

Curriculum Vitae:
Stephen A. Whitmore, PhD

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QUALIFICATIONS

My primary career emphasis has been flight test and flight research. For the past 15+ years I have worked in various aspects of NASA's "access-to-space" technology thrust. Working in the trans-atmospheric vehicle field has given me the opportunity to work on *both* spacecraft and aircraft -- sometimes *simultaneously*. Because of this duality, I feel comfortable "speaking the language" of both astronautics and aeronautics. This broad base provides a solid foundation that allows me to apply a wide variety of solution methods to engineering problems. I have recently accepted early retirement from NASA and have accepted an appointment as assistance professor of engineering at Utah State University.

PROFESSIONAL EDUCATION

- 1980 Bachelor of Science, Aerospace Engineering**
University of Illinois, Urbana-Champaign
 - Graduated *Cum Laude*

- 1983 Master of Science, Mechanics and Structures**
University of California, Los Angeles

- 1987 Professional Engineer Degree, Applied Dynamic Systems Control**
University of California, Los Angeles

- 1989 Doctor of Philosophy, Aerospace Engineering**
University of California, Los Angeles
 - Major: *Flight Dynamics and Control*
 - Minors: Applied Mathematics, Fluid Mechanics

PROFESSIONAL EMPLOYMENT

1976-1979 Student Intern, NASA Dryden Flight Research Center (DFRC), Edwards, CA

Co-operative education student alternating work and school on a semester basis(GS-03-05). Performed a variety of entry-level engineering duties including data analysis, laboratory calibrations, and writing test plans and reports.

1980-1983 Research Engineer, Flight Mechanics / Dynamics Branch, NASA DFRC, Edwards CA

Full time entry level engineering position (GS-07-11). Duties required performing as a member of a flight test team; experimental planning and analysis; and publication of test results. Key Member of DFRC team that developed Pilot Induced Oscillation (PIO) suppression filter for space shuttle Columbia. Filter enabled first 4 flights to be performed with out waiting for the development of new control laws. Developed smoothing algorithm (Kalman filter) to reconstruct the shuttle reentry trajectories from all available sources including inertial, aerodynamic, and meteorological sources. Reference trajectories used agency-wide as reference standard for analysis of all shuttle flight dynamics and aerodynamics data.

1983-1984 Full-Time Graduate Study Leave, NASA Fellowship, University of California, Los Angeles CA

NASA Fellowship enabled me to attend UCLA and complete the majority of my classroom field-work towards PhD. Program required me to return to NASA quarterly to review academic progress and refine thesis research thrusts.

1985-1994 Aerospace Research Engineer, Aerodynamics Branch, NASA Ames Research Center (ARC), Moffett Field CA

Mid-Level research engineering position (GS-12-13). Tasks included acting as principal investigator on flight, wind tunnel, and laboratory experiments. Primary emphasis was on the development of a novel flush air data system (FADS) for hypersonic vehicles. Developed a variety of low-order and higher-order hypersonic analysis codes to assist in the design and development of the FADS system. Member of NASA ARC *Basic Research Council*, 1990-1994.

1994-1996 Acting Chief, Fluid and Flight Mechanics Branch, NASA DFRC, Edwards CA

Supervisory engineering position (GS-13-14). Tasks included supervising 15 engineers / scientist and performing independent engineering research activities. Performed performance appraisals, planned work assignments for employees, and served as liaison to upper management. During this period I was responsible for founding the DFRC Experimental Fluids Laboratory (EFL), served as principal investigator on multiple flight experiments. Acted as member of three flight-readiness review teams.

1996-1999 Vehicle Aerodynamics Technical Group Lead, NASA DFRC, Edwards CA

Senior technical/supervisory position (GS-14-15). Served as key technical lead for all DFRC activities. Acted as center expert for agency wide review and planning teams. Conducted independent technical research. Served as DFRC representative to the American Institute of Aeronautics (AIAA) Aerodynamics measurement technology (AMT) committee. Served as member of agency wide hypersonic vehicle tiger team that led to the development of the X-43A vehicle.

