamics, McDonnell Douglas, Pratt & Whitney, Rocketdyne, and Rockwell International), will be working on such tasks as developing internal procedures for technology transfer, adding to the Technology Description Document, working specific demonstration cases, technology assessments, and other tasks. To ensure a robust contractor program, the contract Award Fee Plan specifically addresses technology transfer as a criteria for fee award.

The kick-off meeting for this effort was held on 13 and 14 February. A follow-up meeting to work such issues as integrated technology transfer schedules and task assignments is scheduled for 19 and 20 March. Included in the agenda will be discussions on Reservists roles as transfer agents and your interaction with the contractor side of the NASP technology base.

New Technology Transfer Team Member

--Angie Hargrave, SAIC

Another SAIC employee has joined the team of personnel working on the NASP technology transfer task. **Kaye Coates** will be undertaking several responsibilities related to NASP and the technology transfer effort. She will assist you, as much as possible, in obtaining the information you need to perform your technology transfer assignments. We welcome Kaye to the NASP program and are confident that she will be an asset to the technology transfer effort.

FYI . . .

Carol Lohman is on Military Leave through May. While she is away, some of her duties have been delegated to **Kaye Coates**. Please contact Kaye if you have any questions or requests. Kaye's number is now listed in *The Chatter Box*.

SDIO Technology Transition Meeting

--Maj John Thomas, NASP JPO

Mr. Terry Kasten and Maj John Thomas met with Col Daniel Heitz, Director of SDIO Technology Applications, in Washington, D.C., on 5 February 1991. Col Heitz was very impressed with NASP technology transition initiatives and sees many opportunities for future efforts.

SDIO, working with the Defense Logistics Agency, has developed an excellent mechanism for controlling Militarily Critical Technologies while allowing access to these technologies for certified domestic industry. Integrating NASP technology into the SDIO on-line technology computer data base was discussed. This integration could help foster wider use of NASP technology and would result in automatic control of critical technologies. SDIO has requested information on the NASP Technology Transfer Task Statement of Work for the Phase 2D effort of the NASP contractors. They are also interested in the NASP Award Fee Plan which incentivizes the NASP contractors to pursue technology transfer. Additional discussions are anticipated.

NASP Technical Documentation and Information Access Process Development

--Adrian DeNardo, SAIC

Several important activities have taken place to bring us a step closer to describing the NASP technology product in detail and to enable a widespread, yet controlled, access to this information.

With respect to describing the technology "product" on paper to interest potential "customers," much has occurred and still more is in the offing. With the Level I and II technology descriptors in hand, what remains is still the larger effort of detailing the NASP technologies down to the third indenture (Level III!) of the Technology Maturation Plan Work Breakdown Structure. Several approaches are being taken to satisfy this requirement.

First, we at SAIC have produced a few sample descriptors and passed these on to the Dayton Management Group for dissemination for your review and comment. We also provided copies to the NASP contractors for their review.

Second, by the time you receive this, several Reservists will have spent three days at our facility writing their own versions of Level III descriptors and evaluating others. (We are also receiving some from one of the airframe contractors.)

DAYTON MANAGEMENT GROUP CORNER**March Tour Plans**

--Capt Mary Slenski, Dayton Management Group

There are two major efforts planned for the March 1991 Annual Tour. First, a small group of Reservists will try their hands at developing Level III Technology Descriptors during the first week. The goal of this project is to expedite getting technology descriptions to Reservists for brainstorming.

The second effort will be the second NASP T2 Orientation Seminar during the second week of the Tour. This improved seminar will be similar to and have the same purpose as the one presented at the August 1990 Tour. Letters inviting interested Reservists were sent to all Detachment Commanders at the end of January.

Finally, during the week of 22 through 26 April, the last of the pre-consortium Tech Mat Symposia will be held at Monterey, California. At this time, the results of each of the technology maturation tasks will be presented in a number of different sessions and documented in a series of two- to eight-page summaries per task. Obviously, these will make a great starting point for the Level III descriptors. Once the documents are received, you will again have an opportunity to review them in light of your own requirements.

The next subject concerns the release of all of this data to our customers. Maj John Thomas and Mr. Terry Kasten of the NASP JPO recently visited the Strategic Defense Initiative Organization's, Technology Applications Information System Office [See the November 90 issue of this report]. There they learned how SDIO managed the same problem. The answer lies in the Defense Logistics Agency (DLA) managed process of contractor certification which gives access to Department of Defense Critical Technologies for use in legitimate commercial interests. Essentially, commercial firms interested in these technologies apply to DLA for certification under DoD Directive 5230.25, "Withholding of Unclassified Technical Data from Public Disclosure," and DoD Directive 5230.24, "Distribution Statements on Technical Documents." Despite their formidable titles, these two regulations outline the clear pathways to the information for qualified firms, as well as addressing the safeguards established to prevent transfer of this technology to adversaries of the United States (along with equally clear penalties for violations).

The JPO is working with SDIO on the possibility that the NASP may utilize the TAIS and its built-in procedures for certification and document dissemination. The JPO office, tasked with protecting sensitive NASP data, is developing draft internal procedures to track such activity. We are all confident that we'll soon have another component of the NASP technology transfer system in place.

Technology Transfer Discussions With
The University of Tennessee Space Institute

--Maj John Thomas, NASP JPO

On 8 February 1991, Maj John Thomas visited the University of Tennessee Space Institute (UTSI) near Arnold Engineering Development in Tullahoma, Tennessee. The meeting was coordinated by Maj Dave Guice, USAFR, as part of his NASP Reserve Project. Lt Col Charles Brown, USAFR, of the Tullahoma Detachment, also participated in the meeting.

Maj Thomas provided an overview of the NASP program to UTSI researchers working on magneto-hydrodynamic (MHD) power generation. He described some of the new NASP-developed technologies that might have an impact on efforts to utilize MHD power generation as an efficient source of energy. Discussions indicated the potential of NASP materials to enable higher operating temperatures for an MHD power generator, resulting in greater overall efficiency. NASP computational fluid dynamics and combustion modeling tools were also seen as having a potential impact.

UTSI will further define their technology requirements related to NASP research topics and present their preliminary findings in a follow-on meeting on 5 March 1991. At that time, Maj Thomas will also present the NASP technology overview to a larger group of UTSI researchers. It is hoped that as a result of these interactions, some cooperative efforts between NASP researchers and the UTSI MHD group may be initiated.

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AIR FORCE RESERVE TECHNOLOGY TRANSFER STATUS REPORT

THE SKY IS NO LONGER THE LIMIT!

January 1991 Edition

Have you noticed . . .

We have changed the name of this publication with every issue of it? We think we have finally settled on a permanent name--at least temporarily!

The most recent change--from "Newsletter" to "Status Report"--is due to the commotion that goes with "newsletters" sponsored by an Air Force organization. A "Status Report" is not required to go through the official Air Force approval process (i.e., Public Affairs), but a "Newsletter" is. Therefore, by doing this, we are eliminating a very tedious and time consuming step.

We know that you will be waiting with anticipation to see what new name we come up with for next month!!

Tech Transfer Activities Update

Adrian DeNardo, SAIC

Work continues to define our "technology product" for the NASP. Recently, two detailed (Level III) technology descriptors were drafted as test documents. The technologies chosen were High Conductivity Composites and Coatings.

The purpose of these preliminary efforts is to begin getting a benchmark for the level and kinds of detail which will be appropriate for a wide range of potential users. The objective of these descriptors is not to provide the ultimate answer to the potential user, but to provide enough data, of the right quality and format, to serve as a guideline for additional contacts for that user. Copies were provided for the Dayton Management Group's 2 February 1991 meeting for their review and comment.

FYI . . .

We are in the process of developing a Technology Transfer Document Library to support the NASP program. This library will be maintained as a data base to assist in tracking technical reports, publications, and documents that relate to the technology transfer effort. We are hopeful that the information maintained in this library will be used by organizations in the public sector, as well as by Federal, State, and Local government.

NASP Technology Accomplishments And Spinoffs

--Maj John Thomas, NASP JPO

The NASP JPO Applications Directorate recently was asked by the Air Force Congressional Liaison Office to provide material to be used in support of Congressional testimony on NASP technical achievements and actual, or pending, spinoffs of NASP technology. The NASP Contractor Team and SAIC responded by reporting on recent achievements and on applications of NASP technology which have surfaced to date. Some of the spinoffs mentioned were uncovered as a result of the efforts of Air Force Reservists working on their NASP Technology Transfer Projects.

The list of technology accomplishments which was provided to the Air Force Congressional Liaison Office follows:

Technology Accomplishments

Computational Fluid Dynamics (CFD)

- hydrogen/air combustion computed for first time on routine basis
- first ever tip-to-tail CFD analysis of hypersonic propulsion systems
- used to design combustors with efficiencies greater than 90 percent
- enables evaluation of designs at high speed flight regimes for which test facilities are not available

Materials and Structures

- 50 percent better strength/density ratios
 - enables 15 percent decrease in fuel consumption over designs using conventional materials
- 25 percent higher temperature tolerances
- novel structural optimization procedures
 - reduces design turnaround time by an order of magnitude
- titanium alloy fasteners for high temperature applications with 50 percent weight savings
- automated metal matrix composite processing yields 50 percent cost savings

Hydrogen Fuel

- slush hydrogen provides propellant density increase of 18 percent
 - yields 23 percent decrease in NASP weight for fixed payload
- 18 percent increase in cooling capacity

The following listed items are identified as actual (A) or in process (I) spinoffs resulting from the NASP Technology Maturation Program:

Sample Spinoffs

1. (A) Integrated thermal/structural analysis tools
 - expands analysis to larger, complex applications
 - already used for heat exchanger design (F-15) and lighter, stiffer wings for commercial aircraft
2. (A) Prosthetic joint replacements using new titanium matrix composite
 - two times the durability (20 year versus 10 year average life)
 - potential to eliminate 60,000 major surgical procedures per year
 - reduced risk of Alzheimer's disease
 - currently in FDA evaluation cycle
3. (I) Lightweight, high temperature internal combustion exhaust valves
 - 50 percent lighter than conventional steel valves
 - higher oxidation resistance
4. (I) Oil and gas pipe
 - potential for sour gas wells
 - 100 times better corrosion resistance than current titanium alloys
 - beta titanium matrix pipe fabricated for oil company evaluations
5. (I) Lightweight, high temperature automotive turbo-charger impellers
 - titanium aluminide impeller 50 percent lighter than Inconel impellers
6. (A) Thermal barrier material
 - material reflects 97 percent of infrared energy
 - added to R11 home insulation raises R factor to R19
 - commercial home product claims 20 percent lower cooling costs, 10 percent lower heating costs
7. (I) High strength refrigeration coils
 - copper niobium coils two times stronger than conventional coils
8. (A) Supersonic/hypersonic boundary layer transition analysis
 - more accurate drag estimates permit better performance predictions
 - lighter aircraft at given performance level

This shows that your efforts can make a critical difference in providing key examples of how NASP technologies can yield national benefits. We need your help in finding additional spinoffs and in flushing out the success stories for the examples which have already been identified.

DAYTON MANAGEMENT GROUP CORNER

**AF Reserve Chief
To Visit March Tour**

--Capt Mary Slenski, Dayton Management Group

Maj Gen John J. Closner, III, UASF Chief, Air Force Reserve, will be visiting the ASD Reserves on 6 March 1991. He comes at the invitation of Brig Gen Jerry White, Mobilization Assistant to the ASD Commander. Maj Gen Closner was appointed Chief, Air Force Reserve last November. He has the full responsibility for the supervision of all USAF Reserve units around the world and serves as the principal advisor on Reserve matters to the Air Force Chief of Staff. The purpose of his visit is to become acquainted with our ASD Reserve Program. The NASP Technology Transfer effort has been selected to be specifically highlighted during his visit. Both the JPO and project Reservists will be briefing Maj Gen Closner. This is an exceptional opportunity for ASD Reservists to receive high visibility.

Case Development

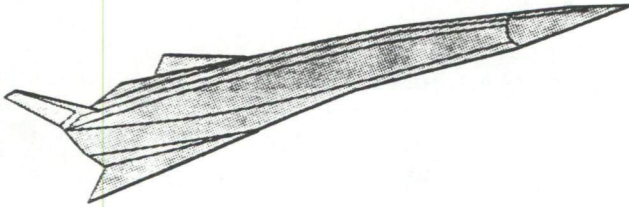
Adrian DeNardo, SAIC

Before the holidays, the Director of the NASP Joint Program Office, Dr. Robert Barthemey, invited local General Motors Organizations to share in the NASP technology development results for automotive applications. Since that time, two State of Ohio Department of Development organizations have become involved to help "broker" this connection.

The first organization is the Edison Materials Technology Center (EMTEC). EMTEC is a materials development consortium which has approximately 60 commercial industrial members and AFSC's Wright Laboratories as members. The purpose of EMTEC is to pool members' resources to solve material and materials process-based problems. Since the Air Force Wright Laboratories contributes both personnel and facilities, this consortium is an example of a technology transfer mechanism. The second organization is the newly-formed Ohio Advanced Technology Center. The purpose of this organization is to provide assistance to Ohio industry in utilizing all of Wright-Patterson Air Force Base technologies.

Together, a small cadre of people is working the preliminary activity to zero in on market driven automotive technology requirements which may have a solution in the NASP technologies. Because of the sensitivity of the particular issues, we are not able to publish the particular topics of interest provided by the General Motors representatives. We are optimistic that this exchange will provide us with a substantial body of data on many of the tech transfer program components on our Program Management Plan.

We are also optimistic in the hope that each of you may be able to use the current TDD as a general aide in beginning a dialogue with your parent firm. Remember, specific information will be held separately as competition sensitive. No cross migration of information among commercial firms will be allowed.



The Chatter Box

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MAJ John Thomas	(513) 255-9977

USAFR

LTC Frank Foegler	(513) 762-8292
Financial Sponsorship	
CPT Mary Slenski	(513) 429-9496
LTC Charles Darwin	(919) 383-1367
Patent/Licensing	

SAIC

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Ms. Carol Lohman	(513) 429-6658
Mr. Jim Batka	(513) 429-6644
Mr. Lou Machuca	(513) 429-6633
Mr. Dick Smith	(513) 429-6729
Ms. Angie Hargrave	(513) 429-6664

NASP JOINT PROGRAM OFFICE
ASD/NAR
WRIGHT-PATTERSON AFB, OHIO 45433-6503



SCIENCE APPLICATIONS INTERNAT'L CORP.
1321 RESEARCH PARK DRIVE
DAYTON, OHIO 45432



AIR FORCE RESERVE TECHNOLOGY TRANSFER NEWSLETTER

THE SKY IS NO LONGER THE LIMIT!

December 1990 Edition

Merry Christmas and Happy New Year!!!

We apologize for not getting the first newsletter to your respective detachments before the November meetings. We urgently need a better system for communicating with you. Please fill out the "mailing preference" form, found on the last page of this newsletter, and return it to us ASAP.

You may have noticed the newsletter is now labeled "FOR OFFICIAL USE ONLY". This procedure is necessary to protect the phone numbers listed in *The Chatter Box*. As we include more information in the newsletter about specific NASP technology transfer cases, it will become essential to label the newsletter "Government/NASP Contractors Only" and include an International Traffic-in-Arms Regulation (ITAR) statement.

In the future, individuals with special areas of expertise within the Reservist team will be identified in *The Chatter Box*. Permission is requested prior to listing an individual and their phone number.

New SAIC Team Members

We have added three more SAIC employees to the team of personnel working on the technology transfer task. In addition to Adrian DeNardo and Carol Lohman, Jim Batka, Lou Machuca, Dick Smith, and Angie Hargrave will join the technology transfer effort. Jim, Lou, and Dick will assist, on a case-by-case basis, in obtaining the information you need to perform your technology transfer assignments. Angie is solely responsible for administrative support. We welcome them. Their phone numbers are listed in *The Chatter Box*.

Reservist Activity Highlighted

Your reservist technology transfer effort is getting great high-level visibility! Lt Gen Ferguson (ASD/CC), ASD Commander, was briefed of the technology transfer project by Terry Kasten of the JPO Applications Directorate on 28 December 1990. The briefing explained the efforts of the NASP JPO to gain the Air Force user command support behind the program by responding to the users' needs and involving them in the development effort (see SAC and AFSPACECOM NASP MOA article). The briefing familiarized Lt Gen Ferguson with the success stories emerging in the NASP technology transfer effort and the critical role you reservists are playing in making that come about. Lt. Gen. Ferguson is very pleased with your efforts, to date, and wants to be kept informed on a regular basis.

Therefore, we need to hear more from you so we may continue to emphasize your activities.

Keep up the good work by following up on the applications you have identified and by brainstorming to come up with more. While some of the applications are already developing into solid success stories, we feel there are many more still out there waiting to be discovered. So, take some time to think about other technology transfer possibilities, and give us (the JPO and/or SAIC) a call when you identify something that can be investigated. We're anxious to hear from you!

SAC and AFSPACECOM NASP Memorandum of Agreement

On 27 November 1990, Lt Col Matthews and Terry Kasten of the JPO, provided a 45-minute briefing on NASP technology and utility to Gen Chain (CINCSAC) and Lt Gen Moorman (AFSPACECOM/CC) during an issues day between these commands. Following this briefing, a NASP Memorandum of Agreement (MOA) was signed by the commanders. The MOA specifies that the two organizations agree to contribute strengths and expertise, participate in technology review, provide operational perspective on critical design decisions, form a NASP Operator's General Officer Steering Committee, and advocate the program in command budget submissions. This MOA is one of the most significant support documents for the NASP program. It is the culmination of four years of user interaction and working group activity between the NASP Applications Directorate and the using commands.

Technology Description Document (TDD)

We completed a first draft of the Level 1 and 2 TDD in November and are currently in the process of incorporating the recommended changes from ASD/NAR. Level 1 includes a general description of the NASP technologies and is aimed at first-time readers who have little knowledge of the NASP program or its technologies. Level 2 concentrates on one of the major NASP technology areas and contains more technical details and specific applications examples.

We are required to go through the Public Affairs process before sending it out to you for your comments. NASP documents cleared for public release are required to go through AF, as well as NASA approval processes and ultimately require SECAF approval. This process can take anywhere from 30 to 45 working days. Since most of our source material was previously cleared, we hope the approval process for the TDD will be somewhat streamlined.

Work is starting on the Level 3 descriptions, and we are in the process of obtaining detailed technical reports to support this effort. Level 3 will contain detailed technical information that will enable face-to-face discussions and problem solving among engineers and scientists involved in those disciplines. Initially, we intend to focus our efforts on materials and manufacturing processes; following that, we will focus on CFD. We expect to have a first draft of the materials and manufacturing Level 3 descriptors by June, 1991. Once we have completed this section and it is approved through Public Affairs, we will send each detachment a TDD three-ring binder. As we complete new descriptors, and once they make their way through Public Affairs, we will distribute them to the detachments as additions to the TDD binder. In this interim period, prior to a PA-approved TDD, we can send you a pre-PA-approved TDD, marked "FOR OFFICIAL USE ONLY," with the understanding that it is for your internal review and comment. Please indicate on the "mailing preference" form whether you would like to receive the pre-approved version or would like to wait until the approved version is publicly released.

NASP Technology Maturation Plan

The NASP Tech Mat effort has ended and a summary is expected out in April, 1991. The NASP Tech Mat Work Breakdown Structure (WBS) has been re-scoped jointly by the JPO and the NPO, therefore, NASP technology maturation will continue through these refocused efforts.

Technology Transfer Cases

We have nine T² cases on-going, five of which involve the Reservist T² project ideas that were relayed to us from Capt Mary Slenski. An SAIC case worker was identified for each case, and in some cases the case worker has already contacted the Reservist who initiated the potential application. We are doing some basic research on how the NASP technology relates to these ideas, as well as identifying some NASP points-of-contact for the technologies. Our intention is to provide you with the information you need to go to the next step.

Successful Technology Transfer --Hip Joint Replacement--

One of the NASP technology transfer success stories was brought to our attention by 1Lt Bridget Mataban, of the New York Detachment, concerning composite materials for biomedical implants. Upon further investigation, it was discovered that TIMET, a materials manufacturer, was contracted by McDonnell Douglass, to develop an improved oxidation resistant titanium alloy for NASP. The Ti alloy, developed and fabricated by TIMET (Beta 21S Titanium), has other

useful applications--particularly for orthopedic implants and for hot corrosive areas in gas and oil wells.

The attractive properties of Beta 21S include lower modulus of elasticity, better high temperature characteristics, much improved corrosion resistance, high strength, and a higher hardness. Beta 21 is currently being investigated as a material for hip joint implant material. It reduces the body's exposure to toxins, and, with a lower modulus of elasticity, it has a higher level of bio-compatibility and helps promote bone growth and attachment onto the implant. Beta 21 is currently being evaluated by the FDA, and implant suppliers are waiting on the sidelines for FDA approval to use Beta 21S in orthopedic implants.

T² Document Library and Data Base

In order to manage and maintain the number of documents we expect to receive, we have started a library and developed a small data base to track what we have in-house. Thus far, we have about 70 documents--mostly papers presented at the 1989 and 1990 AIAA National Aero-Space Plane Conferences. You are welcome to leaf through the library while on your annual tour at Wright-Patterson AFB.

NASP Technology Transfer Program Management Plan (PMP)

The PMP is approaching its final version as a draft document. A copy will be sent to each detachment so you can see how the entire NASP technology transfer process is anticipated to evolve and how the Reserves fit into the process.

NASP Legislation Approved

In this period of tight defense budgets, congressional support for the NASP program was underscored by the legislation funding the effort at a level of \$258 million for FY91--which was close to the total amount requested for the program in the DoD and NASA budgets. Funding at this level has enabled the JPO to proceed with all of the major Phase 2 activities planned for this fiscal year.

The congressional language approving the NASP budget goes on to require the Secretary of Defense to provide a report to the Congressional Defense Committee, by 15 March 1991, identifying the military requirements and missions for NASP and the rationale for continued DoD fundings for this program. The information requested in this report falls within the area of responsibility of the JPO Applications Directorate. One of the benefits the JPO will acquire as they prepare this report for Secretary Cheney is the broad payoff of the NASP-developed technologies for the National industrial base. Estimates of the economic benefit, as

presented by H. Stein and P. Lane at the Second International Aero-Space Plane Conference held in Orlando, in October, were a potential \$26 billion, if the program is funded through completion. Specific examples of technology transfer that you identify will help anchor these estimates.

-----Mailing Preference Form-----

Name: _____

Home Address:

Can we contact you at home?

☐ Yes

☐ No

Home Phone:

Work Address:

Can we contact you at work?