1999 –2000 Chief Engineer, X-40a Orbital Maneuvering Vehicle, NASA DFRC, Edwards CA

Senior technical position (GS-15). As Chief Engineer I was responsible for planning, coordinating, and executing all flight test activities related to the X-40a. These duties included supervising NASA teams members from DFRC and Marshall Space Flight Center, and coordinating all activities with the prime contractor, Boeing Corporation, Seal beach CA. The X-40A vehicle concluded a successful series of flight tests was at the NASA Dryden Flight Research Center (Edwards AFB) in the spring of 2001.

2000 –2002 Michael J. Smith Space Systems Chair Professor, Naval Postgraduate School, Monterey CA

Senior technical position (GS-15). The Michael J. Smith Space Systems Chair Professor is an NASA-funded endowed academic chair in the Space Systems Academic Group at the Naval Postgraduate School (NPS) in Monterey, California. This position was created to honor the memory of astronaut CAPT Michael J. Smith, an alumnus of NPS. Appointment to the chair is competitive with candidates coming from a pool of highly qualified NASA managers, scientists, and engineers. Responsibilities included classroom instruction, serving on academic committees, and serving as academic advisor to students conducting thesis research. Classes instructed at NPS include *Orbital Mechanics and Astrodynamics, Introduction to Space Systems, Applied Mathematics, and Propulsion / Launch Systems*. For the launch systems class I developed a hypersonic air-breathing propulsion lecture module that is still taught as a part of the instructional matrix. Developed a web-based interactive system to archive the lectures and make them readily available for further student research. Lecture notes for the above-described courses may be found at <http://web.nps.navy.mil/~ssweb>.

2003 - 2004 USAF Test Pilot School, Edwards AFB CA

Instructor, Access-to-Space Flight Test Short Course

2002-2005 Lead Flight Mechanics / Aerodynamics X-37 Approach and Landing Test Vehicle (ALTV), NASA DFRC, Edwards CA

Senior technical position (GS-15). After the completion of my term at NPS, I returned to NASA DFRC to take a senior technical

position on the X-37 ALTV program. X-37 (ALTV) will be used for a series of atmospheric flight tests to evaluate subsonic flight characteristics, and validate guidance, navigation, and control algorithms for a candidate reusable orbital maneuvering vehicle. Current plans call for carrying the ALTV aloft on the right wing of a B-52 H-model bomber and releasing it at 42500 ft. MSL for a glide to an unpowered landing. My primary duty in the role of "lead aero" on the ALTV project is to insure a safe, clean separation of the X-37 from the B-52H. Duties include supervision of senior engineers with the primary emphasis on B-52H and range safety. I have also trained and been certified as the backup Launch Panel Operator (LPO) operator for the B-52h. The primary responsibility of this flight-position is to configure the X-37 systems in-flight for launch from the carrier aircraft. The X-37 ALTV is scheduled to begin a series of flight tests in September 2004.

2005- Assistant Professor of Engineering, Utah State University, Logan UT

MAJOR AWARDS AND HONORS

- 1984 NASA Headquarters Honor Award**
 - *Group Achievement Award*
 - "The Piloted Induced Oscillation (PIO) Suppression Filter for the Space Shuttle Columbia"
- 1990 NASA ARC Honor Award**
 - *Outstanding Scientist for Year 1989*
- 1991 Society of Automotive Engineers (SAE)**
 - *Excellence in Technical Presentation Award*
 - "Development of a High Angle-of-Attack Flush Air Data Sensing System"
- 1994 NASA DFRC Honor Award**
 - *Outstanding Scientist for Year 1993*
- 1996 NASA DFRC Honor Award**
 - *Outstanding Paper for Year 1996*
 - "Real Time Demonstration of a Flush Air Data Sensing System"
- 1997 NASA Headquarters Achievement Award**
 - *Exceptional Engineering Achievement Medal*
 - "Research and Development of a Real-Time Non-intrusive Air Data System for Hypersonic Flight Vehicles"
- 2000 American Institute of Aeronautics and Astronautics (AIAA)**
 - *Elected as Associate Fellow*
- 2004 Finalist NASA Mission Specialist Astronaut Class / 2004**

Multiple minor awards including Quality Step Increase (QSI), Space Acts, Tech Brief, Spotlight, and Center Group Achievement Awards.

PROFESSIONAL AFFILIATIONS

Associate Fellow, American Institute of Aeronautics and Astronautics
Member AIAA Aerodynamics Measurement Technology Committee
Advisor to the National Research Council
Member, Space Systems Academic Group, Naval Postgraduate School

MISCELLANEOUS SKILLS AND ASSETS

- US Citizen, Birthplace, Nelsonville OH
- United States Federal Government *Secret Level* Security Clearance
- Private Pilot License (FAA Cert. # 287543765-90892680)
- Active NASA Flight Status
 - Valid NASA/USAF Class III space-flight physical
 - Valid Class II altitude-chamber certification
- Certified Open Water Scuba Diver (PADI Cert. # 800642)
- U.S. Government Secret-Level Security Clearance
- Programming Languages / Computer Operating Systems
 - UNIX / LINUX
 - Window/NT/2000/XP Operating System
 - Apple MacIntosh Operating System, OS 9, OS 10
 - Fluent in Structured Programming Techniques in FORTRAN, "C", LABVIEW / Real-Time Support Environment
 - Fluent in HTML and web page design/internet publication
- Served as University Grant and SBIR Technical monitor
 - Thorough understanding of government procurement and grant procedures including Graduate Student Research Proposal (GSRP), Unsolicited Proposal (UP), Small Business Innovative Research (SBIR) (DDF), and National Research Council (NRC) grants
- Graduate of the Crosby Management Company's Quality Education Systems (QES) Management Program
 - Served As Crosby Quality Work Group Instructor
- Graduate of NASA Supervisory Education Program (SEP)
- Certified US Government Buying Agent, (under \$25000)

PUBLICATIONS AND PATENTS

- 30 Conference Papers
- 10 Peer Reviewed NASA Reports
- 9 Published Peer Reviewed Journal Papers
- 3 Book Chapters
- 8 NASA *Tech Briefs*
- 3 USA Patents

Peer Reviewed Journal Publications

1) Whitmore, Stephen A., Leondes, Cornelius, T., Formulation and Implementation of a Practical Algorithm for Non-Stationary Adaptive State Estimation, *International Journal of Control*, 1986, Vol. 44, no. 3, pp. 767-775

2) Whitmore, Stephen A. and Leondes, Cornelius T., Pneumatic Distortion Compensation for Aircraft Surface Pressure Sensing Devices, *AIAA Journal of Aircraft*, Volume 28, No. 12, December 1991, pp.

828-836.

3) Whitmore, Stephen A., Moes, Timothy R., and Larson, T. L., High Angle-of-Attack Flush Air Data Sensing System, *AIAA Journal of Aircraft*, Volume 29, No. 5, September-October 1992, pp. 915-919.

4) Whitmore, Stephen A., Davis, Roy J., and Fife, J. Michael, In-Flight Demonstration of a Real-Time Flush Air Data Sensing System, *AIAA Journal of Aircraft*, Volume 33, Number 5, September-October 1996, Pages 970-977.

5) Whitmore, Stephen A., Frequency Response of Pneumatic Tubing and Pressure Sensor Configurations in Slip-Flow Conditions, *AIAA Journal*, Vol. 36, No. 1, January 1998, pp. 1789-1791

6) T. J. Rohloff, S. A. Whitmore, I. Catton, "Air Data Sensing from Surface Pressure Measurements Using a Neural Network Method," *AIAA Journal*, Vol. 36, No. 11, November 1998, pp. 2094-2101.

7) T. J. Rohloff, S. A. Whitmore, I. Catton, "Fault-Tolerant Neural Network Algorithm for Flush Air Data Sensing", *AIAA Journal of Aircraft*, Volume 36, Number 3, March 1999, Pages 541-549.