☐ Yes

☐ No

Work Phone:

Mail NTTN to:

☐ Work

☐ Home

TDD Preference:

☐ FOUO Version

☐ Public Release Version

-----Mailing Preference Form-----

The Chatter Box

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Maj. John Thomas	(513) 255-9977

USAFR

Lt. Col. Frank Foegler	(513) 762-8292
Financial Sponsorship	
Capt. Mary Slenski	(513) 429-9496

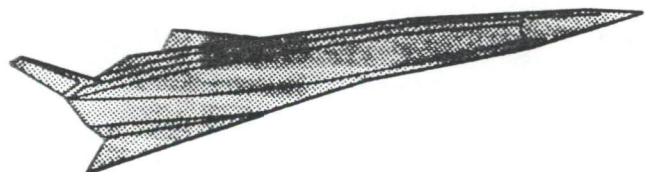
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Mr. Dick Smith	(513) 429-6729
Ms. Angie Hargrave	(513) 429-6664

Reserve Briefers Needed

One idea we would like you to consider is our possibility of helping you get more visibility as you work the technology transfer effort. If you develop a specific technology transfer idea for NASP technology, we would like to offer you the opportunity to brief that idea to senior Air Force management and/or a technical society meeting. Naturally, your idea must be thoroughly researched and developed. If your idea proves acceptable, we could give you the option to brief Lt Gen Ferguson about your task at the next scheduled briefing. Of course, we would support you with travel funds and assist you in getting Reserve time credit for the effort. Another possibility would be to attend a NASP Symposium and present a paper on the results. Since these meetings have traditionally taken place in Orlando or Monterey, this may be more appealing than traveling to ASD in Dayton to present a briefing!

Think about it. Take us up on this challenge! It would be beneficial to your particular technology transfer task, as well as advantageous to the long-term goal of the NASP technology transfer effort as a whole.



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TECHNOLOGY TRANSFER NEWSLETTER

NASP JOINT PROGRAM OFFICE
ASD/NAR
WRIGHT-PATTERSON AFB, OHIO 45433-6503



SCIENCE APPLICATIONS
INTERNATIONAL CORPORATION
1321 RESEARCH PARK DRIVE
DAYTON, OHIO 45432

November 1990 Edition

Here it is--the long-awaited NASP Technology Transfer Newsletter (NTTN)! We trust that it will serve as a forum for you to share information with all of the Reservists, as well as keep you informed on transfer technology issues.

Please take a few minutes during your Detachment meetings to have a "brainstorming" session, and keep us advised of any ideas you may come up with to promote the technology transfer effort to your industry or related industries.

If you wish to pass information on to other Reservists via NTTN, please have the information submitted, preferably written, by the 20th of each month.

We will be contacting you, periodically, to keep abreast of your progress and to see if we can support you in any way.

NASP Technology Transfer Update

Since our workshop in August, a lot has transpired on the NASP program, and we have learned a lot more about tech transfer. What follows are highlights of some of the items that have come up or have been done. I encourage all of you to call me or the SAIC Reserves program director, Carol Lohman, if you would like further information on any of the topics or would like to add what you have learned to the team's general knowledge base.

Technology Description Book

SAIC is working hard to come up with an initial cut at the technology description book. We have chosen to describe the technologies at three different levels of detail. The first level, or tier, will be a general description of the NASP and all of the major technology areas being developed. Attached is a basic overview of these technologies. The second tier talks to a single technology area (e.g. aerodynamics) and lists all of the technology avenues being pursued to solve the aerodynamics problems. The details here are limited to short descriptions of the technologies. Finally, the third tier will describe the details of the research being conducted to solve a particular problem connected with the technology area. Details at this level will be of such nature that they form a basis for person to person discussion in a developer/potential user relationship.

As we develop these descriptions, we are going to meet with businesses of various kinds to test market the

information. We will also send draft write-ups to all of you to do the same thing. What we are looking for here is the reaction to the technology by various types and sizes of businesses. Any feedback from you will prove extremely valuable as distribution of this data will ultimately become quite widespread.

NASP Tech Transfer Program Management Plan

Members of the program office and SAIC are working to put together the NASP technology transfer program plan. This plan is in partial draft state and is being reviewed by the NASP JPO. We are beginning to add in the detailed tasking and schedules to complete the basic plan structure. All Reservists will be part of this plan insofar as having some actions to carry out in support of the tech transfer initiative.

Technology Transfer Society Article

Finally, we have included an article by Souder, Nashar, and Padmanabhan taken from the Journal Of Technology Transfer. While not written about any specific technology transfer program, this article helps put the NASP tech transfer into perspective. In addition, it provides an excellent generic transfer model, identifying specific roles for the tech transfer participants. Lastly, the article provides common terminology for describing the actions and players in the tech transfer task.

NASP Team Addition

Major John P Thomas, Jr. joined the NASP JPO's Applications Directorate as Chief of the Space Applications Branch in September, 1990. His responsibilities include managing the Directorate technology transfer effort, acting as Program Manager for the SAIC support contract, and directing some of the efforts of the NASP Contractor Team's space applications studies.

Major Thomas received his B.A. and M.S. degrees from the Georgia Institute of Technology in 1975 and 1976, respectively. In 1980, the AFIT Civilian Institution Program solicited him to pursue his doctoral studies at Carnegie-Mellon University. Upon his graduation in 1983, he was assigned as a Program Manager at the Air Force Office of Scientific Research where he conducted basic research in the area of computational mathematics. In addition, Major Thomas held a position with the Information Processing Technology Panel of Project Forecast II in 1986 and 1987.

Among his other accomplishments, in 1988, Major Thomas served as a visiting scientist at the German Aerospace Establishment's Research Center in Braunschweig. His assignment was with the Institute for Structural Mechanics, where he developed a finite element program for the analysis of fiber-reinforced composite structures under combined thermal and mechanical loading.

We wish to extend a warm welcome to Major John Thomas and look forward to utilizing his expertise to contribute to the NASP technology transfer effort. We are confident that he will be an asset to the NASP program.

NASP JPO Technology Transition

The NASP JPO is in the process of establishing a JPO Working Group to address technology transition. The Working Group will involve the JPO organizations that have responsibilities in technology transfer and is being tasked to draft, by 15 December 1990, a NASP JPO Technology Transition Policy Statement for Dr. Robert Barthelemy's (NASP JPO Director) review.

The National Program Office (NPO) will also be getting involved in technology transfer. Their support is being solicited through the Phase 2D Statement of Work which includes the requirement to identify functional leads in all technical areas relevant to the NASP program. In addition, a lead for technology transfer issues will be established at the NPO to coordinate the contractor efforts and to act as a point of contact to the Working Group.

Finally, the JPO is requesting the JAG office provide a ruling to clearly describe the extent of technology ownership by the government and the implications to private industry. Preliminary discussions with the JAG office have indicated that the government has exclusive rights to non-royalty use of NASP technology. However, the government does not actually own the technology outright. This ruling fosters technology transition in that it provides economic incentive to contractors to spin-off and license technology. A clear JAG opinion on all technology transfer issues will be obtained and communicated to the national team so that these issues do not become an impediment to technology transfer.

FYI . . .

The October 29, 1990, edition of Aviation Week Space Technology has the newly-released design of the X-30 vehicle. We have enclosed a copy; but, you may want to visit your local library, as the photocopy does not do justice to the color photographs.

SDIO TAIS Data Base

A free, on-line database service has been established by the Strategic Defense Initiative Organization (SDIO) of the Department of Defense. This database, the Technology Applications Information System (TAIS), contains more than 1,300 unclassified, nonproprietary abstracts that identify emerging technologies developed through research on SDI. TAIS abstracts describe SDI research in a variety of technical addresses, including superconductivity, sensors, lasers, supercomputers, electronics, energy, materials, and industrial processes. Through the TAIS you also gain access to information on points of contact at federal, state, and local technology transfer offices and listings of other technology information databases.

As a Reservist, you may obtain access certification by submitting a request, on official letterhead to:

**Director, Technology Applications
The Strategic Defense Initiative
OSD/SDIO/T/TA
Washington, DC 20301**

Please include in the request the reason you want access to the system as well as the full name, title, federal address, and telephone number of the designated point of contact. This certification is a signed agreement to withhold release of any information about militarily critical technologies, such as those provided through the TAIS, to any foreign national without prior approval, authorization, or license under U.S. export control laws.

The TAIS is a free service, other than the cost of the telephone call, and is available to users 24 hours a day, seven days a week. The user is permitted to access the system three times daily for 20 minutes each session. You may request, on-line, more information about a particular technology.

The Chatter Box

Mr. Terry Kasten	(513) 255-3165
Maj. John Thomas	(513) 255-9977
Capt. Mary Slenski	(513) 429-9496
Mr. Adrian DeNardo	(513) 429-6608
Ms. Carol Lohman	(513) 429-6658

If you wish this newsletter forwarded directly to you at your company or home address, please complete the form below and return it to SAIC.

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

This address is my: ☐ Company ☐ Home

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

October 21, 1991

Michelle:

Just so that you folks don't get blindsided here is a copy of the Rohrabacher letter to Bart. I endorse it in general and hope that Bart gets the message. The potential for harm of this difference can be large.

Incidentally, Tony is now under contract to the Program office.

You will know how you want to use this if you do.

Can't call this a billet-doux in the present historical scene so whatever is safe.

Scott

*Rich -
We should find
out if Bart
has answered this*

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

FAX Transmittal Sheet

DATE: 10/28/91

TO: MING TANG
ORGANIZATION: SAF/AQT(NIO), BD944
TELEPHONE: 695-7866
FAX: 695-4580

FROM: RICK YANNUZZI
ORGANIZATION: OFFICE OF SCIENCE AND TECHNOLOGY POLICY
TELEPHONE: 395-5052
FAX: 202-395-3719

NUMBER OF PAGES, INCLUDING COVER PAGE: 5

SPECIAL INSTRUCTIONS:

Ming,

*Michelle would like to obtain a copy of Bart's
response to the attached letter from Rohalacher.
Thank you.*

Rick J.

DANA ROHRBACHER
420th DISTRICT, CALIFORNIA

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Congress of the United States
House of Representatives

COMMITTEES
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AND EDUCATION
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CO-CHAIRMAN, TASK FORCE ON THE
STRATEGIC DEFENSE INITIATIVE
CO-CHAIRMAN, TASK FORCE ON TERRORISM
AND UNCONVENTIONAL WARFARE

Wednesday, October 9th, 1991

Dr. Robert R. Barthelemy
Program Manager
National Aero-Space Plane Joint Program Office (AFSC)
Wright-Patterson AFB, OH 45433-6503

Dear Dr. Barthelemy:

I am writing to express some concerns that have come to my attention with respect to the NASP program.

I have been a supporter of the "NASP concept" -- airbreathing scramjet propulsion to very high Mach enabling single-stage-to-orbit -- since 1985, when I first was exposed to the "Copper Canyon" program while working in the Reagan White House. It is clear to me that the cost of putting payloads into orbit must come down dramatically if we are ever to exploit space in a really meaningful way. Scramjet-powered aerospace vehicles appear to be one of a very few possibilities capable of achieving dramatically reduced operating costs.

Nevertheless, as you well know, building such a vehicle, even an initial experimental one, is a very difficult technical problem, and the skills necessary to properly design the overall vehicle concept are not widely available.

Mr. A.C. Robertson, who is one of my constituents, and Mr. A. A. duPont, the major principal of duPont Aerospace Company (and one of the main individuals responsible for the creation of the "Copper Canyon" program), have reviewed with me the status of the response to Congress's request for a comparison of the Government Baseline Vehicle ("GBV") and the current NASP X-30 configuration ("CNC"). Congress funded this

study in the FY '91 budget. Several points of difference between the GBV and the CNC were pointed out to me during our conversation. Chief among them are:

- The GBV subsystem weights
- The effect upon the X-30 vehicle's gross weight of carrying substantial amounts of LOX for propulsion oxidiser
- The amount of hydrogen fuel needed to achieve orbit

These technical factors are all resolvable, and it was Congress's intention, when the Congress funded this study, that these factors be resolved. Therefore, I would like to suggest that before you report your study results to Congress, that definitive answers to these and any other technical differences important to the future direction of the NASP program be prepared. It was Congress's intent, as I understand the legislative history, that the duPont Aerospace Company was to participate in these studies to the extent necessary to resolve the technical questions surrounding the differing GBV and CNC NASP design approaches.

The JPO needs to settle the technical arguments between the GBV and CNC. In the meantime, however, Mr. duPont, the originator of the NASP concept, and perhaps the most knowledgeable person in this technology, is about to become unavailable because of a lack of funding from the JPO.

It seems to me that now is the time to utilize Mr. duPont's team to the fullest possible extent, rather than dropping them. I recommend most strongly the JPO do this. I believe that it is imperative that the technical questions surrounding these two opposing "NASP worldviews" be given uncompromising, objective technical "scrubs" in order to base engineering decisions upon numbers, not opinions.

I would appreciate an answer in this matter as soon as you can render it. May I request an answer on your decision by, say, October 20th, 1991?

Sincerely,


Dana Rohrabacher
Member of Congress

Attachment

DR:tbk

NASP Point Paper -- "GBV" vs. "CNC" Issue

1. In the FY '91 DoD Authorization Conference Report, up to \$2,000,000 was set aside for DARPA to define the reasons why the initial DARPA "Government Baseline Vehicle" ("GBV") NASP airplane, which grossed 50,000 pounds at takeoff, has now become an NPO design (the "Current NASP Configuration" or "CNC") which grosses roughly ten times as much.
2. DARPA chose to hand this study off to the NASP Joint Program Office ("JPO").
3. Having the JPO do the study represents a conflict of interest, since the CNC is now their responsibility.
4. Because of a feeling that there are features of the original airplane which, if adopted by the NPO Team, would result in significant weight reduction (and, thus, of cost), some aspects are being pursued objectively in spite of the conflict of interest situation.
5. The draft final report of the study is so biased that the initial comments will hopefully result in a more factual final draft. Under the rules set out by the JPO, the contractor's resized airplane to meet the current mission grosses 40,000 pounds.
6. The JPO is pursuing further, with Rockwell's assistance, a revised engine design for the current team configuration, which incorporates the features of the GBV engine.
7. DuPont's assessment is that the larger engine size required by the lifting body selected by the NPO National

Team (over twice as large) has by itself alone increased the gross weight of the CNC by over a factor of two.

8. The remaining increase in size/mass of the CNC can be directly attributed to the difference in engine performance. This difference is currently being addressed by the JPO.

9. The information is available to achieve a stable low gross weight X-30 configuration.

10. To date, the JPO engineering group has elected to insist that certain of the initial weights have low credibility rather than admit that at a given size the aircraft weight level is similar to the present NPO National Team level, and that the engine size alone is responsible for some of the growth. They do concede that engine performance is a factor of two or more in gross weight of the aircraft.

11. Congress can be instrumental in achieving a satisfactory aircraft design for the X-30 by:

- a. Insisting on factual answers in the mandated study.
- b. Insuring that the original Government Baseline Vehicle contractor, duPont Aerospace Company, is kept involved as a knowledgeable advocate of the lower gross weight X-30 aircraft design, and aerodynamically stable solutions.

Aerospace Daily

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AEROSPACE DAILY 1156 15th Street, N.W., Washington, D.C. 20005 EDITORIAL TELEPHONE 202-822-4661 FAX 202-293-2682 TELEX 892447 William D. Hall/Editor, Richard Tuttle/Managing Editor, Frank Moring, Jr./Senior Editor, Charles Rabby/Congressional Reporter, James Mathews/Int'l. Financial Reporter, John Tirpak/Military Reporter, Tim Garity/Desk Editor, Tom Woodson/Publisher Published daily except Saturdays, Sundays and holidays by the Aviation Week Group of McGraw-Hill, Inc. 1221 Avenue of the Americas, New York, N.Y. 10020. (ISSN No. 0163-4346/90) Officers of McGraw-Hill, Inc.: Joseph D. Bionne, Chairman, President and Chief Executive Officer; Robert Landee, Executive Vice President, General Counsel and Secretary; Harold W. McGraw, III, Executive Vice President; Frank D. Pangloss, Senior Vice President, Treasury Operations; and Kenneth E. Guzzola, Executive Vice President, Aviation Week Group. COPYRIGHT © 1991 by McGraw-Hill, Inc. All rights reserved. None of the content of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without the prior written permission of the publisher.

Vol. 160, No.39

Tuesday, November 26, 1991

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SPACE COUNCIL OKAYS NASA/DOD LANDSAT 7; NO NASP, NLS DECISIONS

Key members of the Bush Administration's National Space Council yesterday approved a joint NASA/DOD program to develop the Landsat 7 remote sensing platform. But aside from agreeing that the satellite would be essentially a "clone" of Landsat 6, the council "executive committee" left funding and other details to its lower-ranking Policy Implementation Review Committee (PIRC), an Administration official reported after the council meeting.

Vice President Quayle, Deputy Defense Secretary Donald Atwood, NASA Administrator Richard Truly, Under Secretary of Commerce John Knauss and other council members also were briefed on two other joint NASA/DOD programs, the National Aerospace Plane (NASP) and the National Launch System (NLS), but made no decisions on those programs, the official said.

A bipartisan group of 21 House Armed Services Committee members last week sent Quayle and Truly letters asking that NASA reprogram part of its in-hand funds to make up the shortfall in civilian funding of the hypersonic aircraft research project left by Congress in the space agency's fiscal 1992 spending bill on grounds "any substantive reduction in NASA's funding support will likely be used by NASP opponents to kill it next year." The action by NASP supporters on the committee came in the wake of a warning by defense conferees that they wouldn't let DOD pay the bill for NASP or Landsat alone (DAILY, Nov. 18).

No NASP Decisions

* "There weren't any decisions to make on the NASP," said the official, who asked not to be otherwise identified. "Everybody got briefed on NASP and NLS, but there weren't any real issues. (The reprogramming request) didn't come up."

Instead, the council members decided to go along with a recommendation from the PIRC that the joint Landsat 7 program be established (DAILY, Nov. 13). PIRC members, generally deputies to the members of the Space Council, also recommended that NASA and the Pentagon fund the next-generation remote sensing satellite and directed the two agencies to work out the details. The official said Space Council members did not expand on the PIRC recommendation, and did not address Landsat 7 funding.

"The decision that was made didn't capture that point, but there is every reason to believe that what the two agencies will propose is a jointly funded program," the official said. "The two agencies still have the mandate that they were given at the PIRC meeting to go work the details of the proposed plan. At the time they were told to work up what they would propose if the Space Council's decision was to move forward. They were of course not able to complete all that work prior to this meeting because not enough time had elapsed, and so they are still working those details."

The official said details should be available no later than President Bush's fiscal 1993 budget submission to Congress, where Democratic legislation designed to ensure a continuation of the Landsat program is already in the works. Introduced by Rep. George E. Brown Jr. (D-Calif.), chairman of the House Science, Space and Technology Committee, the legislation also establishes a joint Landsat program office and, in the interest of preventing a gap in the 19-year Landsat database, calls for a "clone" of Landsat 6 as its replacement to save development time (DAILY, Oct. 24).

"They discussed that point," the official said. "...I would say that the prejudice seems to be that a clone of Landsat 6 is the right answer," the official said.

(Continued On Following Page)

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ESA Proposes Delaying Hermes In Attempt to Hold Down Spending

JEFFREY M. LENOROVITZ/PARIS

The European Space Agency is proposing new delays for its Hermes manned spaceplane program as the organization struggles to meet demands by member states to hold down spending.

The new proposal pushes back the first unmanned mission for Hermes to 2002, while the initial manned mission is targeted for 2003.

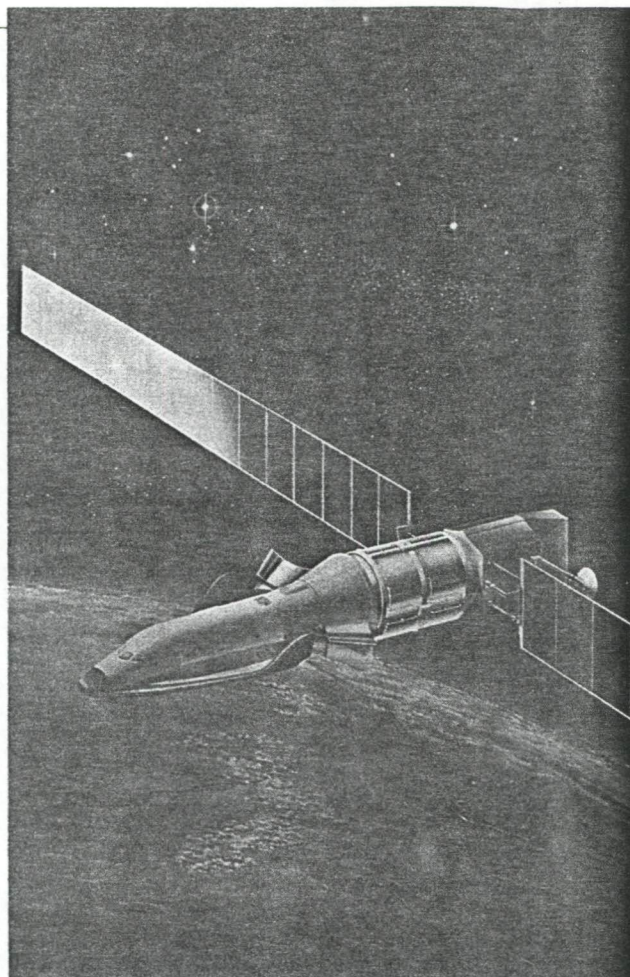
ESA's revised scenario for Hermes represents the latest change in program planning as the agency nears decisions on key elements of its long-term space plan. ESA's management council is to review the latest Hermes proposals at a meeting Oct. 16-17, after which the final proposal documents will be forwarded to member governments. Ministers of ESA member states will make the decisions at a meeting in Munich Nov. 18-20.

"The pressure really has been put on ESA to rework its programs to meet the spending limits that many member nations have been seeking for some time," one government manager at an ESA member state said. "There has been a lot of 'sweating' going on in ESA's management as the participating countries force the agency to work up a plan that can be accepted when the ministers meet in November at Munich."