8) Whitmore, Stephen A., and Moes, Timothy R., "Base-drag reduction experiments on the X-33 Linear Aerospike SR-71 Flight Program", *AIAA Journal of Spacecraft and Rockets*, *Volume 37, Number 3, May-June 2000*, pp. 297-303.

9) Whitmore, Stephen A., "Frequency Response of Pressure Sensor Configurations in Slip-Flow Conditions", *AIAA Journal of Spacecraft and Rockets*, *Volume 39, Number 2, March-April 2002*, pp. 219-226.

10) Whitmore, Stephen A., Naughton, Jonathan W., and Sprague, Stephanie, Blunt-Body Drag Reduction using Forebody Surface Roughness, *AIAA Journal of Spacecraft and Rockets*, *Volume 39, Number 4, September-October 2002*, pp. 596-604.

Peer Reviewed NASA Reports

1) Whitmore, Stephen A., and Nugent Jack R., Formulation of an off-nominal inlet flow model for the -15 F-100 turbofan engine propulsion System, NASA TM X11235, December 1976

2) Webb, Lanie D., Whitmore, Stephen A., Dom Andryich-Varda, Flight and Wind-Tunnel Comparisons of the Inlet Airframe Interaction of the F-15 Airplane, NASA TP 2374, November 1984.

3) Whitmore, Stephen A., Heeg, Jennifer, L., Larson, Terry J., Ehernburger, L. J., Hagen, F. W., and DeLeo, R. W., Adjustment of A Hemispherical Sensor for the Effects of Pneumatic Lag and Upwash at High Angles of Attack, NASA TM 88104, May 1987

4) Larson, Terry J., Whitmore, Stephen A., Ehernburger, L. J., Johnson, J. B., and Siemers, Paul M., II, Qualitative Evaluation of a Flush Air Data System at Transonic Speeds and High Angles of Attack, NASA TP 2716, April 1987

5) Whitmore, Stephen A., Experimental Characterization of the Effects of Pneumatic Tubing on Unsteady Pressure Measurements NASA TM 21315, February 1990

6) Whitmore, Stephen A., and Haering, Edward A., Jr., FORTRAN Program for the Analysis of Ground Based Range Tracking Data--Usage and Derivations, NASA TM 104201, December, 1992.

7) Whitmore, Stephen A., Haering, Edwards A., and Ehernberger, L. Jack, An Optimal Deconvolution Method for Reconstructing Pneumatically Distorted Near-Field Sonic Boom Pressure Measurements, NASA -TP (Published, exact title reference number classified as economic-sensitive and not available for public disbursement)

8) Cobleigh, Brent R., Whitmore, Stephen A., Haering, Edward, Borrer, J., and Roback, Eric, V., Flush Air Data Sensing (FADS) System Calibration Procedures and Results for Blunt Forebodies, NASA/TP-1999-209012, November 1999.

Publications in Conference Proceedings

1) Whitmore, Stephen A., Reconstruction of the Shuttle Reentry Air Data Parameters Using a Linearized Kalman Filter, AIAA Paper 83-2097, August 1983, *Presented at the 12th AIAA Atmospheric Flight Mechanics Conference, Gatlinburg, TN, Aug. 1983*

2) Whitmore, Stephen A., Larson, Terry J., and Ehernburger, L. J., Air Data Position-Error Calibration Using State Reconstruction Techniques, NASA TM 86029, August 1984, *Presented at the High Maneuverability Aircraft Technology Conference, Edwards AFB CA, September 1984*

3) Whitmore, Stephen A., Formulation and Implementation of A Non-Stationary Adaptive Estimation Algorithm with Applications to Air-Data Reconstruction, NASA TM 86727, *Presented at the IEEE*

National Aerospace and Electronics Conference, May 1985.