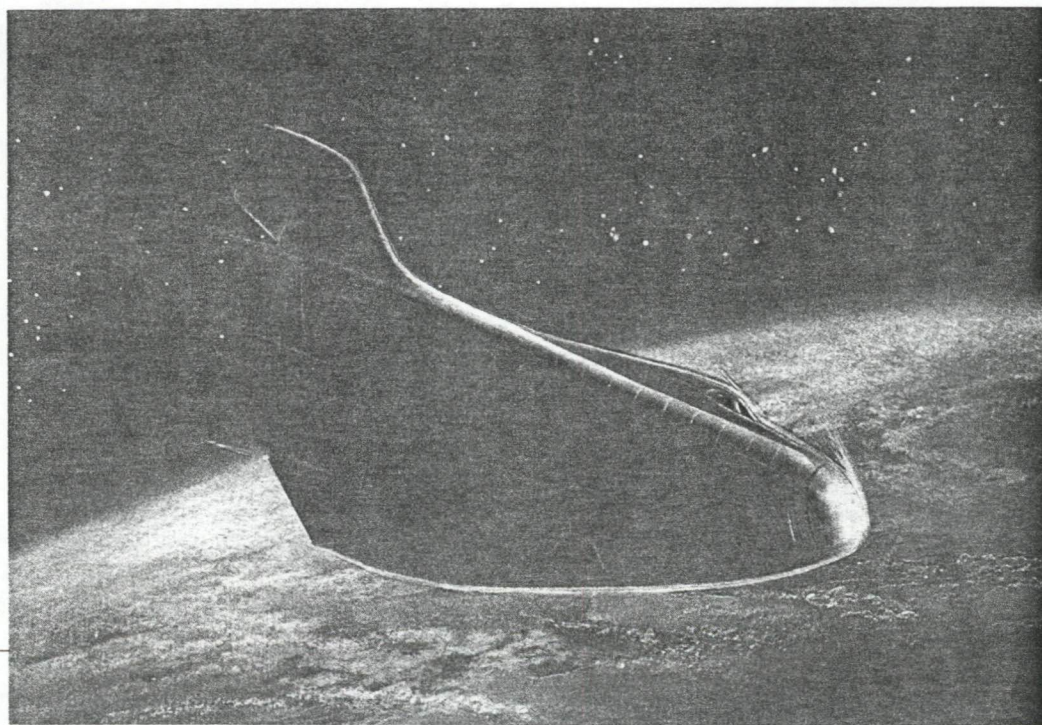
In the new scenario, Hermes' initial unmanned mission will be in 2002—five years later than originally planned. The second flight will carry European astronauts and is targeted for 2003. These two missions constitute the spaceplane's flight development phase, and they will be followed by an operational validation flight in 2003 and another in 2004 to qualify Hermes for full servicing of ESA's Columbus free-flying laboratory facility.

A delay in Hermes was proposed earlier this year in a program package drawn up by ESA Director General Jean-Marie Luton in response to members' requests for reductions in future spending (AW&ST June 17, p. 96). That proposal—which called for Hermes' first mission to slip from the original 1998 date to late in the year 2000—was

Docking of Hermes with the Columbus free-flier, as depicted in artist's concept, would not occur until 2003 or 2004, based on the latest ESA proposal. The plan takes into account Europe's growing difficulties with paying for its long-term space program.



Europe's Hermes spaceplane is shown during reentry in this artist's concept. ESA is proposing a new delay in the Hermes program as member states deal with increasing budgetary problems.



not accepted by ESA countries, leading to the latest revision.

"The earlier proposal called for a peak in Hermes spending in 1996," one ESA manager said. "With the latest proposal, this peak has been pushed into the 1998 time period; the peak itself is lower, and the overall spending curve is flatter."

Jorg E. Feustel-Buechl, ESA director for space transportation systems, said the new proposal delays the Hermes program as long as possible. "Any further stretch-out would effectively force the program as we now know it to stop," he told AVIATION WEEK & SPACE TECHNOLOGY. "It is difficult to design a spaceplane in the late 1980s and fly it early in the next century. It will not be possible to keep the Hermes industrial team together if any more delays are put into the planning."

The Hermes program workload for Europe's aerospace industry will be about 20% lower annually than previously pro-

posed by ESA Director General Luton because of the stretch-out.

A few small companies may be put into a "catastrophic" position by the reduction, and some specific measures are under consideration "to avoid the worst," managers said.

The new scenario for Hermes was one of several considered after Luton's earlier revision was rejected. Also considered was a plan that would have reduced Hermes to a technology-oriented effort for several years, with a decision on full-scale development delayed until 1994-95.

"This scenario would have diminished the financial burden for member states because the budget required for the next few years would have been smaller," Feustel-Buechl said. "However, we rejected it because it would have completely destroyed all system-level activity for Hermes, and it would have led to a destruction of the Hermes industrial team."

Since most of the technology activity is concentrated in France, Germany and Italy, the other nations would not have a real contribution to the program during this period, he added.

"In a technology-only effort, the program would no longer have merited the name Hermes since it had little to do with the spaceplane itself," Feustel-Buechl said. "In such an approach, it would not be worth spending time and money on hypersonic research, thermal protection, and other areas because we wouldn't know how the spaceplane would change since it was not sufficiently defined at the start."

The Hermes program currently is in its Phase 1 definition/development stage. The industry proposal for Phase 2 full-scale development and production was submitted last March.

Feustel-Buechl said Hermes is considered in "relatively good shape" from a

Soviet Space Managers Seek Funds From Russia

TOURS, FRANCE

Soviet space program managers expect the Russian Republic to provide most of the funding needed to continue their national space programs.

Vladimir Kotelnikov, director of the Soviet Academy of Sciences' Intercosmos council, said the budget request for space research and space science next year is 450 million rubles.

The 1991 budget request was about 300 million rubles, a figure that includes the spacecraft, their launches, experiment hardware and operation of experiments in orbit.

However, Albert Galeev, director of the IKI space research institute, said the high Soviet inflation rate all but eliminates any real growth in next year's budget.

He said the 300-million ruble budget granted for 1991 covers planetary and space astronomy, and solar terrestrial physics work.

"Of this total about 266 million rubles is for program spending, while the remainder is for salaries, operating budgets, etc.," Galeev told AVIATION WEEK & SPACE TECHNOLOGY.

"If we get 400 million rubles for next year, we would be happy," Galeev added. "With the high inflation rate in our country, the real spending power would be even lower than this year."

Galeev and other program managers said most funding for the country's space program is likely to come from the Russian Republic, where many of the Soviet Union's space institutes, design bureaus, and production factories are located. □

Soviets Slash Mars Plans by Half, Continue Other Cooperative Ventures

TOURS, FRANCE

The Soviet Union has reduced the scale of its mid-1990s Mars exploration program, effectively cutting it in half from the original plans and spreading it over separate flights that would begin in 1994 and 1996.

The new scenario calls for launch of one spacecraft in 1994 equipped with small Martian landers and surface penetrators. Launch of a second spacecraft that is to carry a Martian balloon and rover vehicle would follow in 1996.

Soviet managers outlined the revised Mars mission planning at an annual French-USSR space cooperation meeting in the city of Tours. France is one of the international participants in the Mars mission, and will be involved in several experiments and systems.

France's cooperation with the Soviet Union is organized through the French CNES national space agency, and CNES managers said they were "heartened" by the positive attitude shown by their Soviet colleagues during the planning meeting here.

"Despite all of the turmoil in their country, our Soviet colleagues came to the meeting here at Tours with a very positive attitude," CNES Associate Director Daniel Sacotte told AVIATION WEEK & SPACE TECHNOLOGY. "While there obviously are many questions about the Soviets' funding and organization for the future, those managers who met with us here were upbeat and we were able to talk concrete programs and goals."

Alain Esterle, the manager responsible for CNES' microgravity activities, said

the Soviets stressed their intention to respect their commitments concerning cooperative space missions. "For example, there is no doubt that the 1992 Soviet/French Antares joint manned mission will occur as planned with the initially agreed [cost and operational] aspects," Esterle said.

Soviet program officials said the new Mars mission scenario for 1994 and 1996 takes into account the funding and technical constraints now faced by the Soviet space sector. Under original planning, the Soviets had foreseen the launch of two Mars spacecraft in 1994 and two more in 1996. A variety of scenarios have been studied for those flights since the mid-1980s.

REMAINING FLIGHTS ESSENTIAL

Genevieve Debouzy, CNES assistant director for space science, said the Soviets have made a firm commitment to the revised Mars mission plan, and consider the remaining 1994 and 1996 flights essential.

"The 1994 mission's objective is primarily the observation of Mars from the [Martian] orbiter, which will be supported by the use of the small surface stations and penetrators—while the priority of the 1996 mission is on the rover and the balloon," she said.

An intergovernmental agreement covering France's participation in the 1994/1996 Mars flights is expected to be signed soon—once the Soviets clarify the organizational structure of their space programs in the post-communist era following the failed August coup.

technical point of view. "Industry has done a very good job in the last three years, and has contributed significantly to the spaceplane's technical consolidation," he said. "There's no doubt that we now have a sound technical concept."

The ESA manager noted that the Phase 2 industrial proposal will need to be reworked based on the new scenario due to the changed payment schedule and the shift in mission dates. Industry's revised proposal will be turned in after ESA's Munich ministerial meeting in November, since the companies cannot respond so quickly to the changes in the new scenario.

The resulting delays will increase costs, ESA program managers said.

The project's original cost was estimated at 4.42 billion ESA accounting units at 1986 values. If the new scenario is approved, the cost will go up to an estimated 6.22 billion accounting units at 1986

values—the equivalent of about \$9 billion in today's values.

Two flight-qualified Hermes orbiters will be built. The spaceplane will be launched by Europe's Ariane 5 heavy-lift vehicle.

Hermes will be 12.7 meters long (41.7 ft.), and will carry a crew of three. The spaceplane is designed to carry a 3,000-kg. (6,600-lb.) payload into orbit for servicing the Columbus free-flying laboratory in a 28.5-deg. orbit.

Hermes' overall mass has grown during the definition/development phase, and currently is 22,400 kg. (49,380 lb.). This meets the lift capability of the basic Ariane 5, and allows Hermes to carry a reduced payload—enough for the spaceplane's development and operational/validation flights, Feustel-Buechl said.

An improved Ariane 5 would allow Hermes to grow to about 24,000-kg. (52,910-lb.), giving the spaceplane the

full 3,000-kg. (6,600-lb.) payload.

Feustel-Buechl said a decision on improving Ariane 5 is expected in 1994. The upgraded launcher would be available in the 2000-2001 time period so it could be used starting with Hermes' initial launch.

An improved liquid oxygen turbopump in the Ariane 5 core stage's HM-60 Vulcain cryogenic main engine will provide the necessary performance boost. The core stage would be modified so more liquid oxygen could be carried.

The improved Ariane 5 "would be necessary for Hermes, and it would allow Europe to launch the Columbus free-flying laboratory," Feustel-Buechl said. "In addition, the improved Ariane 5 would be able to carry an additional 700-800 kg. [1,540-1,765 lb.] in geostationary transfer orbit for commercial launches by Ariane-space—allowing two satellites with a mass of 3,200-kg. [7,055-lb.] each to be carried." □

"We are confident the agreement [concerning the Mars mission] will be signed, and we made the decision during our planning meeting here to continue our work as if the agreement already had been concluded," CNES Associate Director Saccotte said.

France plans to provide stereo cameras for the Mars rover launched in 1996 as well as the software to be used in generating digital terrain maps for the vehicle's navigation over the surface. In addition, a French space radiation experiment will be installed on the Soviet orbiter for the mission launched in 1994.

Program managers said they still expect to use a relay on the U.S. Mars Observer spacecraft to transmit data back to Earth.

For the mission launched in 1994, the relay will handle data from the landers and penetrators sent to the Martian surface.

A. A. Galeev, director of the Soviet IKI space research institute, said Mars Observer's expected operational lifetime also should allow the relay craft to be used for transmitting data from balloons deployed during the mission launched in 1996. If there is a problem, the Soviet orbiter that carries the balloon will be able to provide partial relay coverage, he said.

Manned space flight is another major area of French/Soviet cooperation. The Antares mission to Mir with a French cosmonaut remains scheduled for 1992. The 14-day flight is scheduled for the end of July or early August.

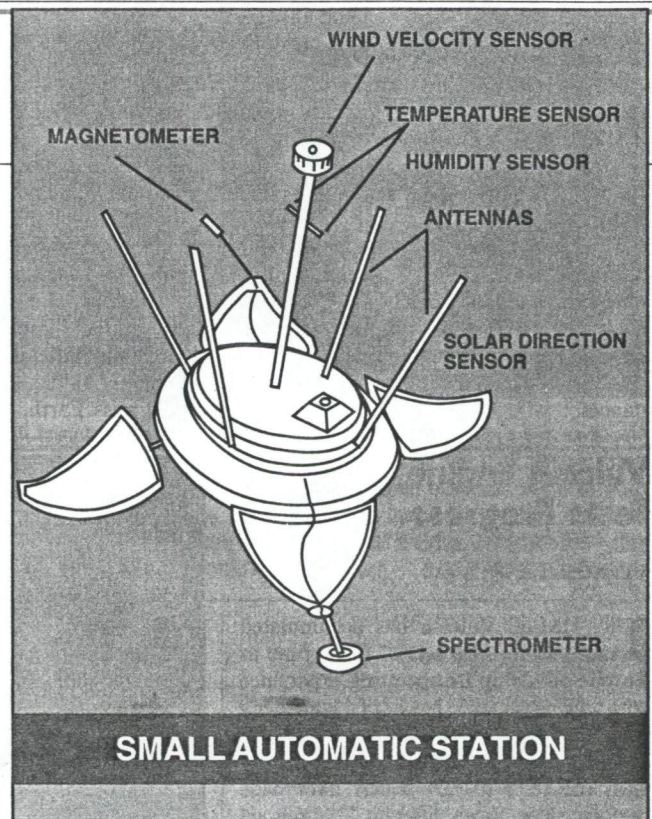
The Soviets will confirm the date next January, according to Jacques Breton, director of research at CNES.

The French and Soviets earlier agreed to arrange joint manned space missions over 10 years. Informal discussions have started on the next mission, which is targeted for 1995-96, Saccotte said.

The French and Soviets also will continue their co-operation on the Interball mission that is scheduled before the end of 1992 to study solar wind, the Earth's magnetosphere and ionosphere. "There are some problems with the supply of certain equipment, but the necessary efforts are being made to resolve the problems," Breton said.

France and the Soviet Union also plan to take part in a major international ozone-monitoring campaign that will rely on balloons, launched from Kiruna, Sweden.

France also plans to work with the Soviet Union on the launch of three instruments that will provide Earth radi-



Soviets would send automated landers like this one to Mars in 1994. U.S. Mars Observer spacecraft would be used to relay data to Earth.

ation budget information. The project, called Scarab, foresees the launch of three such sensors in 1993-94.

Preparations are continuing for the French/Soviet Alissa program, in which a lidar will be fired from the Soviet Mir manned space station for Earth cloud-top measurements. Alissa should begin operation in 1993.

France and the Soviet Union also have decided to expand their cooperation in telecommunications to the systems level. □

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The Honorable J. Danforth Quayle
 The Vice President of the United States
 The White House
 Washington, DC 20501

Dear Mr. Vice President:

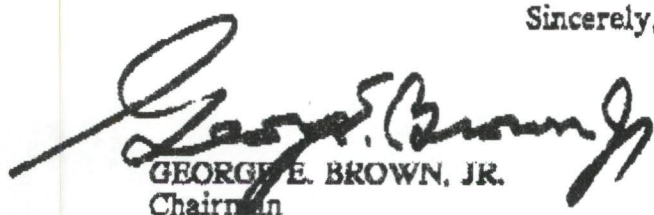
We are writing to express our concern about the future of the National Aerospace Plane. Although we are pleased that funding for NASP has been included in the Department of Defense Authorization and Appropriation for fiscal year 1992, we are worried about the drastic cut made to NASP in the VA/HUD/Independent Agencies appropriations bill.

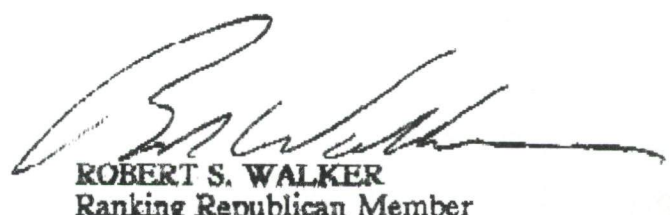
In the wake of the \$67 million cut from the President's request made by the VA/HUD/IA Appropriations subcommittees, the authorizing committees responded by amending the NASA authorization bill to permit the transfer of up to \$67 million within NASA's research and development account to the NASP program. Once this legislation is enacted, we urge you to take advantage of this provision and ensure that the NASP program is fully funded.

It is essential to the future of the program that NASA demonstrate its commitment to NASP. By funding NASP at \$31.8 million less than the President's request, and through report language, the Armed Services Committees of both Houses have indicated that they do not intend to allow the Department of Defense to shoulder the burden of funding NASP development alone. It is crucial that the program proceed on schedule so that the scheduled 1993 review can occur as planned.

As Chairman of the National Space Council, you are in a position to ensure that the NASP program is a well-coordinated effort. For that coordination to occur, it is essential that NASA be dedicated to the program. We urge you to encourage NASA to use the transfer authority provided in H.R. 1988 to get NASP back on track.

Sincerely,


 GEORGE E. BROWN, JR.
 Chairman


 ROBERT S. WALKER
 Ranking Republican Member

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Republican Chief of Staff

The Honorable Richard H. Truly
Administrator
National Aeronautics and Space Administration
Washington, DC 20546

Dear Admiral Truly:

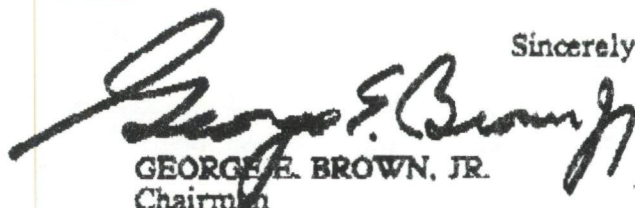
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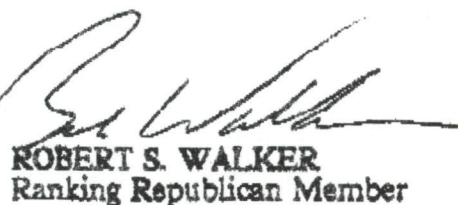
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We urge you to show that NASA is dedicated to the NASP program, and to use the transfer authority provided in H.R. 1988 to get this project back on track.

Sincerely,


GEORGE E. BROWN, JR.
Chairman


ROBERT S. WALKER
Ranking Republican Member

The Honorable J. Danforth Quayle
November 26, 1991
Page two

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Sam Johnson

The Honorable Richard H. Truly
November 26, 1991
Page two

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11/21/91
Will be delivered today. Both
lots

Document Originally
Attached to
Following Page

DRAFT

November 20, 1991

Richard H. Truly
Administrator
National Aeronautics and Space Administration
600 Independence Avenue, S.W.
Washington, D.C. 20546

Dear Admiral Truly:

During the FY92 Defense Authorization Conference, the House and Senate spent considerable time discussing a program of mutual interest - the National Aerospace Plane. As strong supporters of NASP, we worked hard to overcome a number of Senate objections that would have eliminated FY92 funding. With the Conference now complete, we would like to share our concerns about the future of the program as well as ask for your assistance in providing adequate funding in FY92 and beyond.

A major item of debate during the NASP negotiations related to NASA's support for the program in 1992 and future years. While we are aware that NASA's funding for NASP was severely cut by the Congress in the VA/HUD/IA Appropriations Bill, questions remain about NASA's current and long term commitment to NASP. Indeed, there was considerable discussion during the conference about NASA's proposed deletion of Phase 3 funds from its FY93 NASP request. This would amount to a one-third reduction in the NASA portion of the NASP budget.

In response to these perceptions, the Conference included language which stated, in part, "that the NASP program will not be permitted to become a civilian space program activity overwhelmingly funded by DoD." Simply put, the defense committees must be assured that NASP will remain a joint program with adequate funding from both DoD and NASA.

In light of this, we request that NASA reprogram a portion of current or prior year funding to provide additional NASP funds in FY92. In addition, the highest possible level of funding should be maintained for FY93 - optimally the full original request of \$120 million.

As stated above, we support the NASP program. It is an essential part of maintaining this nation's competitive edge in aerospace. We are aware that your agency has been supportive of NASP to date, however, it must be clearly understood that any substantive reduction in NASA's funding support will likely be used by NASP opponents to kill it next year.

Thank you for your attention to this matter. We will look forward to your response.

Sincerely,

Truly Letter

REPUBLICANS (14)

Davis
Spence
Bateman
Kyl
Hunter
Blaz
Hansen
Weldon
Ravenel
Dornan
McCrery
Saxton
Franks
Cunningham

DEMOCRATS (7)

Skelton
Byron
Ray
Sisisky
Darden
McCurdy
Hochbrueckner

Quayle Letter

ALL REPUBLICANS LISTED ABOVE (14)

Vice President Dan Quayle
Old Executive Office Building
Washington, D.C. 20501

Dear Mr. Vice President:

During the FY92 Defense Authorization Conference, the House and Senate spent considerable time discussing a program of mutual interest - the National Aerospace Plane. As strong supporters of NASP, we worked hard to overcome a number of Senate objections that would have eliminated FY92 funding. With the Conference now complete, we would like to share our concerns with you about the future of the program.

A major item of debate during the NASP negotiations related to NASA's support for the program in 1992 and future years. While we are aware that NASA's funding for NASP was severely cut by the Congress in the VA/HUD/IA Appropriations Bill, questions remain about NASA's current and long term commitment to NASP. Indeed, there was considerable discussion during the conference about NASA's proposed deletion of Phase 3 funds from its FY93 NASP request. This would amount to a one-third reduction in the NASA portion of the NASP budget.

In response to these perceptions, the Conference included language which stated, in part, "that the NASP program will not be permitted to become a civilian space program activity overwhelmingly funded by DoD." Simply put, the defense committees must be assured that NASP will remain a joint program with adequate funding from both DoD and NASA.

In light of this, we have asked NASA to reprogram a portion of current or prior year funding to provide additional NASP funds in FY92. In addition, we have urged NASA to maintain the highest possible level of funding for FY93 - optimally the full original request of \$120 million.

Under your leadership the National Space Council revitalized NASP in 1989 by restructuring the program and directing continued joint participation by NASA and DoD. NASP is again at a critical crossroads in terms of its political and financial viability. It must be clearly understood that any substantive reduction in NASA's funding support will likely be used by NASP opponents to kill it next year. Accordingly, your continued interest, support and direction is essential if the NASP program is to realize its very promising potential.

Respectfully yours,

NASP: A Program In Political Trouble

- The NASP program is in very good shape in terms of technical progress, schedule, deliverables, costs, etc.
- The NASP program is not, however, in good political shape. Example: The FY '92 NASA monies for NASP. NASP received only \$5M, vs. the \$72M Administration request.
- The Vice President endorsed NASP in his speech on National Space Policy at Vandenberg AFB on July 24th, 1991.
- NASP cannot sustain any cut in its DoD FY '92 budget and still remain politically viable. Congress' DoD Authorization must authorize NASP at the level the Administration requested (\$232M).
- Going into the DoD Authorization Conference, the House had authorized \$232M; the Senate authorized nothing.
- Senate and House appropriators will fund NASP to the full value the DoD Authorization Conference authorizes for NASP.

What We Want

Short Term

- The Vice President should use his good offices to assure that the DoD Authorization Conference authorizes NASP at \$232M.

Longer Term

The Vice President should use his good offices:

- To help change the current lack of vigorous support for NASP within NASA's upper management.
- To help change the current lack of support for this program on the part of Secretary of Defense Cheney.
- To help change the current lack of support for this program on the part of Secretary of the Air Force Rice.
- To help to build the base of political support within the Administration and the Senate for the NASP FY '93 funding request.
- To help to ameliorate the "tepid" support for NASP within the staff of the Space Council.
- To help to make sure that the VA/HUD/IA Appropriators (specifically Representative Traxler) don't kill NASP in FY '93.

The Vice President should build and lead the political support within Congress and the Administration for NASP, to restore the NASP program to political "health."

Relates to you to VP.

Clay Jones

- ~~was~~ NASA submission to OMB rec 120-83 for FY93
- G. Bob Davis learned of it (R-Machem) + called Jim McDermott to protest
- Tony Wu advised DOD to reduce their '93 MBP submission of 13 (~\$60 million)
- Steve Asakourty - work for Warren Noonan
- Jim Beale - Sp. Counsel.

Print paper given to Atwood.

Document Originally
Attached to
Following Page

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
02a. Paper	Background Paper on NASP (3 pp.)	11/15/91	(b)(1)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: National Security Files
WHORM Cat.:
File Location: [National Aero-Space Plane] [3 of 4] [1991]

Date Closed:	2/25/1991	OA/ID Number:	62072-001
FOIA/SYS Case #:	2005-0336-F	Appeal Case #:	
Re-review Case #:		Appeal Disposition:	
P-2/P-5 Review Case #:		Disposition Date:	
AR Case #:		MR Case #:	
AR Disposition:		MR Disposition:	
AR Disposition Date:		MR Disposition Date:	

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 the 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]

C. Closed in accordance with restrictions contained in donor's deed of gift.

PRM. Removed as a personal record misfile.

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

(b)(1) National security classified information [(b)(1) of the FOIA]
(b)(2) Release would disclose internal personnel rules and practices of an agency [(b)(2) of the FOIA]
(b)(3) Release would violate a Federal statute [(b)(3) of the FOIA]
(b)(4) Release would disclose trade secrets or confidential or financial information [(b)(4) of the FOIA]
(b)(6) Release would constitute a clearly unwarranted invasion of personal privacy [(b)(6) of the FOIA]
(b)(7) Release would disclose information compiled for law enforcement purposes [(b)(7) of the FOIA]
(b)(8) Release would disclose information concerning the regulation of financial institutions [(b)(8) of the FOIA]
(b)(9) Release would disclose geological or geophysical information

Withdrawal/Redaction Sheet

(George Bush Library)

Document No. and Type	Subject/Title of Document	Date	Restriction	Class.
02b. Paper	Background Paper on the NASP Technical Status (2 pp.)	11/15/91	(b)(1)	

Collection:

Record Group: Bush Presidential Records
Office: Science and Technology Policy, Office of (OSTP)
Series: Bromley, D. Allan, Files
Subseries: National Security Files
WHORM Cat.:
File Location: [National Aero-Space Plane] [3 of 4] [1991]

Date Closed:	2/25/1991	OA/ID Number:	62072-001
FOIA/SYS Case #:	2005-0336-F	Appeal Case #:	
Re-review Case #:		Appeal Disposition:	
P-2/P-5 Review Case #:		Disposition Date:	
AR Case #:		MR Case #:	
AR Disposition:		MR Disposition:	
AR Disposition Date:		MR Disposition Date:	

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 the 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]
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C. Closed in accordance with restrictions contained in donor's deed of gift.

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(b)(3) Release would violate a Federal statute [(b)(3) of the FOIA]
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(b)(8) Release would disclose information concerning the regulation of financial institutions [(b)(8) of the FOIA]
(b)(9) Release would disclose geological or geophysical information

NATIONAL AERO-SPACE PLANE PROGRAM ACCOMPLISHMENTS

ACCOMPLISHMENTS TO DATE:

- Formed the NASP National Contractor Team from the five major NASP contractors.
- Awarded and definitized a single \$488M contract with the National Team for completion of Phase 2.
- Completed subscale component and/or integrated engine tests at Mach 4, 7, 8, 10, 17 & 20, demonstrating ramjet and scramjet concepts.
- Completed over 800 subscale engine component level tests.
- Completed the first airborne test demonstrating the external burning concept proposed for the vehicle.
- Completed testing of linear rocket platelet injectors.
- Completed prototype system development of a laser-based hypersonic flow diagnostic system.
- Completed over 5000 hours of wind tunnel test (500 + Shock tunnel test) on contractor-unique models and constructed two team configuration models.
- Established wind tunnel data base for drag, stability/control and aero-heating characteristics.
- Applied computational fluid dynamics (CFD) codes for the hypersonic vehicle forebody, inlet, and nozzle flows required for accurate scramjet performance.
- Over 60,000 hours of super computer run time (20 + Super computer used).
- Created a National infrastructure for NASP advanced materials development.
- Fabricated large scale panels of titanium metal matrix and carbon-carbon.
- Fabricated and tested a titanium metal matrix composite fuselage section with thermoplastic noncircular tank to external temperatures up to 1300F.
- Created four operational flight control simulators.
- Demonstrated end-to-end Low Speed Oxidizer System.
- Completed tests of two low speed component integration rigs.
- Completed two design cycles of the team's configuration.
- Produced, aged, and transferred slush hydrogen (50,000 gallons to date).

FY92 PLANNED PROGRAM:

- Design/initiate fabrication of airframe structural demonstration components.
- Complete testing on tank and fuselage structural articles.
- Complete other small structural articles test.
- Complete fabrication of large structural articles.
- Continue low speed engine performance tests.
- Initiate design of concept demonstration engine.
- Continue to improve slush production, aging and transfer.
- Complete Phase 3 program plan and cost estimate.
- Fabricate and initiate tests for concept demonstration engine.
- Complete third design cycle.
- Complete preliminary design review for experimental demonstration engine.
- Conduct Systems Requirement Review of X-30.

FY93 PLANNED PROGRAM:

- Complete 4th design cycle.
- Design XDE (experimental demonstration engine).
- Conduct Systems Design Review of X-30.
- Complete Phase 2 engine and airframe testing and analyze final development data.
- Complete large structural article tests.
- Phase 3 decision.
- Initiate preliminary design review of X-30.
- Initiate transition from Phase 2 to Phase 3.

PROGRAM TO COMPLETION:

- Complete all engineering design reviews.
- Fabricate and assemble two X-30 flight research vehicles.
- Construct the necessary ground test and ground support facilities.
- Flight test the two X-30 research vehicles.
- Analyze, document and disseminate flight test data.

National aerospace plans

The amended budget request included \$231.3 million in the Department of Defense and \$72.0 million in NASA for the joint national aerospace plane (NASP).

The House bill would authorize the requested amount in DoD. The Senate amendment would terminate the program.

The conferees agree to authorize ^{200.0} \$115.9 million for DoD to continue phase II of the program but to delay completion of phase II until fiscal year 1994. The conferees make no commitment to phase III of the program and shall not consider such a commitment until it is clear that both DoD and NASA have included full outyear funding for the effort.

The Housing and Urban Development and Independent Agencies (HUD/IA) appropriations act for fiscal year 1992 approved only \$5.0 million of the requested \$72.0 million for NASA's participation in the NASP program. The NASA request for NASP, relative to the DoD request for fiscal years 1992 and 1993, indicates a low level of commitment to the program from NASA. The HUD/IA appropriation indicates that congress judges NASP to be a low priority for NASA as well. The conferees do not believe that DoD can afford to continue the NASP program without substantially greater financial participation by NASA.

Moreover, the conferees note that the principal argument for NASP has become the assurance of U.S. technological leadership, not the development of a military capability. As noted in the Senate report (Rept. 102-113), the Department of Defense at this point has no idea of what the costs and benefits of NASP might be in terms of missions or the acquisition and operating costs for an operational system. Future DoD budgets are expected to decline sharply, and DoD resources must be focused on the satisfaction of clear military requirements. The conferees serve notice to the administration that the NASP program will not be permitted to become a civilian space program activity overwhelmingly funded by DoD.

FACSIMILE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, D.C. 20515

SUBCOMMITTEE ON ENERGY

B374 RHOB
FAX NUMBER: (202)225-2021

DATE: 11/7/91

FAX NUMBER: 395 1572 NO. OF PAGES: 9
(INCLUDING THIS PAGE)

TO: RICK YANNUZZI

FROM: SCOTT CROSSFIELD

COMMENTS: Rich here are the pertinent
pages. If you need more:
whistle. Please advise Michelle.

IF YOU HAVE ANY DIFFICULTY RECEIVING THIS FACSIMILE,
PLEASE CALL: (202)225-8056

EXPLANATION OF H.R. 1988

Overview and Summary of Major Provisions

- o The Bill provides \$14.896 billion in new budget authority and amends previously provided budgetary authority to authorize a total of \$15.159 billion for F.Y. 1992. This represents a reduction of \$594 million from the President's request.
- o The Bill also provides general new budget authority for the next two fiscal years in the amount of \$15.601 billion for F.Y. 93 and \$16.959 billion for F.Y. 94. These authorizations represent a 5% real growth per year, accounting for an annual inflation of 3.8%, from the fiscal year 1992 appropriated level.
- o Specific funding initiatives include the following:
 - The bill provides \$2.029 billion, the full request, for Space Station Freedom. Of this amount, \$18 million is authorized for design and development of an Assured Crew Return Vehicle.
 - Up to \$40 million is provided for propulsion technology studies and \$10 million for vehicle design studies including single stage to orbit vehicles in order to establish a firm technology base for a possible New Launch System. The Committee intends to thoroughly review the need for and potential roles of such a New Launch System pending the availability of a substantive program plan and detailed budget submission.
 - The bill provides, within Physics and Astronomy, \$3 million to carry out scientific programs which were eliminated from the Station due to the reduction in attached payload accommodations.
 - Within Earth Sciences, the bill provides \$5 million for Landsat data purchases at the cost of reproduction and authorizes funding for long lead Landsat parts in order to preclude a gap in data coverage. \$1 million has been made available for other remote sensing data conversion from Defense related data bases and \$3 million has been provided for a pilot study with the objective of making aircraft and satellite remote sensing data available for Global Change research in machine readable form. The Committee expects Department of Energy capabilities to be brought to bear on this effort. Finally, the bill provides \$2 million for the conversion of archived Landsat data into a more durable medium. The Committee places a high priority on the maintenance of a consistent and usable set of Landsat data both in the past and in the future.
 - Within Space Technology, the Bill provides \$10 million for solar power

research and technology development and \$10 million for a program of component technology development, validation and demonstration directed at commercial launch competitiveness. The Committee expects that, in carrying out this program, close coordination and cooperation is established with the private sector and with Agency elements responsible for the procurement of launch services for Government payloads. One major goal of this program is to reduce the cost of launch services for the Government.

Also within the Space Technology account, the Bill provides \$15 million for telerobotics research in order to capitalize on the investment made in the Flight Telerobotic Servicer program. The Committee expects that NASA will incorporate the results obtained to date in developing a robust long term activity in this area, and will explore ways in which hardware and software advances from the Flight Telerobotic Servicer program can be incorporated into future telerobotics designs.

- Within Space Shuttle production and operational capability, \$375 million has been made available for the Advanced Solid Rocket Motor program. The Committee recognizes that this amount contains \$50 million which was transferred from the Construction of Facilities account but not specifically provided for in the Appropriations bill. The Committee does not wish to restrict NASA's budget authority for Construction of Facilities and therefore will entertain reprogramming requests that readjusts the balance between Research and Development and Construction of Facilities expenditures for the ASRM as future needs dictate.

Also within this general account, the Committee has provided \$112 million for the Assured Shuttle Availability program. A general \$10 million reduction has been applied without prejudice.

- Within Launch Services, funds have been authorized for the launch of the Mobile Satellite provided that all administrative and judicial uncertainties with respect to the status of the license are resolved and a plan of reimbursement from other Federal Agencies to NASA is submitted to the Committees. For the purposes of this requirement, the NASA share of such expenditures shall be limited to the equivalent commercial cost of its pro rata share of satellite usage in connection with its mobile communications experiment program. Any additional operational usage of mobile communications services should be procured on a competitive basis and should be identified in a budget request.
- The bill amends previously provided budgetary authority for the Comet Rendezvous/Asteroid Flyby--Cassini program to reduce the amount available for F.Y. 1992 with a concomitant increase in the total program amount made available through program completion. The Committee has taken this action in view of the severe shortfall in

agency wide appropriations in F.Y. 1992 but has maintained its commitment to a full program authorization. The Committee, however, will revisit this commitment in the event that foreign participation in this program does not materialize.

—Special reprogramming authority for transatmospheric research and technology has been provided within the Research and Development account in order to provide NASA the flexibility to commit sustaining funds, in combination with appropriated amounts from Department of Defense, for the continuation of the National Aerospace Plane program.

- o The Bill establishes a Facility Maintenance Office within the Office of Management Systems and Facilities in order to centralize programmatic authority for planning, budgeting, and carrying out an agencywide facility maintenance program.
- o The Bill includes a provision which requires a special 5-year budget plan for developmental programs in excess of \$200 million. The programs reported in this submission must include an estimate of life-cycle costs. For the purposes of this submission, life-cycle costs must include, as a minimum, ongoing annual mission operating budgets, data analysis programs, planned hardware upgrades, and other costs that will be incurred in future years. The intent of this provision is to provide the Committee with specific information to enable prudent decisions to be made in allocating funds for the immediate fiscal year.
- o The Bill includes a National Scholars Program feasibility study intended to review options for increasing the number of PhD recipients among economically disadvantaged groups.
- o The bill authorizes for the Department of Transportation up to \$20 million for a program to ensure the resiliency of the Nation's space launch infrastructure by improving the efficiency and effectiveness of launch facilities. The availability of this authority is subject to the enactment of legislation establishing a grant type program for managing and allocating these funds.
- o The Bill establishes a testing program for illegal drugs and alcohol use in violation of applicable law for agency personnel identified in Executive Order 12564 and contractor personnel also involved in safety-sensitive, security, or national security functions. It is the Committee's intent that these testing guidelines and policies be implemented within 18 months after the date of enactment of this act prior to which time the current testing guidelines and policies should remain in effect. The Committee does not intend that the current testing program be interrupted in any way.

1 of space vehicles, the Administrator should establish a
2 program of research and development to enhance the
3 competitiveness and cost effectiveness of commercial
4 expendable launch vehicles; and

5 (5) the National Aeronautics and Space
6 Administration should promote and support efforts to
7 advance scientific understanding by conducting or
8 otherwise providing for research on environmental
9 problems, including global change, ozone depletion, acid
10 precipitation, deforestation, and smog.

SEC. 4. AUTHORIZATION OF APPROPRIATIONS FOR NASA.

12 (a) RESEARCH AND DEVELOPMENT.--There is authorized to be
13 appropriated to the National Aeronautics and Space
14 Administration to become available October 1, 1991, for
15 "Research and development", for the following programs:

16 (1) United States International Space Station
17 Freedom, \$2,028,900,000 for fiscal year 1992, of which
18 \$18,000,000 is authorized for the design and development
19 of an Assured Crew Return Vehicle.

20 (2) Space transportation capability development,
21 \$679,800,000, of which \$40,000,000 is authorized for
22 propulsion technology development, and \$10,000,000 is
23 authorized for launch vehicle design studies, including
24 single-stage-to-orbit vehicles.

25 (3) Physics and astronomy, \$1,104,600,000, of which
26 \$3,000,000 is authorized for carrying out scientific

H.R. 1988

1 programs which have otherwise been eliminated from the
2 Space Station.

3 (4) Life sciences, \$163,900,000.

4 (5) Planetary exploration, \$299,300,000.

5 (6) Earth science and applications, \$756,600,000,
6 of which--

7 (A) \$5,000,000 is authorized for the purchase
8 of Landsat data at cost for global change research;

9 (B) \$5,000,000 is authorized for the purchase
10 of long-lead parts for a follow-on to Landsat 6;

11 (C) \$1,000,000 is authorized for remote
12 sensing data conversion;

13 (D) \$3,000,000 is authorized for a pilot study
14 and prototype demonstration to convert
15 remotely-sensed aircraft and satellite data into
16 machine readable form for global change research;
17 and

18 (E) \$2,000,000 is authorized for converting
19 Landsat data collected prior to the date of
20 enactment of this Act into a more durable archive
21 medium.

22 (7) Materials Processing in space, \$120,800,000.

23 (8) Communications, \$39,400,000.

24 (9) Information systems, \$42,000,000.

25 (10) Technology utilization, \$32,000,000.

26 (11) Commercial use of space, \$107,000,000.

H.R. 1988

1 → (12) Aeronautical research and technology,
2 \$591,200,000.

3 → (13) Transatmospheric research and technology,
4 \$72,000,000.

5 (14) Space research and technology, \$324,800,000,
6 of which \$10,000,000 is authorized for a solar dynamics
7 power research and technology development program,
8 including a ground test of the technology, and
9 \$10,000,000 for a program of component technology
10 development, validation, and demonstration directed at
11 commercial launch competitiveness.

12 (15) Exploration activities, \$34,500,000.

13 (16) Safety, reliability, and quality assurance,
14 \$33,600,000.

15 (17) Tracking and data advanced systems,
16 \$22,000,000.

17 (18) Academic programs, \$64,600,000.

18 (b) SPACE FLIGHT, CONTROL, AND DATA COMMUNICATIONS.--

19 There is authorized to be appropriated to the National
20 Aeronautics and Space Administration to become available
21 October 1, 1991, for "Space flight, control, and data
22 communications", for the following programs:

23 (1) Space shuttle production and operational
24 capability, \$1,328,900,000, of which \$375,000,000 is
25 authorized for the Advanced Solid Rocket Motor program.

26 (2) Space shuttle operations, \$2,970,600,000.

H.R. 1988

1 (3) Launch services, \$291,900,000, amounts of which
2 may be expended for the Mobile Satellite launch if--

3 (A) the Administrator, in consultation with
4 the Chairman of the Federal Communications
5 Commission, determines that uncertainties with
6 respect to the status of the American Mobile
7 Satellite Corporation as the sole Federal
8 Communications Commission license holder for mobile
9 satellite services have been resolved; and

10 (B) at least 30 days prior to the obligation
11 of any funds for the Mobile Satellite launch, the
12 Administrator submits to the Committee on Commerce,
13 Science, and Transportation of the Senate and the
14 Committee on Science, Space, and Technology of the
15 House of Representatives a report detailing plans
16 for reimbursement to the National Aeronautics and
17 Space Administration for its portion of launch
18 costs of the Mobile Satellite.

19 (4) Space and ground network, communications, and
20 data systems, \$920,900,000.

21 (c) CONSTRUCTION OF FACILITIES.--There is authorized to
22 be appropriated to the National Aeronautics and Space
23 Administration to become available October 1, 1991, for
24 "Construction of facilities", including land acquisition, as
25 follows:

H.R. 1988

(2) in clause (i), by striking the semicolon at the end and inserting in lieu thereof ", of which not more than \$263,000,000 shall be available for fiscal year 1992;"; and

(3) in clause (iii), by striking "\$640,000,000" and inserting in lieu thereof "\$940,000,000".

⁹³
~~at~~ (k) TOTAL AUTHORIZATIONS FOR FISCAL YEARS 1983 AND 1984.--There is authorized to be appropriated to the National Aeronautics and Space Administration for "Research and development", "Space flight, control, and data communications", "Construction of facilities", "Research and program management", and "Inspector General" a total amount of \$15,⁶⁰¹335,000,000 for fiscal year 1993, and \$16,⁹⁵⁹554,000,000, for fiscal year 1994, to remain available until expended.

(l) TRANSFER FOR TRANSATMOSPHERIC RESEARCH AND TECHNOLOGY.--The Administrator may transfer up to \$67,000,000 of the amount authorized for "Research and development" for fiscal year 1992 to use for the purposes described in subsection (a)(13). No such funds may be obligated until a period of 30 days has passed after the Administrator has notified the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives of such transfer.

SEC. 5. CONSTRUCTION OF FACILITIES REPROGRAMMING.

OCT 31' ~ NOV 08'

ACTIVITY REPORT (SEND)

NO.	REMOTE STATION	MODE	START	DURATION	PAGES	RESULT	NOTE
002	202 395 5349	STD	31,13:57	00'36	01	OK	SEND
001	89142416292	STD	01,18:23	02'08	03	OK	SEND
001	97036976602	STD	05,09:48	01'03	02	* OK	SEND
002	2026473506	STD	05,13:06	09'54	20	OK	SEND
003	2026535929	STD	05,13:22	09'52	20	* OK	SEND
001	94260608	STD	06,16:07	01'58	01	T.3.1	SEND
002	94260608	STD	06,16:12	01'25	02	OK	SEND
001	301 394 5112	STD	07,09:40	02'19	04	OK	SEND
002	703 506 0578	STD	07,09:53	01'32	03	* OK	SEND
003	202 395 5349	STD	07,17:17	00'34	01	OK	SEND

ACTIVITY REPORT (RECEIVE)

NO.	REMOTE STATION	MODE	START	DURATION	PAGES	RESULT	NOTE
001	G3	STD	01,10:48	04'43	07	OK	
002	17038474115	STD	01,13:04	03'10	04	OK	
003	1 703 693 7146	STD	01,16:52	01'14	02	OK	
001	G3	STD	03,10:56	05'35	05	OK	
001	703 204 6292	STD	04,10:33	01'43	03	* OK	
002	202 331 0109	STD	04,14:18	04'28	05	OK	
003	Use Originator's FAX	STD	04,14:35	01'18	02	OK	
001	Use Originator's FAX	STD	05,15:46	01'19	02	OK	
002	7035536640	STD	05,17:48	01'24	02	* OK	
001	USNRC/INT'L PROGRAMS	STD	06,11:16	05'19	09	OK	
002	G3	STD	06,13:06	02'45	03	OK	
001	G3	STD	07,10:48	01'11	01	OK	
002	G3	STD	07,14:05	02'31	04	OK	
003	G3	STD	07,16:58	01'57	03	OK	
001	202 225 2021	STD	08,09:28	04'45	09	* OK	



NASP Interagency Office

Telefax Transmission Cover Sheet

Date: 28 OCT 91 2 Pages (Including cover sheet)To: MR RICK YANNUZZI

Telephone No: _____

FAX No: _____

From: Mr Ming Tang

National Aero-Space Plane (NASP) Interagency Office

SAF/AQT (NIO), Pentagon Room BD944

Washington, D.C. 20330

Telephone No: (703) 695-7866 DSN 225-7866

FAX No: (703) 695-4580

Comments:

GOOD MORNING,
YOU MIGHT LIKE TO ATTEND
THIS MEETING TOMORROW.
I BELIEVE NSP STAFF WILL
BE PRESENT. (COL BEALE)

705 29 OCT 91

Hewlett-Packard Telecopier 7020 10-24-91 17:12

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2

Joint NASP Program Meeting

Tuesday, October 29 at 10:30 am
New Executive Office Building, room 8103

Please send names and birth dates of attendees to Alice Sheek,
fax 395-4817, phone 395-3935 by Monday COB.

AgendaEach Agency:

- o Review FY 1992 budget status
 - Summarize relevant committee views and report language.
- o Present FY 1993 budget (with runout) and plans

Coordinated Presentation

- o FY 1992 and 1993 program activities, schedule and milestones (i.e., upcoming decision points).
- o FY 1992 and 1993 budget breakdown among NASP program elements including
 - Government and industry participants
 - Design and technology development areas
- o Implications (i.e., technical, schedule, contractor team, Phase II total cost, etc.) of the following scenarios:
 - For FY92, \$67M cut for NASA, and different levels of appropriations for DoD.
 - For FY93, \$40M reduction to the \$300M target.
 - 1, 2, and 3 year stretchout to Phase II.
- o Options being considered for Phase III and cost estimates.

RD-2 = DESCRIPTIVE SUMMARY

Janet Fleetwood - Comptroller

Cal Branco - ARL

Ming

Baker - NSPC

Dr. Bush - NASA

Chair, Norman Noonan
Tony Wu

To

Rick

Date

10/7

Time

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Ming Tang

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**NASP Interagency Office****Telefax Transmission Cover Sheet**Date: 7 Oct 91 Pages (including cover sheet)To: Mr R YANNUZZI

Telephone No: _____

FAX No: _____

From: Mr Ming Tang**National Aero-Space Plane (NASP) Interagency Office****SAF/AQT (NIO), Pentagon Room BD944****Washington, D.C. 20330****Telephone No: (703) 695-7866 DSN 225-7866****FAX No: (703) 695-4580****Comments:**

*PLEASE DELIVER TO MR YANNUZZI
IMMEDIATELY.*

THANKS

OCT 7 '91 11:13 NASA HQTS

PAGE.02



National Aeronautics and
Space Administration

Washington, D.C.
20546

Office of the Administrator

OCT 7 1991

Honorable J. Danforth Quayle
The Vice President of the
United States
Washington, DC 20501

Dear Mr. Vice President:

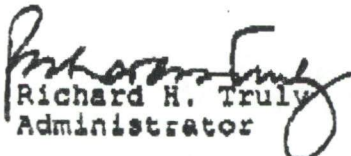
As you know, the House-Senate (HUD and Independent Agencies) Appropriations Conference reduced NASA funding for the National Aero-Space Plane (NASP) program from \$72M to \$5M. The DoD request is \$233M and is currently in the Conference process. The reduction to NASA's budget was made with "deep regret" due to severe domestic funding limits; \$5M was inserted to maintain a "NASA presence." I am concerned about this action for two reasons.

First, a significant delay in the decision to proceed with Phase III is highly undesirable due to loss of momentum and loss of part of the contractor/government team. Therefore, full funding in FY 1992 and FY 1993 is necessary to support the Space Council decision to review the program in 1993.

Second, I am concerned that the Congressional budget action calls into question the importance of this national program. Although at the \$5M level NASA's financial contribution is very small relative to the DoD, it is essential that NASP continue to move forward as a full joint program. In this regard, NASA is heavily committed to NASP with its people (approximately 300) and facilities.

I believe that NASP will be a key factor in maintaining U.S. leadership in aerospace well into the next century and look forward to NASA's role in making it happen. Therefore, a clear policy directive to executive agencies and strong advocacy statement to Congress which endorses the importance of the NASP for the nation, and the necessity of maintaining the balanced, joint NASA/DoD participation is highly desirable. We appreciate your continued efforts on behalf of NASP in FY 1992 and FY 1993.

Respectfully,


Richard H. Truly
Administrator

NATIONAL SPACE COUNCIL
EXECUTIVE OFFICE OF THE PRESIDENT
WASHINGTON, D.C. 20500

July 20, 1989

MEMORANDUM FOR MS. EMILY L. WALKER

Executive Secretary
Department of Treasury

MR. FRANK HODSOLL
Associate Director
Office of Management
and Budget

MR. J. STAPLETON ROY
Executive Secretary
Department of State

MR. G. PHILIP HUGHES
Executive Secretary
National Security Council

COL. GEORGE P. COLE JR.
Executive Secretary
Department of Defense

DR. THOMAS RONA
Acting Director
Office of Science and
Technology Policy

MR. CRAIG R. HELSING
Chief of Staff
Department of Commerce

MR. H. LAWRENCE SANDALL
Executive Secretary
Central Intelligence
Agency

MS. RUTH KNOUSE
Director, Executive
Secretariat
Department of
Transportation

MR HENRY E. CLEMENTS
Executive Officer
National Aeronautics and
Space Administration

CAPT ANTHONY MANESS
Executive Assistant to the
Chairman
Joint Chiefs of Staff

FROM:

MARK J. *[Signature]*

SUBJECT:

Presidential Decision on the National Aero-Space
Plane

The President has approved the following policy with regard to
the National Aero-Space Plane (NASP) program.

"The United States will continue the NASP program as a
high priority national effort to develop and demonstrate
hypersonic technologies with the ultimate goal of single-
stage-to-orbit. The government will complete the Phase
II technology development program and plan to develop an
experimental flight vehicle after completion of Phase II,
if technically feasible. Performance of the experimental
flight vehicle will be constrained to the minimum
necessary to meet the highest priority research, as
opposed to operational, objectives. Unmanned as well as
manned designs will be considered and the program will

be conducted in such a way as to minimize technical and cost uncertainty associated with the experimental vehicle."

The President also approved the following actions to implement the policy decision.

- o Retain an appropriate joint DOD/NASA management structure.
- o Restructure the NASP technology program to focus only on research and technology objectives.
- o Extend the technology development phase of the program approximately 2 1/2 years and plan to begin experimental flight vehicle development in early 1993. The Space Council will review the program prior to initiation of vehicle development.
- o Within currently approved DOD budget levels, increase NASP funding by \$27 million in FY 1990, \$158 million in FY 1991, \$233 in FY 1992 and by appropriate amounts in FY 1993 and FY 1994.

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ARLINGTON, VIRGINIA 22202
COMMERCIAL NUMBER - (703) 553-XXXX



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NATIONAL AEROSPACE PLANE (NASP)

PE 603269F
Line 28, AF RDT&E

FUNDING

	FY91	FY92 Requested	FY92 Authorized		FY92 Appropriated	
			House	Senate	House	Senate
DoD	\$163M	\$232M	\$232M	0	\$232M	0
NASA	\$95M	\$72M	\$72M	\$72M		\$5M (Conference)

(Through FY90, private industry has invested over \$700M in NASP research)

BACKGROUND

NASP is a joint DoD/NASA program to develop an experimental aircraft that can take off horizontally and travel at hypersonic velocities (MACH 5-25) into space orbit—in effect a vehicle capable of single-stage-to-orbit from conventional runways.

The NASP program is presently in the second, or technology development phase of a three phase program. Phase II is designed to advance the required technologies to the point where a decision can be made to proceed to Phase III; the design, fabrication and flight test of the X-30.

In 1989, the National Space Council reviewed the NASP program, endorsed its national importance and directed continued joint participation of DoD and NASA in the research and development effort. In May of 1990, the DoD and NASA approved a contractor team arrangement involving General Dynamics, McDonnell Douglas, Pratt and Whitney and Rockwell. Under the team the contractors will cooperatively focus resources and ideas toward addressing the propulsion, materials and systems integration challenges of the NASP program.

DISCUSSION

The NASP program represents a significant technology effort of enormous potential to the country, both in civilian and military applications—a revolution in aerodynamics, advanced materials, propulsion and avionics systems technology. As such NASP is a critical investment in this nation's industrial and R&D base. In addition, NASP supports our nation's goal of maintaining technological superiority and continued leadership in aerospace at a time when Germany, Japan, the Soviet Union and Great Britain are pursuing aerospace plane programs.

ISSUE

As a result of a \$67M reduction in the NASA Appropriations conference, the program will incur a five month slip in technology development and risk reduction activities leading to the Phase III decision. This assumes full funding for the DoD request (\$232M) which now becomes essential to make this decision in FY93. Many of the Phase II efforts are nearing completion and would be severely curtailed if further funding cuts were realized.

RECOMMENDATION

Fully support the HASC and HAC budget actions on the DoD FY92 budget request for NASP.

9/30/91

NASP FUNDING ASSESSMENT

- 0 IMPACT OF \$67M NASA APPROPRIATIONS REDUCTION
- 0 ASSUMES FULL DOD FUNDING OF \$232M

9/30/91

ASSESSMENT OF \$67M NASP FUNDING CUT

ASSUMPTIONS

- 0 FY92 FUNDING = \$237M VS \$304M REQUEST
- 0 FY93 FUNDING = \$303M AS REQUESTED
- 0 PROGRAM MUST DELIVER SAME LEVEL OF TECHNOLOGY DEVELOPMENT PRIOR TO PHASE 3 DECISION
- 0 ORIGINAL PHASE 3 DECISION OCCURRED 1 APRIL 1993 (SEE CHART 1)

IMPACT

- 0 LOWER LEVEL OF FUNDING IN FY92 RESULTS IN SLOWER TECHNOLOGY DEVELOPMENT PACE IN FY92 (SEE CHART 2)
- 0 BY UTILIZING FULL FY93 FUNDING (\$303M), REQUIRED TECHNOLOGY DEVELOPMENT FOR PHASE 3 DECISION CAN BE ACCOMPLISHED BY 1 SEPT 93 (SEE CHART 2)
- 0 PHASE 3 DECISION IS MOVED TO 1 SEPT 1993 (SEE CHART 3)

NASP MAJOR DEMO SCHEDULE (U)

CHART 1

	FY91	FY92	FY93
PROGRAM MILESTONES	START PHASE 2D	SYSTEM RECMTS REVIEW	PHASE 3 GO AHEAD
VEHICLE INTEGRATION	CLOSEDCONFIG/ PWBR INITIAL SIZE	FINAL SIZE (TODGW)	SDR
FUSELAGE	WING ATTACH	FUSELAGE TANK	PANELS
TANK	PROOF OF CONCEPT	ENG DEMOS	PROOF OF CONCEPT
OTHER PROTECTOR SECTION	UNCOOLED DEMOS	COOLED DEMOS	ENG DEMOS
ENGINE	PERFORMANCE	STRUCT. DEMO	PERFORMANCE
LOS	STRUCT. DEMO	PERFORMANCE	STRUCT. DEMO
SLUSH	WING & HANDLG	CONTROL DEMO	CONTROL DEMO

IMPACT OF \$67M REDUCTION ON NASP MAJOR DEMO SCHEDULE (U)

CHART 2

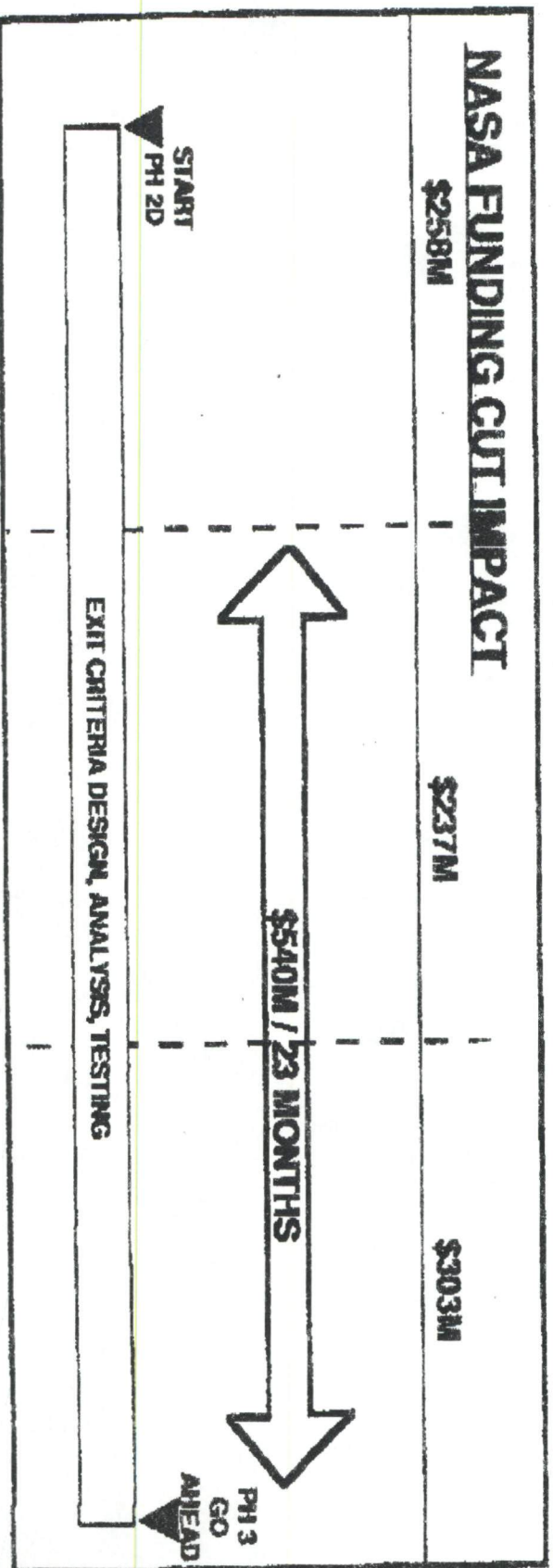
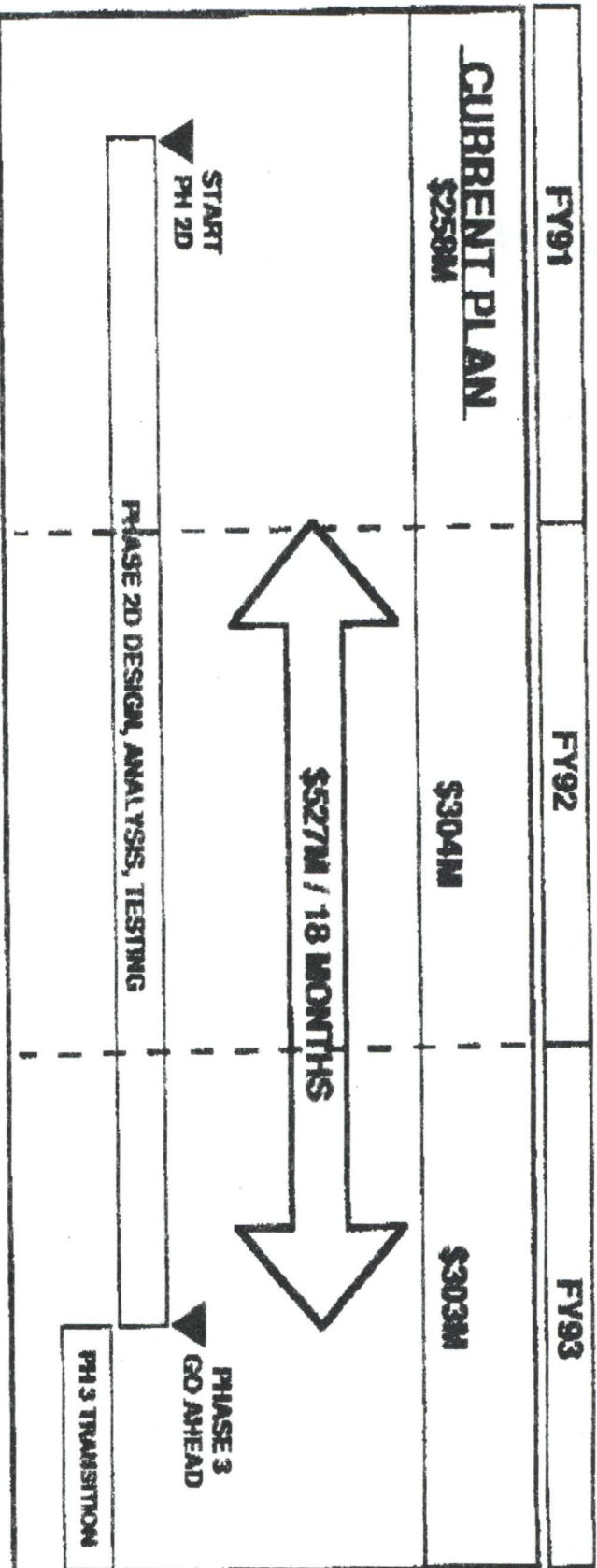
FIRST CUT (9/30/91)

		FY91	FY92	FY93
PROGRAM MILESTONES		START PHASE 2D		
			SYSTEM REQNTS REVIEW	PHASE 3/GO AHEAD
VEHICLE INTEGRATION	CLOSED CONFIG/ PBR INITIAL SIZE	FINAL SIZE (100W)	SDR CONFIG FREEZE	SDR
FUSELAGE	PROOF OF CONCEPT ENGR DEMOS	WING ATTACH	FUSE/TANK	PANELS FULL SCALE SUBCOMPONENTS
TANK	PROOF OF CONCEPT ENGR DEMOS	LH ₂ CONTAIN.	CIRCUIT JOINTS DYDOME ATTACH.	
POWER SYSTEM COOLED DEMOS			LARGE PANEL	SUBELEMENTS HEAT PIPE
ENGINE	PERFORMANCE STRUCT. DEMO	SUBSCALE C-C PANEL	GRIP STRUCT SUBSCALE AL PANEL	SUBSCALE LEADING EDGE SEALS
LSOS	PERFORMANCE STRUCT. DEMO	INITIAL SYSTEM	FAB DEVEL	UPGRADED SYSTEM #1 FAB #2 FAB #1 TEST
SLUSH	MFG & HANDLG CONTROL DEMO			MAINT & MIDDG CONCEPTS DEF INTEGRATED TANK DEMO

SUMMARY OF \$67M FUNDING CUT IMPACT ON NASP

CHART 3

09/30/91



Lifting Body Design Is Key To Single-Stage-to-Orbit

STANLEY W. KANDEBO/WRIGHT-PATTERSON AFB, OHIO

The recent selection of a single design configuration for the National Aero-Space Plane is expected to enhance the viability of the program and improve the likelihood that the technical issues surrounding it will be resolved successfully before a go-ahead decision is considered in early 1993.

The NASP concept now favored by the National Program Office—a contractor group comprising airframers McDonnell Douglas, General Dynamics and Rockwell, and propulsion specialists Pratt & Whitney and Rocketdyne—is a directionally stable lifting body that incorporates short wings, dual stabilizers, and a two-man, dorsal crew compartment.

Propulsion for the vehicle is expected to be provided by three to five scramjet engines and by a single 50,000-70,000-lb.-thrust rocket integrated into the airframe. The single-stage-to-orbit X-30 aircraft, which will take off and make powered landings like a conventional airplane, is expected to be 150-200-ft. long and have a takeoff gross weight of about 250,000-300,000 lb.

The two-man crew will sit side-by-side in a small "blister" located just aft of the hypersonic vehicle's nose.

By reducing the number of NASP configurations from six to one and developing one that incorporates the best features of the six, the contractors have shown that their team can be relied on to make decisions that are in the best interest of the X-30 project. The formal teaming of the contractors in May and selection of the single configuration will allow program resources to be concentrated and technical problems—and possibly their solutions—to be more sharply defined.

These actions also will help put to rest some issues that surfaced early in the project, particularly concerns regarding program management and technology progression rates.

The process that led to the selection of the current NASP design—formerly referred to as the "composite configuration"—began shortly after the contractors received government approval of their teaming efforts in late May, according to Barry J. Waldman, the Rockwell corporate vice president selected by the contractors as the X-30's national program director. Prior to the teaming approval, each contractor's design and experimental

data were proprietary. Only the government's Joint Program Office, headed by USAF civilian scientist Robert Barthelmy, had access to each contractor's data. After the teaming arrangement was approved, however, the contractors were allowed to share data and to examine the existing designs. Much of this mutual technology exploration work was performed in June and July of this year.

Following this work, "we set up an ad hoc engineering staff and used teams consisting of members from the five contractors to make technology comparisons. We looked at the original six designs, then we laid out some new candidate designs that embodied features from all the old designs," Waldman said.

"Much of the groundwork for developing these new designs was provided by the government. 'The government had performed extensive evaluations of the old designs and was able to brief the contractor team on the strengths and weaknesses of each one. This allowed the team to capture the strengths of the previous designs when the new ones were devel-

oped," Waldman said. Eventually, the team made a first attempt at a configuration document, and "one of the discriminators in this document turned out to be the issue of a lifting body versus a winged aircraft," he added.

Of the two designs, the lifting body seemed to be the preferred

configuration because of the propulsion advantages it provided. The NASP is planned primarily as an air-breathing system, so propulsion is critical to its success.

"At high speeds, the only way to compress air for the propulsion system is by using the forebody of the vehicle. And, the aft body of the aircraft needs to be used as an expansion nozzle for the engines," Waldman said. "The wider the body, the more air you can compress and feed into the engines. So, even though the wide body may add some drag, it also helps provide the aircraft with greater thrust."

In short, "the things you do to compress the flow stream [such as widening the vehicle] also give you lift," he said. "With all that lift available, we found we didn't need much of a wing. The main purpose of the wing now seems to be to provide [vehicle] control surfaces."

Wing designs now under consideration include all moving wings or wings fitted with elevons. "But we are trying to avoid the need for exotic controls," Waldman said. The area and span of the wing also are still being defined more fully.

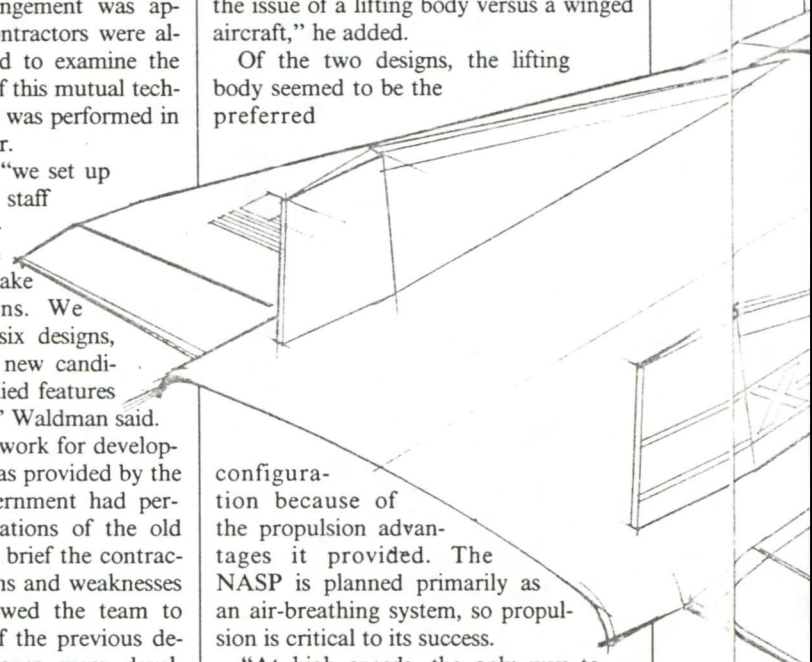
One aircraft control issue already decided, however, is the design of the vertical stabilizer. "We found that we get better directional stability from two smaller tails than from one large one," Waldman said.

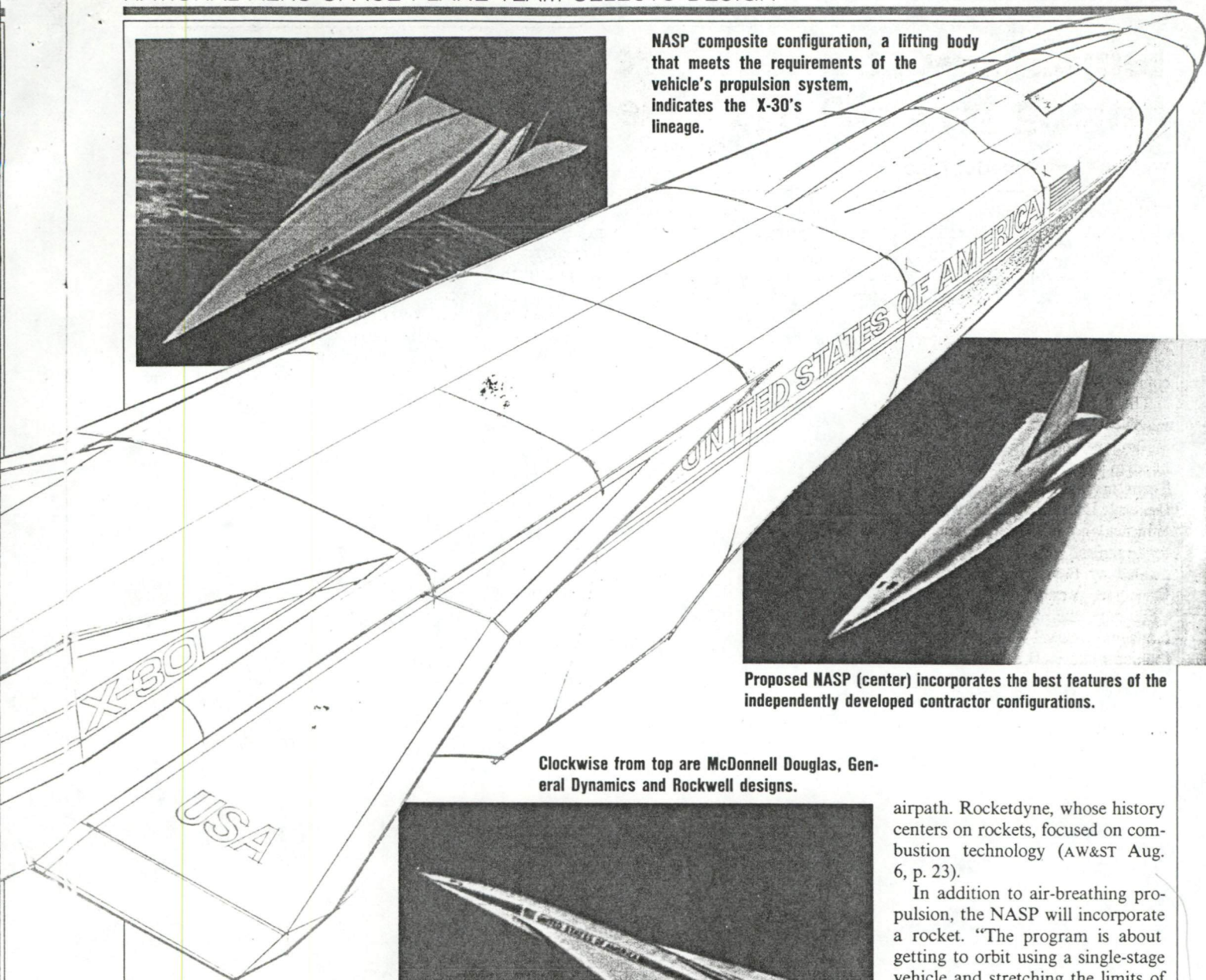
Propulsion for the vehicle will be pro-

The National Aero-Space Plane, or X-30, program plans to develop and flight test a single-stage-to-orbit manned research vehicle that can take off and land like a conventional aircraft. Powered by hydrogen-fueled supersonic combustion or scramjet engines, the NASP could begin flight test around 1997 if a decision is made to construct two flight test vehicles and one ground test article in early 1993. Single-stage-to-orbit would be attempted in 1999.

Five prime contractors, represented by a unified, National Program Office, and the government-led USAF/NASA/Navy Joint Program Office at Wright-Patterson AFB are leading the NASP efforts. The team recently selected a configuration for the vehicle, an important step in moving the X-30 toward development.

The following report written by AVIATION WEEK & SPACE TECHNOLOGY Technical Editor Stanley Kandebo details the process and decisions that led to the selection of the configuration as well as the managerial and technical progress made by the program in the past year. □





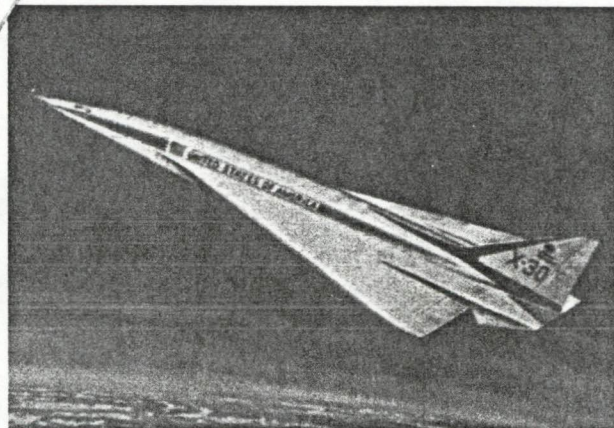
NASP composite configuration, a lifting body that meets the requirements of the vehicle's propulsion system, indicates the X-30's lineage.

Proposed NASP (center) incorporates the best features of the independently developed contractor configurations.

Clockwise from top are McDonnell Douglas, General Dynamics and Rockwell designs.

vided by three to five scramjet engines located on the lower surface of the X-30. The contractor team has already defined how it will combine the two competing propulsion designs originally developed by Pratt & Whitney and Rocketdyne, "and it's clear to us that we know what we want to do, but the plans just aren't very mature yet," Waldman said. "The engine has to be modularized, but the extent of that modularization is still being debated. You get some enhanced flight safety from a multi-engine design, but if that philosophy goes too far the propulsion system gets heavy and cumbersome."

According to program officials, the approach each propulsion company took to the NASP engine challenge reflected the previous products developed by that firm. The company with the most air-breathing engine experience, Pratt & Whitney, designed its engine around the powerplant's



airpath. Rocketdyne, whose history centers on rockets, focused on combustion technology (AW&ST Aug. 6, p. 23).

In addition to air-breathing propulsion, the NASP will incorporate a rocket. "The program is about getting to orbit using a single-stage vehicle and stretching the limits of air-breathing propulsion technology. But a small rocket in the 50,000-70,000-lb.-thrust class will be integrated into the X-30's airframe, independent of the vehicle's air-breathing propulsion, for a number of reasons," Waldman said.

The rocket will be used to provide the X-30 with the final burst of energy it will need to obtain orbital velocity, and it also will be used to maneuver the NASP out of Earth orbit. The rocket also will enhance safety during early X-30 flight tests. Facility limitations are likely to restrict ground tests of the NASP's air-breathing engines to speeds of about Mach 7-8, but the vehicle is expected eventually to fly at about Mach 25. Should there be an air-breathing engine failure during envelope expansion flights, the rocket will be able to provide the vehicle sufficient power to land safely. "Once we put it on [the vehicle], we'll use it where it makes sense," Waldman said. □



Teaming Agreement Stresses Equality Among Five NASP Prime Contractors

WRIGHT-PATTERSON AFB, OHIO

The teaming agreement that melded the five NASP prime contractors into one organization was based on the propositions of equality, equitability of work and working toward a common goal of building the X-30.

In addition the development was to be performed under a leader selected by the constituent companies.

The result of that teaming agreement, which was developed by the contractors in January and approved by the government in May, was a National Contractor Team made up of McDonnell Douglas, General Dynamics, Rockwell, Pratt & Whitney and Rocketdyne, and a contractor-organized National Program Office headed by Barry Waldman, a Rockwell Corp. vice president.

To date, the office's directors—the top management level—each have come from the contractors. The second level of organization, the deputy directors, is made up of the program managers from each of the five NASP prime contractors.

"The program managers at each of the

companies were made NPO deputies for a reason. If they remain only program managers, they could develop too narrow a focus and lose some of their value to the program," Waldman said.

The basic propositions of the teaming agreement satisfied three objectives, Waldman said—motivating normally intense competitors to work together, running the program, and working toward delivering five companies competent in hypersonics at the end of the X-30 effort.

'DOING WHAT'S BEST'

"Basically, the need to cooperate is clear. If we don't pull together, we don't get to Phase 3 [construction of an X-30]," Waldman said.

But the motivation to cooperate has been strengthened by the program's distribution of work and to some extent by the way the fees from the impending cost-plus-award-fee contract will be distributed equally.

"By equally dividing the contract fee, all the contractors will recognize that the

only way to earn any money is to do what's best for the program. No single company can earn very much if everyone isn't earning the same. The only way a company can succeed is if the whole team does," Waldman said.

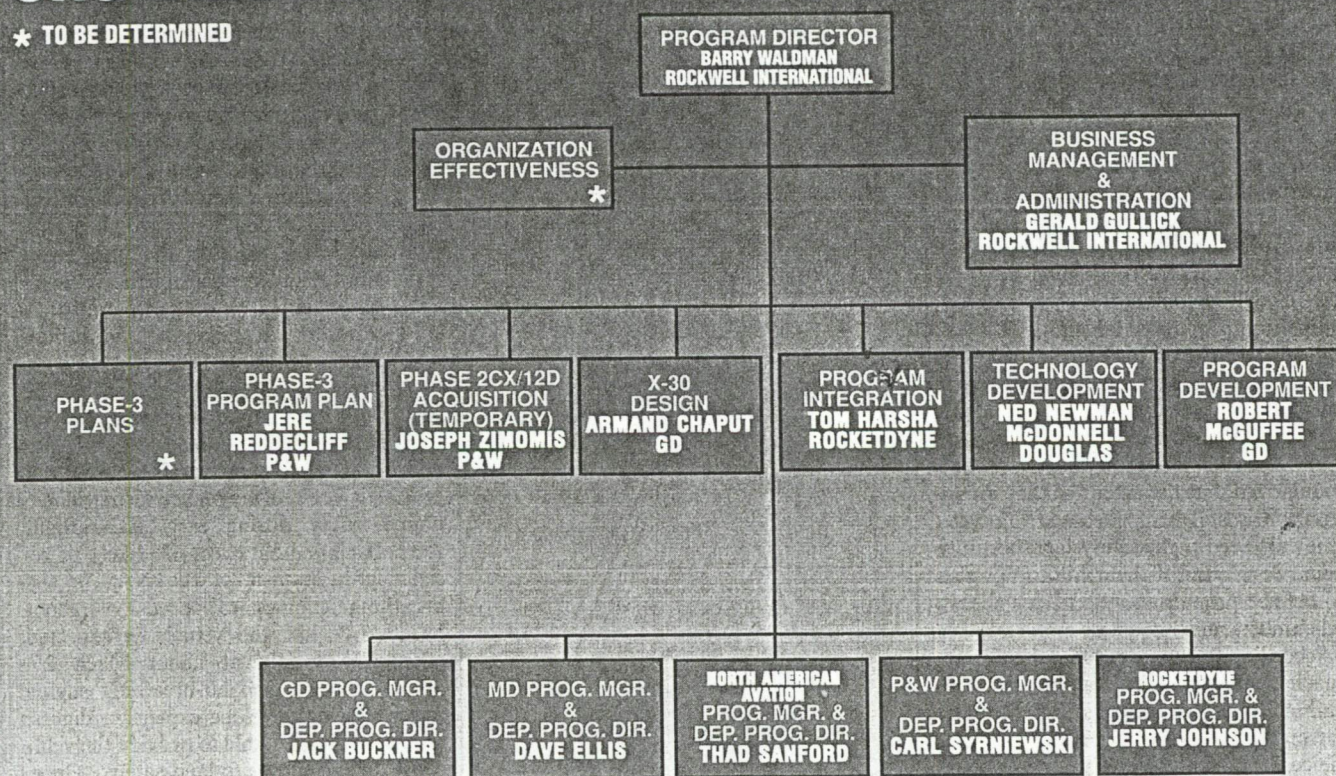
Equal distribution of fees, a move that decouples the amount of money earned by each contractor from the amount and type of work each contractor performs, also will help the program, according to Waldman.

"Equal division of fees means that work isn't fought over," Waldman said. "It also helps us achieve equitability of work," one of the most important aspects of the X-30 program after construction and test of the vehicle itself.

Equitable distribution is not based on the volume of work each contractor does. Instead, it means that each contractor will have sufficient participation in all technical and management areas of the X-30 program so that in the future U.S. industry will have at least five hypersonic leaders, Waldman said. The group over-

NATIONAL PROGRAM OFFICE ORGANIZATION

* TO BE DETERMINED



'Equal division of fees means that work isn't fought over. It also helps us achieve equitability of work'

seeing contractor work distribution is made up of the program managers at each of the contractors and Waldman. To date, with the approval of the NASP Executive Committee—an overview board—they have agreed that:

- McDonnell Douglas will have lead responsibilities in the areas of fuselage development, vehicle thermal controls and aerodynamic stability and control.

- General Dynamics will lead the integration of airframe subassemblies and integration of the vehicle's airframe and engines.

- Rockwell Corp.'s North American Aircraft will lead efforts in developing the X-30's vehicle management system and vehicle subsystems.

- Pratt & Whitney will have lead responsibility in engine flow path integration and controls.

- Rockwell's Rocketdyne will lead engine systems integration and propulsion structures and materials efforts.

In addition to having lead roles, each airframe company also will participate to

a lesser role in each of the airframe areas where it is not the designated leader. The two NASP propulsion contractors will do the same. Each engine company will participate in propulsion areas where it is not the designated leader. This is expected to bring each of the five contractors some experience in all areas of the NASP airframe or engine.

COMMUNICATION TEAM FORMED

In addition to helping resolve the equitable work distribution issue, the designation of leaders for various technical areas also ensures that there is no loss of accountability.

"Given the amount of participation, the ability of the program to maintain accountability was a key concern," Waldman said.

The organization of the contractor's National Program Office also has been evolving since the teaming plan was agreed to in January.

"One of the lessons we learned was that it is not a good idea to set up formal

organizations immediately. Instead, we've been developing ad hoc committees, then working toward a formal body," Waldman said.

One body already formed is an electronics communication team that has been developing communications systems to link the contractors and the government-run Joint Program Office (JPO) at Wright-Patterson AFB.

Composed of members from each contractor and the JPO, the team has been dealing with linking computer-aided design systems, computing systems and other electronic systems that are the backbone of the program's communications and computational power, Waldman said.

"One of the challenges was to link three different CAD systems," he added.

The team already has developed an unclassified network to develop scheduling and other plans, and it is now working on a classified system to handle electronic transfer of drawings and other data, Waldman said. □

NASP Team Explores New Management Techniques, Enhances Cooperation Between Government, Contractors

WRIGHT-PATTERSON AFB, OHIO

The National Aero-Space Plane program team is exploring innovative management techniques and redefining the way the U.S. government, industry and universities cooperate in developing advanced research aircraft.

One of the X-30 program's most significant breaks with the past is the high level of integration between government and contractor resources.

Key to this integration and cooperation is a process called "mainlining," a technique in which government labs and research centers accept responsibility for explicit pieces of work that are on the main development path of the program.

In the past, government laboratories and facilities participated in X-plane programs by conducting generic work. But mainlining brings the government-run facilities into positions often played by contractor research labs or subcontractors, a move that serves two purposes.

First, it allows X-30 program officials to take advantage of skills that could otherwise be lost to the program. "If a government agency has a unique technical capability, the program will have it work in that area, even if the work is technical-

ly and schedule-critical to the program," Barry Waldman, a Rockwell corporate vice president and head of the NASP contractors' National Program Office, said.

Secondly, mainlining fulfills a guiding tenet of the X-30 program, that there be a clear line of responsibility and accountability for every item developed under the NASP effort.

Under the mainlining principle, the NASP contractor team has responsibility for vehicle design, technical and program coordination and for scheduling. The contractor-led National Program Office, or NPO, and the government-led Joint Program Office, or JPO, headed by USAF civilian scientist Robert Barthelemy, will have joint responsibility for developing statements of work for the contractors and work packages for government facilities. "But only the JPO will direct the government labs," Waldman said.

The high level of integration required by the program and the mainlining process is going to create "an interesting situation for the JPO," Waldman observed.

According to USAF's Barthelemy, "the government is no longer just a funder or evaluator." The government

now will have contractor and customer responsibilities, Waldman said. The government has some responsibility as a performer of work, and a part of the JPO will coordinate the government work packages in the contractor-like role. But part of the JPO also will be involved in overall program reviews, and that role has customer-like responsibilities. "To work, the program has and will continue to operate at an unprecedented level of openness," Waldman added.

To achieve this openness and integration, there is a NASA official and an Air Force official at the NPO. In addition, the NPO and JPO are jointly writing statements of work and requests for proposals. Both contractors and the government have been conducting and continue to conduct thorough reviews of all program aspects.

As another example of cooperation and openness, Waldman said the NASP contractors had participated in a recent meeting where the Defense Dept.'s Acquisition Strategy Panel explored the next phase of the NASP program. "Contractor participation in these meetings is highly unusual," Waldman said. □

NASP Researchers Forge Ahead With Propulsion and Technical Advances

WRIGHT-PATTERSON AFB, OHIO

Industry and government researchers have made significant progress in the key area of National Aero-Space Plane propulsion during the past fiscal year, boosting confidence in the future of one of the most challenging of the project's technologies.

In addition to propulsion achievements, researchers also have accomplished a number of technical advances in NASP materials, aerodynamics and simulations.

In the past year, Rocketdyne has tested a quarter-scale NASP engine at speeds simulated up to Mach 7 at NASA's Langley Research Center in Hampton, Va., and Pratt & Whitney also completed testing of a one-sixth scale scramjet engine model in the same facilities.

Pratt made more than 170 runs, accumulating more than 90 min. of test time, and demonstrated that engine performance in the Mach 4-7 range matched the levels predicted by computational fluid dynamics codes. The Rocketdyne model, operating in ramjet and scramjet modes, agreed closely with predictions. Also agreeing closely with predicted results were data collected from a Rocketdyne engine flowpath model tested at the General Applied Science Laboratory in Ronkonkoma, N. Y., and information gathered from a Pratt full-scale flowpath

model tested at speeds of Mach 6, Mach 8 and Mach 1 at Marquardt in California.

This combination of performance and closely matching predictions for both Pratt and Rocketdyne engine concepts has increased confidence in the scramjet engine approach to NASP propulsion, according to Robert Barthelemy, head of the NASP Joint Program Office here.

INLET CONCEPTS TESTED

Tests of engine inlets also have raised expectations that a high-performance NASP inlet can be developed and cooled properly. NASP 2-D and 3-D inlet concepts have been tested at the Naval Surface Warfare Center in Baltimore under simulated free-flight conditions of Mach 10-14, and high-performance, small-scale inlets were used at NASA's Lewis Research Center in Cleveland to investigate the effects of shock and boundary layer control on inlet unstart and operability. The NASA-Lewis tests also ganged engine modules to help develop multimodule inlet designs that would resist the spread of engine unstart should it develop in a single-engine module.

In addition to inlet flow conditions, inlet leading edge cooling techniques also were demonstrated this past year. A Pratt heat pipe concept was tested at United

Technologies' laser facility in Connecticut to show that the proposed structural design of the NASP engine's leading edge could withstand flight heat loads. The test indicated the heat pipe approach could handle cowl heat fluxes of more than 70,000 BTU/sec.-sq. ft.

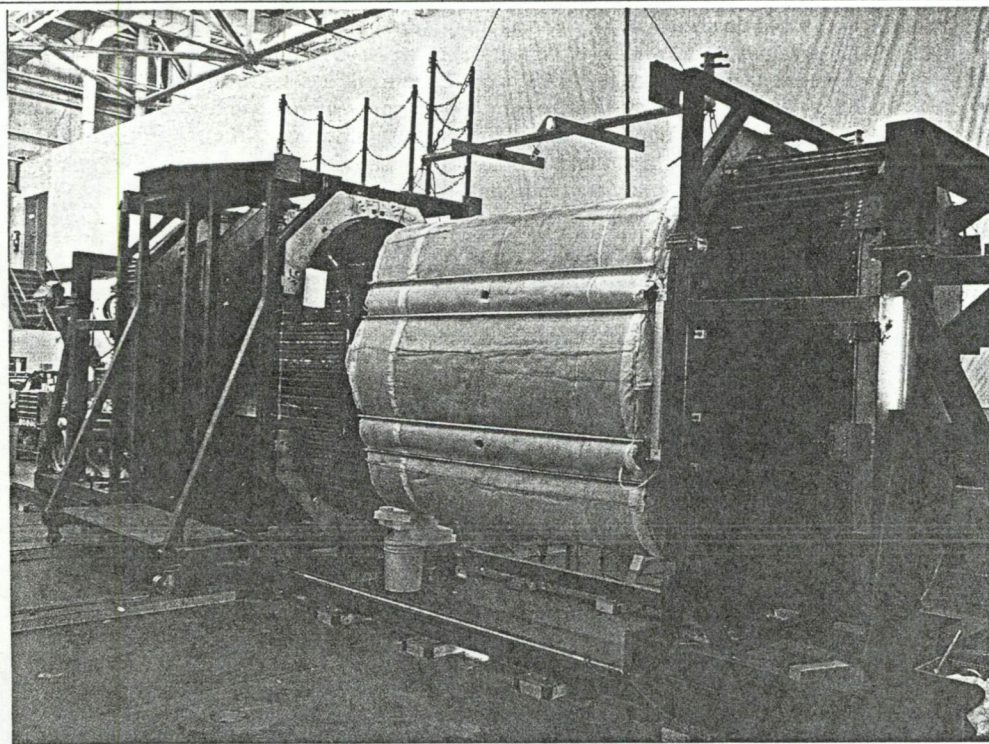
Engine operability issues also were resolved in part by tests of a hydrogen-fueled scramjet model at NASA-Lewis and scramjet engine concepts at General Applied Science Laboratory's Hypulse facility conducted under Mach 17 conditions.

Tests conducted at NASA-Lewis at Mach 3.5 conditions are expected to contribute to development of an advanced control system for the NASP, because recent tests defined inlet operating characteristics, demonstrated combustor ignition and determined combustor operating limits. In addition, the tests led to development and validation of a procedure for restarting the engine inlet.

Engine test facilities also gained this year. Progress was made at NASA-Lewis in developing a prototype laser-based system for measuring combustion species concentrations and temperatures in hypersonic flight regimes. Rocketdyne has been working with NASA-Lewis on the prototype, and an operational system is due by mid-1991.

Rapid progress also has been made in the materials area, which is attributed to the contractor/government Materials Consortium created about 2½ years ago (AW&ST Mar. 7, 1988, p. 43). Since it was formed in 1988, the consortium has pooled the talents of more than 130 organizations' personnel to develop the exotic materials required by the NASP. In addition, full-scale structural components have been built and tested, Barthelemy said.

One element cutting across the development of nearly all the materials has been the need to understand the interactions of the proposed NASP materials with hydrogen, the X-30's expected fuel and coolant. Government efforts led by NASA-Ames have provided an understanding of how to safely contain hydrogen, especially during the NASP's high-temperature flight, Barthelemy said.



Insulated thermoset composite hydrogen-fuel tank is fitted into a 4 × 4 × 8-ft. NASP fuselage test assembly made from silicon carbide fiber-reinforced titanium material.



One area in which this work is applicable immediately is in development of an 8-ft.-long, lightweight, thermoplastic, noncircular fuel tank. The McDonnell Douglas-developed tank has been tested twice to full pressure with nitrogen and is being installed in a full-size X-30 vehicle cross-section test article, also developed by McDonnell.

The 4 × 8 × 8-ft. vehicle test article is made of 4 × 4-ft. silicon carbide fiber-reinforced titanium composite panels strengthened by about 130 hat stiffeners made of the same material. Textron made the panels, which were joined by various means to complete the test structure.

Installation of the tank into the fuselage test article is nearly complete, and the assembly is scheduled for mechanical and thermal load tests at Wyle Laboratories' facilities in Ontario, Calif., soon.

Another materials effort related to hydrogen was Rockwell's development of a multilayer insulation concept. The sandwich-like insulation has demonstrated its effectiveness in protecting slush hydrogen fuel from the 1,800F surface temperatures that may be generated on the NASP during flight, Barthelemy said.

Carbon-carbon composite technology also gained because of the NASP program. General Dynamics and subcon-

tractor B. F. Goodrich Aerospace, with McDonnell Douglas help, developed the largest structural carbon-carbon panel assembly manufactured to date. The panel was formed from two 40 × 68½-in. curved carbon-carbon panels joined by a structural frame. Silicon carbide-coated fasteners joined the subassemblies.

The material has a temperature limit about three times that of conventional titanium and weighs about one-third as much as a similar titanium structure.

NEW COATING

The panel was treated with a new silicon-carbide-based coating to withstand oxidation degradation, and representative components manufactured from the same materials as the panel were tested to thermal and mechanical stresses that simulated more than 200 NASP earth-to-orbit-to-earth flight cycles. Temperatures during the tests reached as high as 3,000F, Barthelemy said.

In addition to materials, achievements also have been made in other technologies critical to the NASP effort.

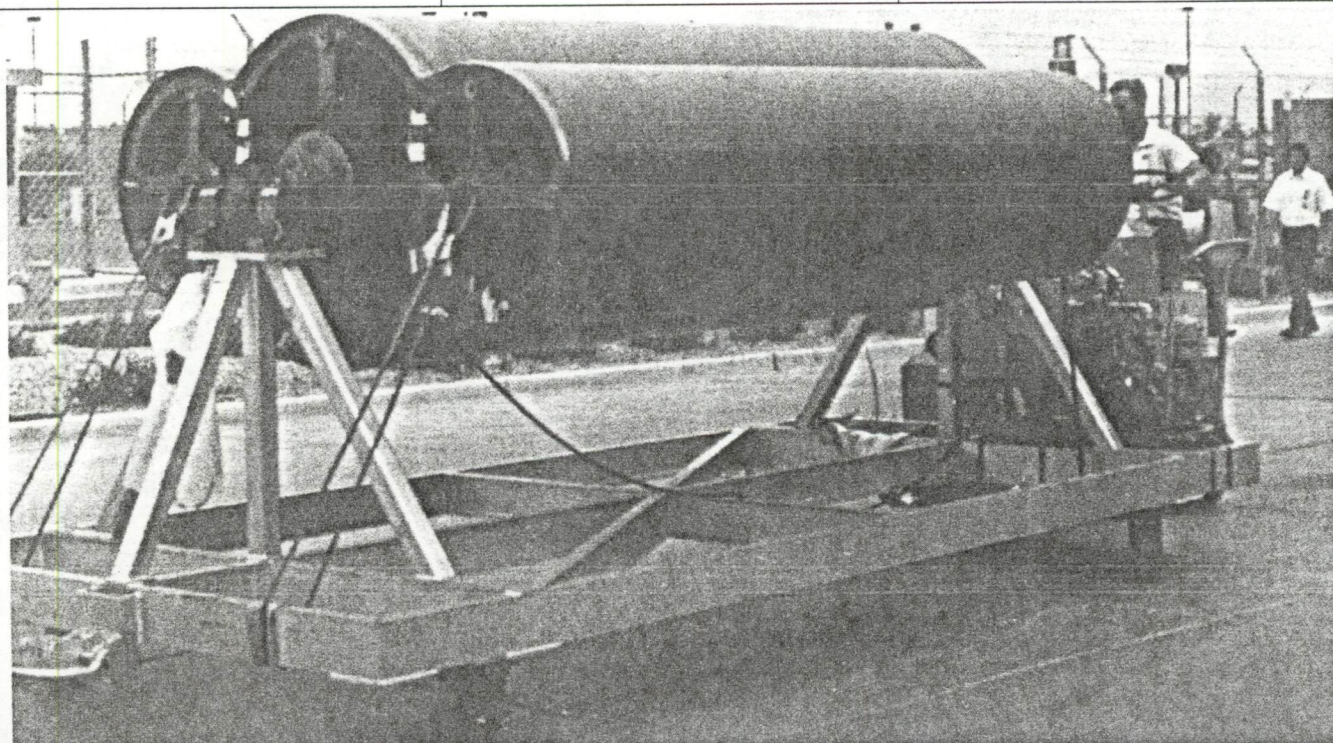
One of the most significant has been the progress made in locating the boundary layer transition point on the NASP. The uncertainty surrounding the location has been reduced to about 20% of the

length of the vehicle. The reduction ultimately will benefit vehicle performance.

Another was completion of high-speed aerodynamic tests on a General Dynamics NASP configuration model. The tests, performed at the Naval Surface Warfare Center at speeds up to Mach 14, will provide baseline lift, drag and control data for the NASP composite design.

A third was production and transferral of "a large quantity" of slush hydrogen. Facilities at NASA-Lewis' Plum Brook Station near Sandusky, Ohio, produced slush hydrogen with a 50% fraction of solids. It was transferred into a 500-gal. tank and drained, demonstrating that slush can be manufactured and safely distributed in at least modest quantities.

Another milestone was completion of fluid dynamics codes for the X-30 forebody, inlet and nozzle flows. The codes, developed by NASA-Ames, were validated by test data and will provide key reaction rates for hydrogen-air mixing. □



McDonnell Douglas has tested this thermoset composite cryogenic tank twice at full pressure with liquid nitrogen. The non-circular tank, shown

without insulation and before installation in the NASP fuselage test section, measures about 8 ft. long.

JPO Studying Flight Test Issues In Early Phases of X-30 Program

WRIGHT-PATTERSON AFB, OHIO

NASP flight test issues now are being studied by the Joint Program Office here, although X-30 first flight is at least seven years away. One of the most pressing issues is pilot visibility—whether or not the vehicle will have windows.

Based on in-flight, limited visibility tests conducted at NASA's Dryden Flight Research Center, the test pilot community has come down on the side of at least some direct visibility, and the vehicle now is planned with windows mounted on the sides of the blister covering the crew compartment, USAF Col. Ted Wierzbanski, the program's deputy for Phase 3 activities [building and flying the X-30], said.

Despite the side windows, the primary forward visual system for the NASP is still being evaluated and the debate is one of electronic versus optical sensors. But the test pilot community is concerned with the reliability of electronic systems and the time lag associated with them,

preferring a retracting periscope or some other optical means of seeing outside the cockpit, Wierzbanski said.

A second flight test concern now being addressed is the issue of NASP escape systems. Decisions on a baseline system are scheduled to be made early next year and for now, as a minimum, a high-performance open seat/pressure suit combination will be provided. But other systems are under study.

EARLY FLIGHTS WITHIN EDWARDS

Flight envelope expansion is an additional area receiving much attention, and proposed flight profiles have been developed based on simulation work conducted at the NASA-Ames Research Center/Dryden Flight Test facility. Based on the experience of previous X-plane programs, the X-30 conceptual flight test plans were developed with the assumptions that at some point in the test program the engines will fail, that the structure will sus-

tain damage and that some design predictions will be wrong, Wierzbanski said.

The profile on the aircraft's initial flights will keep the vehicle within the confines of Edwards AFB's R-2508 complex. But these flights, which initially will focus on systems verification, will soon lead to other flights, which will rapidly expand the flight test area to cover much of the continental U. S., Wierzbanski said.

Expanding flight tests are expected to place the X-30 on a ground track that will begin at Edwards, loop around Florida's Kennedy Space Center and terminate at Edwards. Current plans call for the aircraft to cruise above normal air traffic at speeds of Mach 2-4. Then, at a range determined by the desired maximum Mach number and aircraft glide capability, the X-30 will turn toward Edwards and accelerate to the desired Mach number. The aircraft will then be held at this Mach



Engine, Airframe Integration Key To Meeting NASP Design Goals

NEW YORK

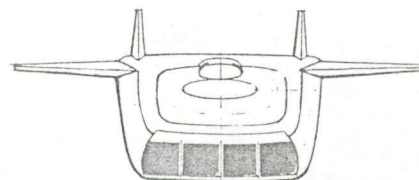
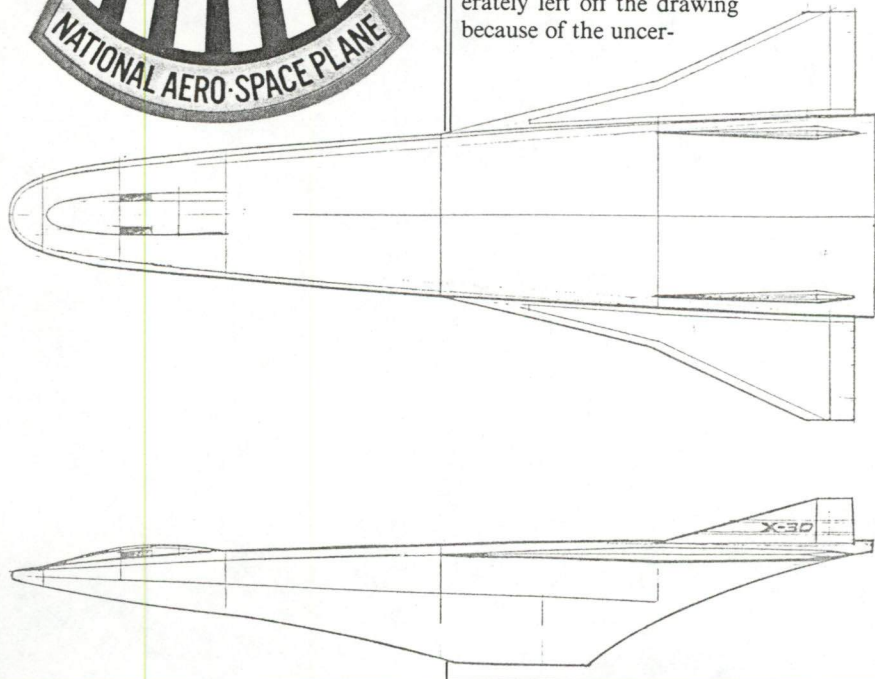
The wide planform and small wings visible in this three-view drawing of the National Aero-Space Plane emphasize the lifting body concept employed in the hypersonic vehicle design.

Scale and dimensions have been deliberately left off the drawing because of the uncer-

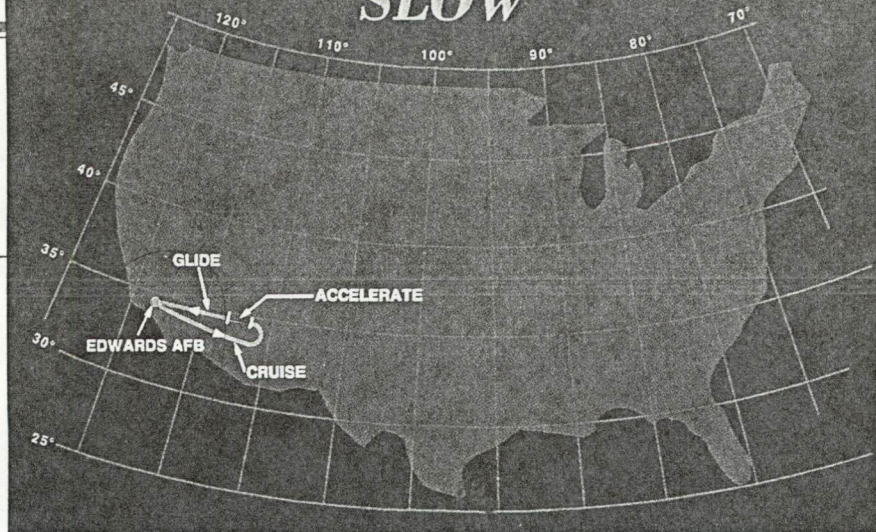
tainty still surrounding the exact size of the X-plane. The X-30 is expected to be 150-200-ft. long and to have a gross take-off weight of 250,000-300,000 lb. The crew compartment, visible as a "blister" on the NASP's upper surface, will house two pilots in a side-by-side configuration. Windows now planned for the sides of the crew enclosure are visible in the plan and side views.

The side view also provides an indication of how the vehicle's curved forebody will be used to compress engine inlet air; its highly swept aft body will serve as an expansion nozzle. In addition, the integral nature of the propulsion package can be inferred from the side view.

Visible only in the forward view is the engine inlet area. The large inlets are indicative of how critical the vehicle's propulsion system is in meeting the X-30's goal of single-stage-to-orbit flight. □

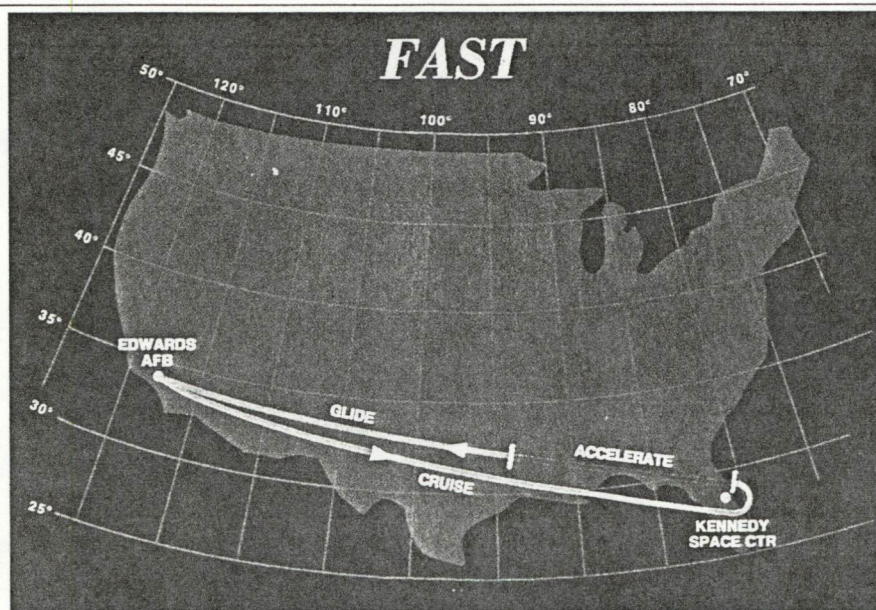


SLOW



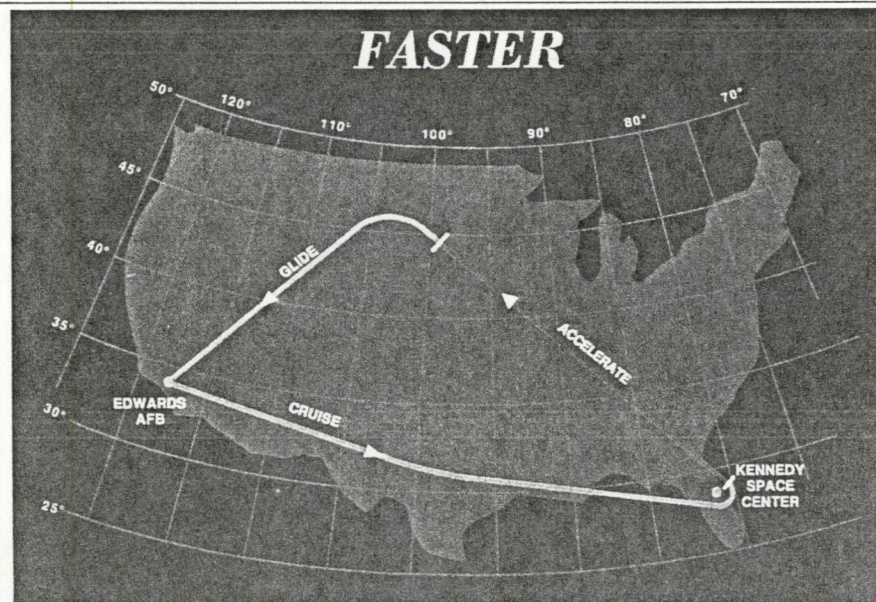
Envelope expansion flight test ground tracks developed using simulations performed at the NASA-Ames/Dryden Flight Research facility indicate the early flight profile currently favored.

FAST



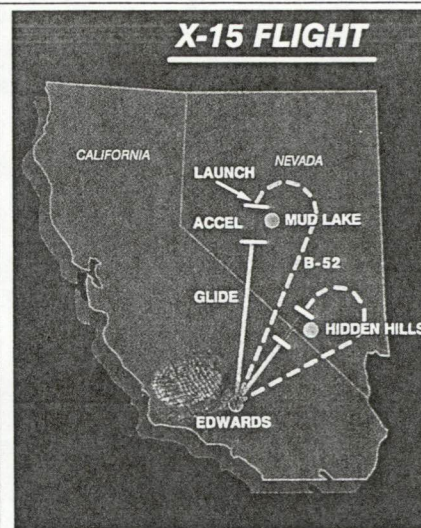
Test plans call for envelope expansion flights during which the aircraft will cruise from Edwards to the Kennedy Space Center in Florida, turn and accelerate back toward Edwards.

FASTER



X-30 envelope expansion will continue to build (above) toward a single-stage-to-orbit attempt. The X-15's flight test profile (top right) is shown for comparison.

X-15 FLIGHT



number for data acquisition. Alternatively, depending on available equipment, data may be taken under dynamic conditions that better represent the X-30's actual ascent environment, Wierzbanski said.

During the early part of envelope expansion, once the data required by the flight are collected vehicle flight safety issues call for a relatively benign, minimum stress profile to be flown back to Edwards. In fact, in the early envelope expansion flights, this profile will exclude the possibility of a NASP pilot conducting a powered go-around. Wierzbanski stressed, however, that the aircraft is being designed to make powered landings with go-around capability, and that the landing limitations will be a feature of early flights only.

Plans call for minimizing aircraft stresses after flight test data collection because the X-30 could sustain thermal damage during high-speed flight. "The vehicle will be subjected to high heat loads, and the X-15 and shuttle programs indicate that thermal damage is a possibility after high-Mach flight," Wierzbanski said. Needless to say, overstressing an X-30 that could be suffering from thermal damage could result in additional damage, he added.

But the minimum stress flight profile for early flight test also has other advantages, Wierzbanski said. Besides minimizing the vehicle's heat loads, turns are made at relatively low Mach numbers, decreasing the time to turn and reducing turn radius. The profile also always points the aircraft back to Edwards after high speed, just in case trouble develops, Wierzbanski said. □

EDITORIALS

Put NASP on Solid Budget Footing

Members of the international technical community attending the AIAA's International Aerospace Planes Conference in Orlando late last month sent the United States a clear message—they may eventually challenge U.S. leadership in the hypersonics arena, and their countries, individually or as a consortium, will surpass the U.S. in this area if given the chance.

Taken by itself, the news is neither unsettling nor unwelcomed. By law and sovereign right nations are free to spend their money as they wish. And the U.S. always has thrived in a competitive environment.

Despite the increased international competition, the U.S. Congress does not appear to be convinced of the value of hypersonic research in general or the X-30 National Aero-Space Plane in particular. For the past several years the Senate, while acknowledging the technological value of NASP, has zeroed funding for the program. Each year the House, with Reps. Dave McCurdy, John P. Murtha and Robert A. Roe in the vanguard, has restored those funds. This year was no exception, but the House managed to preserve X-30 funding near the level recommended by the U.S. Space Council.

In an uncompetitive environment it might be practical to downgrade or stretch out long-term technology development programs like NASP as a contribution to cutting

the U.S.'s crushing national debt. But with competition in hypersonics clearly increasing, and the U.S. facing a European effort that combines the resources of Germany, France and perhaps the Soviet Union, such a move could seriously injure the U.S. aerospace industry.

The X-30 program is vital to the future of the U.S. industry—one of the few profitable export entities left in the country. The NASP effort is driving advances in aerospace materials, propulsion and computational fluid dynamics in the U.S. That is why industry has paid for about one-third of the program so far and ultimately will contribute about \$700 million to NASP research efforts.

Congress must continue to consider the full impact of NASP as it annually weighs the Space Council's budget recommendations. The council's estimates are the minimum needed to keep the program progressing at an efficient rate.

If Congress wants the U.S. to continue its leadership in aerospace, it must view the X-30 as more than an interesting, but not critical, program. Treating the NASP as a budget bargaining chip needlessly handicaps U.S. aerospace companies while strengthening the hand of their international competitors. U.S. industry is willing and able to compete in the hypersonic arena, but adequate and steady funding is needed to level the playing field.

Australia's Deregulation Challenges

Airline deregulation has come to Australia, offering expanded air service and competitive fares in a nation that has 16 million people spread over a continent as vast as the U.S. But the transition to a free airline market will not be easy after 40 years of government protection. Government and airline officials alike must cast off old ideas nurtured by regulation and fasten their safety belts for the bumpy ride deregulation provides.

For starters, Australian government officials must keep their hands off the deregulated industry. Their record on meddling so far is not good. Shortly before deregulation took effect, they allowed Australian Airlines and Ansett Australia to acquire 30-year leases on airport properties, an outlandish stroke of incumbent favoritism.

This free market infringement transformed the key airports resource into a national duopoly. The airline lease holders have invested in expansion and are expected to provide gate space and airport services to new entrant carriers, but the action was not fair and the matter should end up in the courts.

Speeches by W. A. Swingler, chief executive of Australia's Federal Airports Corp., indicate officials of the new airport authority also disapprove of the 30-year leases. Swingler, speaking as an airport man, supports common-use gates at Australian airports. He is correct in saying

common-use gates are efficient and fair, and his proposal for downtown check-ins for passengers who would be bused to their aircraft also has merit.

But the award for innovation goes to Bryan Grey, head of new entrant Compass Airlines. Grey collected more than \$65 million (\$53 million U.S.) from a public offering, and his method had the seed of genius. The 12,000 Compass investors became members of an Owners Club, entitling them to 10% of their investments in free travel on the airline annually for 10 years. Grey gained his up-front money, and Owners Club members have an investment they potentially can recoup in free travel.

Deregulation will disrupt Australia's airline system. In addition to Compass, Southern Cross is a likely entrant in 1991. They will have to learn the ropes quickly, find market niches and keep the passengers coming back. Discount fares that consumers expect are possible only if costs are reduced. This may be difficult in a nation where unions are considered another layer of government. With unit costs about double those of U.S. airlines, the Australian incumbents have their work cut out for them.

One crucial development will be the selection by Qantas of a domestic airline partner or partners. This connection will be valuable in a nation where tourism has grown at a rate of 30% a year.

**NASP Interagency Office****Telefax Transmission Cover Sheet**Date: 5 SEPT 91 2 Pages (Including cover sheet)To: MR RICK YANNUZZITelephone No: (202) 395 5052

FAX No: _____

From: Mr. Ming H. Tang

National Aero-Space Plane (NASP) Interagency Office

SAF/AQT (NIO), Pentagon Room BD944

Washington, D.C. 20330

Telephone No: (703) 695-7866 DSN 225-7866

FAX No: (703) 695-4580

Comments:

ATTACHED IS A SUMMARY OF THE
NASP TECHNICAL QUARTERLY REVIEW.
HOPE YOU HAVE A GOOD TRIP ON
THE 26TH

NATIONAL AERO-SPACE PLANE (NASP) STATUS REPORT

- The 5th NASP Quarterly Technical Review (QTR) was held at NASA's Dryden Flight Research Facility on July 31, 1991
 - The purpose of the meeting was to review technical progress and programmatic status
 - In attendance were key NASP Steering Group members, contractor Executive Oversight Committee members, NASA Center Directors, DoD Laboratory Officials and key industry team representatives
- Meeting Output:

The Program goal and objectives are unchanged

The meeting was very constructive, especially in providing guidance to Phase 3 planning that recognizes the national budget realities expected in future years.

 - Programmatic guidance was to move the program forward with a balance of performance and cost
 - Previously, the program has been focused on performance
- Approach:

Freeze the SSTD X-30 size and configuration by Fall 1991

 - Examine cost reduction options which will evolve a robust experimental vehicle which will demonstrate the most critical technologies for SSTD
 - Examples of possible options:
 - Delayed Implementation of slush hydrogen
 - Existing rocket in lieu of new optimized rocket
 - Off-the-shelf hydraulic system in lieu of new high pressure system
- Expected Result:

Robust, affordable X-30 aircraft providing timely integrated technology demonstration

 - To continue U.S. leadership in international aerospace
 - To pave the way for new classes of military and civil aerospace vehicles in the 21st Century



ACQUISITION

THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301

10 JUN 1991

Honorable John P. Murtha
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

In accordance with the request on page 530 of House Report 101-923, the Conference Report that accompanied the National Defense Authorization Act for Fiscal Year 1991, enclosed is the report on the National Aero-Space Plane Program.

A copy of this report is also being furnished to the House Armed Services Committee and the Senate and House Appropriations Committees.

Sincerely,

A handwritten signature in dark ink, appearing to read "Don Yockey", is written over the typed name.

Don Yockey
Acting Under Secretary

Enclosure

cc:
Honorable Joseph M. McDade
Ranking Republican



REPORT TO THE
CONGRESS OF THE UNITED STATES
ON THE
NATIONAL AERO-SPACE PLANE PROGRAM

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, DC

March 15, 1991

Introduction

This report responds to the request on page 530 of House Report 101-923, the Conference Report that accompanied the National Defense Authorization Act for Fiscal Year 1991, to identify "the military requirements and missions for NASP and the rationale for continued DoD funding for this program." The National Aero-Space Plane program is an important part of the nation's space program, with major future civilian and military applications. The Department of Defense is committed to the success of this important Presidential initiative. The following sections address the requested areas.

Military Requirements and Missions

As a science and technology program, the NASP mission is to demonstrate and validate the technological basis for single-stage-to-orbit space launch vehicles and aircraft capable of hypersonic cruise in the atmosphere. Vehicles derived from a successful NASP program could provide significant increases in our capabilities in both strategic and tactical missions.

There are validated military requirements for future systems which could be directly derived from a successful NASP program. These requirements cover a wide variety of missions and include a Strategic Air Command (SAC) Statement of Need for Military Spaceflight Capability and Air Force Space Command (AFSPACECOM) Statements of Need for an Advanced Launch System and a Military Aerospace Vehicle. On November 27, 1990, the Commanders of SAC and AFSPACECOM signed a memorandum of agreement (MOA) committing both commands to support and advocate the NASP development effort which "represents a significant technology effort of enormous potential to the country and the military." More recently, the two Commanders jointly stated: "Our commands believe an aerospace vehicle derived from the NASP technology offers tremendous benefits to our national space launch and warfighting capabilities." Furthermore, the Joint Chiefs of Staff, after a review of NASP, concluded: "Numerous military requirements for national security missions could potentially be satisfied by NASP-derived vehicles (NDVs) . . . NDVs could provide rapid, cost-effective, flexible, and reliable access to space as well as extended hypersonic atmospheric cruise capability for a variety of candidate military missions." In summary, there are requirements and missions for future military weapon systems that a successful NASP program could address.

Rationale for Continued DoD Funding

There are three important reasons for continued DoD funding. First, and most importantly, if the NASP program achieves its

goals, the potential military benefits will be important in addressing the military missions and requirements discussed in the preceding section.

Second, the current NASP technology development efforts will yield technology that is valuable in other areas of defense, including aircraft and missiles. The NASP program efforts on advanced, lightweight, high-temperature materials will be very useful in applying these materials to aircraft and missile structures, aircraft turbine engines, and space structures. The NASP developments in computational fluid dynamics will be applicable to many aeronautical systems; for example, these codes have been already been used to model complex flow fields on the B-2. Similarly, NASP efforts on high-speed propulsion will be applicable to a wide variety of missiles. These applications of NASP technology to other areas will contribute to maintaining preeminence in the aerospace sector, which is important to the Department and the Nation.

The third reason for continued DoD support is that the program is making good progress. The development and selection of airframe materials is proceeding very well. We have obtained a substantial amount of data on engine component performance in the last two years. That data has provided the basis for a more realistic assessment of engine performance than any made previously. And we have recently demonstrated flow control techniques for slush hydrogen. With the recent formation of the contractor team, we expect the rate of progress increase even more.

Schedule, Milestone, and Cost Data

NASP is a three-phase program. Phase I, the DARPA Copper Canyon concept feasibility study was completed in 1985, prior to the formal designation of the NASP program. Phase II, technology development, was initiated in Fiscal Year 1986 and is scheduled for completion in Fiscal Year 1993. A decision on proceeding to Phase III, the experimental flight vehicle phase, is planned for the third quarter of Fiscal Year 1993.

Milestones for Fiscal Year 1991 include design cycles one and two of the selected X-30 configuration by the recently-formed contractor team, four foot by eight foot cryogenic tank and fuselage structural article tests, the first series of module-to-module engine tests to determine potential interference effects between the engines, tests to validate external burning as an aerodynamic drag reduction technique, the decision on the use of slush hydrogen as the X-30 fuel, and design of the full-scale ramjet/scramjet concept demonstration engine which will be tested up to Mach 8. Fiscal Year 1992 milestones include small structural article tests, large structural test component

fabrication including a cryogenic tank, wing/fuselage joint and one-quarter scale fuselage section for the new configuration, the initial Phase III cost estimate, concept demonstration engine fabrication and initial test, and the third and fourth X-30 design cycles. Milestones for Fiscal Year 1993 include the fifth X-30 design cycle, the X-30 Systems Design Review, completion of Phase II engine and airframe testing and final data analysis, large structural article tests, and the Phase III decision.

The historical and programmed funding for the NASP program is:

	<u>Prior</u>	<u>FY90</u>	<u>FY91</u>	<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>FY95</u>	<u>FY96</u>	<u>FY97</u>
DoD	569	192	162	232	183	102	102	102	102
NASA	<u>237</u>	<u>59</u>	<u>95</u>	<u>72</u>	<u>120</u>	<u>145</u>	<u>TBD</u>	<u>TBD</u>	<u>TBD</u>
TOTAL	806	251	257	304	303	247	TBD	TBD	TBD

The DoD programmed funds for Fiscal Year 1994 and beyond are a "placeholder" for Phase III until sufficient information is available to evaluate thoroughly the nature, feasibility, and costs of the experimental flight vehicle program. Preliminary estimates indicate that total program costs for two single-stage-to-orbit experimental flight vehicles could be on the order of \$10 billion. This estimate may be refined after the initial Phase III cost estimate is completed in Fiscal Year 1992. Phase III funding requests will be adjusted based on this estimate and program progress. A thorough evaluation of the nature and costs of the experimental flight vehicle program will be made during Fiscal Year 1993. We are working to minimize program costs through streamlined management procedures, contractor teaming and technical focusing.

Planned Funding Shares Between DoD and NASA

NASP is a joint DoD-NASA program. The relationship between DoD and NASA for the conduct of the NASP program is governed by a Memorandum of Understanding (MOU) signed by the Secretary of Defense and the NASA Administrator. In accordance with the provisions of the MOU, it will be revised as necessary for the conduct of Phase III. Actual and programmed funding shares are negotiated between DoD and NASA and are shown in the preceding paragraph. As previously mentioned, both DoD and NASA funding for Fiscal Years 1994 and beyond may be adjusted based on the Phase III cost estimate and program progress.

Technical Risk Assessment

The technical challenge of building a reusable, airbreathing, single-stage-to-orbit vehicle is a large one. Significant advances in a number of critical technical areas are required. These include propulsion, materials, structures,

cryogenic fuels, and computational fluid dynamics. The high sensitivity of single-stage-to-orbit vehicles to technological uncertainty places stringent demands on the NASP program to reduce uncertainty to manageable levels before proceeding to Phase III. While we have made significant progress to date in reducing the levels of technological uncertainty in the critical technical areas, much remains to be done before they can be considered to be at a manageable level for a Phase III single-stage-to-orbit vehicle. The remainder of Phase II is devoted to reducing technological uncertainty. While the propulsion system is currently the area of highest uncertainty, it is the aggregate effect of uncertainties in all areas that is the biggest challenge.

Technological uncertainty will continue to be reduced during the remainder of Phase II with such activities as the concept demonstration engine tests, large structural article tests and wind tunnel testing. The Air Force and NASA have a very effective joint management team working with the five-contractor NASP team to provide the maximum amount of quality data possible, and hence the lowest possible level of uncertainty, at the Phase III decision point. This team carefully monitors current levels of uncertainty in the critical technical areas, updates these levels on the basis of data obtained, and evaluates the impact on the risk of the X-30 design. We anticipate that these efforts will be successful in reducing the uncertainties, and the associated risk to manageable levels. However, significant technical challenges will still remain and NASP will continue as a high risk science and technology program until the critical enabling hypersonic technologies are demonstrated during flight test.

Priority Ranking of NASP in Relation to DoD's Other Advanced Technology and Space Access Programs

NASP is a high priority science and technology program. As the executive agency for the program, the Air Force is committed to the NASP program. Technology development programs such as NASP are essential not only to the Air Force's future but also to the Nation's ability to maintain its competitive edge into the twenty-first century. The Department supports the NASP program and, within budget constraints, will continue to strive to ensure that NASP receives the high priority ranking necessary to ensure its successful execution.

The Department urges the Committees to support the President's DoD and NASA budget requests for NASP. With your support we anticipate this important initiative will continue to make impressive technical progress.

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RUEBHAA/STORAGE CENTER FBIS RESTON VA

RUEHC/SECSTATE WASHINGTON DC//INR/SEE/SI//

RUEKJCS/DEFINTAGENCY WASH DC

RUEOACC/CDR PSYOPGP FT BRAGG NC//ASOF-POG-SB//

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RUFHVOA/VOA MUNICH GE

RUMJBP/FBIS OKINAWA JA

ACCT FBLD-EWDK

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CONTROLS

UNCLAS 30/PMU/SU

SERIAL: LDO407203991

BODY

COUNTRY: USSR

SUBJ: WORK UNDERWAY TO DEVELOP 'SPACE PLANE'

SOURCE: MOSCOW RADIO MOSCOW WORLD SERVICE IN ENGLISH 1200 GMT 4 JUL
91TEXT:

((TEXT)) WORK HAS STARTED IN THE SOVIET UNION TO DEVELOP A SPACE PLANE OF THE 21ST CENTURY. TAKING OFF FROM AN ORDINARY AIR FIELD, IT WILL INSURE REGULAR SUPPLIES FOR ORBITING STATIONS. THIS FLYING MACHINE MUST BE EXTREMELY LIGHTWEIGHT, DURABLE AND RESISTANT TO VERY HIGH TEMPERATURES OF ABOUT 2,000 DEGREES CELSIUS. IT WILL USE LIQUID HYDROGEN AS A FUEL.

SINCE THE DEVELOPMENT OF A SPACE PLANE WILL REQUIRE LARGE FUNDS, AN OPEN DISCUSSION OF THE PROGRAM IS EXPECTED IN THE SOVIET NATIONAL PARLIAMENT.

ADMIN

(ENDALL) 041200 WALL/PJ 05/0707Z JUL

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ROUTINE

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PAGE 01

NSC: OSTP SPAC

 <PREC> ROUTINE <CLAS> UNCLASSIFIED <OSRI> RUFHFR <DTG> 121359Z JUL 91
 FM AMEMBASSY PARIS
 TO RUEHC/SECSTATE WASHDC 0719
 INFO RHEHAAA/WHITE HOUSE
 RUEANAT/NASA HQRS
 RUCPCDC/USDOC WASHDC
 RUEBBA/DEPT OF TRANSPORTATION
 RUFJCX/AMCONSUL BORDEAUX 6687
 RUFJCX/AMCONSUL LYON 8326
 RUFHMI/AMCONSUL MARSEILLE 8782
 RUFJCX/AMCONSUL STRASBOURG 8683
 RUFHOL/AMEMBASSY BONN 7460
 RUEHBS/AMEMBASSY BRUSSELS 0836
 RUFHLD/AMEMBASSY LONDON 8437
 RUEHRO/AMEMBASSY ROME 8626
 RUEHKO/AMEMBASSY TOKYO 8600

<SUBJ> FRANCE LAUNCHES A RESEARCH PROGRAM ON
 ADVANCED HYPERSONIC PROPULSION
 UNCLAS SECTION 01 OF 02 PARIS 19200
 WHITE HOUSE FOR OSTP; BRUSSELS FOR USEC
 E.O. 12356: N/A
 TAGS: TSPA, TNGD, EIND, TSPL, KSCA, FR
 SUBJECT: FRANCE LAUNCHES A RESEARCH PROGRAM ON
 ADVANCED HYPERSONIC PROPULSION
 >BEGIN SUMMARY<

1. SUMMARY: ON JUNE 22, THE FRENCH GOVERNMENT
 ANNOUNCED THE LAUNCHING OF PREPHA, A RESEARCH PROGRAM
 ON ADVANCED HYPERSONIC PROPULSION. THIS FOUR-YEAR
 PROGRAM, CONDUCTED BY THE FRENCH NATIONAL OFFICE FOR
 AEROSPACE STUDIES AND RESEARCH (ONERA) AND FOUR FRENCH
 COMPANIES (AEROSPATIALE, DASSAULT-AVIATION, SEP AND
 SNECMA), WILL BE ALLOCATED A BUDGET OF FF 500 MILLION
 (USD 81.30 MILLION) FROM THE FRENCH GOVERNMENT AND THE
 AFORE-MENTIONED FIRMS. THE OBJECTIVE OF THE PROGRAM,
 WHICH WILL CONCENTRATE ON THEORETICAL STUDIES ON THE
 STATOREACTOR WITH SUPERSONIC PROPULSION (SUPER-STATO OR
 SCRAMJET), IS TO PREPARE FOR THE POST-ARIANE PERIOD AND
 TO DEMONSTRATE FRANCE'S POTENTIAL IN THIS AREA. ONCE
 THE PROGRAM HAS BEEN COMPLETED, ONERA PROPOSES TO
 DEVELOP AN EXPERIMENTAL VEHICLE WHICH WILL VALIDATE IN
 FLIGHT THE PRINCIPLE OF HYPERSONIC PROPULSION USING A
 SCRAMJET. A MODEL THEREOF WAS PRESENTED AT THE PARIS
 AIR SHOW IN JUNE. END SUMMARY.

>END SUMMARY<

2. BACKGROUND: IN 1989, FRENCH MINISTER OF RESEARCH
 AND TECHNOLOGY HUBERT CURIEN ASKED THE FRENCH NATIONAL
 OFFICE FOR AEROSPACE STUDIES AND RESEARCH (ONERA) TO
 REVIEW THE STATUS OF HYPERSONIC PROPULSION. TO THIS
 END, A TASK FORCE, CALLED "GIE HYPERSPACE", WAS
 CREATED, WHICH INCLUDED ONERA AND THE FRENCH COMPANIES
 AEROSPATIALE, DASSAULT-AVIATION, SEP AND SNECMA. IN
 MAY 1990, THIS GROUP SUBMITTED A REPORT CONTAINING
 CONCLUSIONS AND RECOMMENDATIONS CONCERNING STUDIES AND
 RESEARCH TO BE CONDUCTED IN THIS SECTOR. AT THIS
 POINT, THE DEFENSE MINISTRY GENERAL DIRECTORATE FOR
 ARMAMENT (DGA) AND THE NATIONAL CENTER FOR SPACE
 STUDIES (CNES) JOINED IN. ON THE BASIS OF THE REPORT,
 PRIME MINISTER EDITH CRESSON ANNOUNCED ON JUNE 22 THE
 LAUNCHING OF A RESEARCH PROGRAM ON ADVANCED HYPERSONIC
 PROPULSION, CHRISTENED PREPHA.

3. PREPHA, A FOUR-YEAR RESEARCH PROGRAM COMING UNDER
 THE AEGIS OF DGA, CNES AND THE MINISTRY FOR RESEARCH
 AND TECHNOLOGY, WILL BE ALLOCATED A BUDGET OF FF 500
 MILLION (USD 81.30 MILLION). THE FRENCH GOVERNMENT

WILL CONTRIBUTE FF 400 MILLION (USD 65 MILLION) TO THE
 PROGRAM. THE REMAINING PORTION WILL BE FINANCED BY THE
 AFOREMENTIONED FRENCH COMPANIES.

4. RESEARCH AND STUDIES WILL BE CONDUCTED BY THE TASK
 FORCE. THE ENGINEERING SCIENCE DIRECTORATE OF THE
 NATIONAL CENTER FOR SCIENTIFIC RESEARCH (CNRS) AND THE
 NATIONAL INSTITUTE FOR RESEARCH IN COMPUTER SCIENCE AND
 AUTOMATION (INRIA) ALSO WILL MAKE A MODEST CONTRIBUTION
 TO THE PROGRAM. THESE TWO ORGANIZATIONS AND THE TASK
 FORCE ARE LAUNCHING A RESEARCH PROGRAM ON SUPER-STATO
 COMBUSTION, CALLED PRCCS. IN REALITY, THIS PROGRAM,
 WHICH IS TO END IN OCTOBER, IS AN INTEGRAL PART OF
 PREPHA.

5. PREPHA WILL FOCUS ON THEORETICAL STUDIES ON THE
 STATOREACTOR WITH SUPERSONIC COMBUSTION, ALSO CALLED
 SUPER-STATO OR SCRAMJET, AND ON A FEW STUDIES ON
 VEHICLE TECHNOLOGIES. IN AN INTERVIEW IN THE DAILY LE
 FIGARO OF JULY 24, MINISTER OF RESEARCH CURIEN
 INDICATED THAT "TO DEFINE THE PRINCIPLE OF A PROPULSION
 SYSTEM SUCH AS THAT ONE, IS TO PREPARE FOR THE
 POST-ARIANE OR RATHER FOR THE POST-ROCKET PERIOD ...
 HOWEVER, ALTHOUGH SUCH A PROGRAM WILL NOT BE APPLICABLE
 AT THE INDUSTRIAL LEVEL UNTIL 2015, THERE IS A LARGE
 VARIETY OF POTENTIAL USES: PUTTING OBJECTS INTO ORBIT
 WITH A FULLY RECOVERABLE SYSTEM, ENSURING AIR
 TRANSPORTATION, OR MEETING THE SPECIFIC NEEDS OF THE
 MILITARY." CURIEN FURTHER STATED THAT EUROPEAN
 COOPERATION "IS POSSIBLE, AND EVEN ADVISABLE, BUT NOT
 UNCLAS SECTION 02 OF 02 PARIS 19200
 WHITE HOUSE FOR OSTP; BRUSSELS FOR USEC
 E.O. 12356: N/A

TAGS: TSPA, TNGD, EIND, TSPL, KSCA, FR
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 ADVANCED HYPERSONIC PROPULSION
 NECESSARILY IN THE FIRST PHASE. IT IS NECESSARY TO
 REMEMBER THAT THIS PROGRAM SPECIFICALLY AIMS AT
 ASSESSING --AND THEREFORE AT ALSO DEMONSTRATING-- THE
 NATIONAL POSSIBILITIES IN THE AREA OF HYPERSONIC
 PROPULSION."

6. ONERA IS ALREADY PREPARING FOR GOING BEYOND
 PREPHA'S THEORETICAL STUDIES. AFTER THE PREPHA PROGRAM
 HAS BEEN COMPLETED, IT PROPOSES TO DEVELOP AN
 EXPERIMENTAL VEHICLE WHICH WILL VALIDATE IN FLIGHT THE
 PRINCIPLE OF HYPERSONIC PROPULSION USING A SCRAMJET.
 THE MODEL THEREOF WAS PRESENTED AT THE PARIS AIR SHOW
 IN JUNE. THIS VEHICLE, CONSISTING OF AN AERODYNAMIC
 BODY EQUIPPED WITH AN INTEGRATED SCRAMJET, WILL BE 9
 METERS LONG (29.7 FEET), WILL WEIGH 2.5 METRIC TONS AND
 WILL CARRY 250 KILOGRAMS (550 POUNDS) OF INSTRUMENTS.
 ITS SPEED WILL EXCEED MACH 8. IT WILL BE BUILT WITH
 NORMAL MATERIALS. IF THE PROJECT IS APPROVED, THE
 FIRST TESTS WILL TAKE PLACE IN ABOUT TEN YEARS.
 CURLEY

<SECT>SECTION: 01 OF 02 <SSN> 9200 <STOR> 910712100350 MSG000300621830
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