5) Whitmore, Stephen A., Formulation of a General Technique for Predicting Pneumatic Attenuation Errors in Airborne Pressure Sensing Devices, NASA TM 100430, *Presented at the 4th AIAA Flight Testing Conference, May 1988.*

6) Whitmore, Stephen A., Leondes, Cornelius T., Compensating for Pneumatic Distortion in Pressure Sensing Devices, NASA TM 101716, 1990, *Presented at the 25th AIAA Aerospace Sciences Conference-- Reno, NV January 1990*

7) Whitmore, Stephen A., Moes, Timothy, Larson, Terry J., Preliminary Results From A Subsonic High Angle-of-Attack Flush Air Data Sensing (HI-FADS) System: Design, Calibration, And Flight Test Evaluation, *Presented at the 25th AIAA Aerospace Sciences Conference-- Reno, NV, January 1990*

8) Moes, Timothy R., and Whitmore, Stephen A., A Preliminary Look at Techniques Used to Obtain Air Data from Flight at High Angles-of-Attack, NASA TM-101729, *Presented at the High Alpha Technology Conference, Langley Research Center, Hampton VA, Oct 1990.*

9) Moes, Timothy R., and Whitmore, Stephen A., Preliminary Results From an Inertial Air Data Enhancement Algorithm with Application to High Angle-of-Attack, NASA TM-101737, 1991, *Presented at the 26th AIAA Aerospace Sciences Conference-- Reno, NV January 1991*

10) Whitmore, Stephen A., and Moes, Timothy R., The Effects of Pressure Sensor Acoustics on Air Data Derived from a High-Angle-of-Attack Flush Air Data Sensing (HI-FADS) System, NASA TM 101736, *Presented at the 26th AIAA Aerospace Sciences Conference-- Reno, NV January 1991*

11) Whitmore, Stephen A., Development of a Pneumatic High Angle-of-Attack Air Data Sensing System, SAE Paper N0. 912142, September 1991, *Presented at the SAE Aero-Tech Conference in Long Beach CA, September 1991.*

12) Whitmore, Stephen A., and Moes, Timothy R., Failure Detection and Fault Tolerance Techniques for Pneumatic Flush Air Data Sensing (FADS) Systems, NASA TM 4335, *Presented at the 27th AIAA Aerospace Sciences Conference-- Reno, NV January 1992*

13) Whitmore, Stephen A., Hypersonic Pressure Sensing System Analysis and Design Techniques, AIAA Paper # 92-266, *Presented at AIAA National Aerospace Plane Symposium, Monterey, CA April 1992.*

14) Whitmore, Stephen A., Moes, Timothy R., Czerniejewski, Mark W., and Nichols, Douglas A., Application of a Flush Air Data Sensing System to a Wing Leading Edge, NASA TM 104267, February, 1993, *Presented at the 28th AIAA Aerospace Sciences Conference-- Reno, NV January 1993*

15) Moes, Timothy R., and Whitmore, Stephen A., and Jordan, Frank L., Flight and Wind Tunnel Calibrations of a Flush Air Data Sensor at High Angles of Attack and Sideslip and at Supersonic Mach Numbers, AIAA paper # 93-1017, February 1993. *Presented at the AIAA/AHS/ASEE Aerospace Design Conference-- Irvine, CA, February, 1993.*

16) Whitmore, Stephen A., Hypersonic Pressure Sensing System Analysis and Design Techniques: Measurement of Pressures in Rarefied Flow with Large Temperature Gradients, AIAA Paper, 93-78, *Presented at AIAA National Aerospace Plane Symposium, Monterey, CA April 1993*

17) Whitmore, Stephen A., and Moes, Timothy R., Feasibility and Uncertainty Analysis for a Flush Air Data System on a Hypersonic Flight Test Experiment, AIAA paper # 94-1930, June 1994. *Presented at the AIAA/ Applied Aero Conference-- Colorado Springs, CO, June, 1994.*

18) Whitmore, Stephen A., Davis, Roy A., and Fife, Michael J., Flight Demonstration of a real Time Flush Air Data Sensing (RT-FADS) System, AIAA Paper #94-3433, August 1995. *to be Presented at the AIAA/ Atmospheric Flight Mechanics Conference-- Baltimore, MD, August, 1995.*

19) Whitmore, Stephen A., Petersen, Brian, J., and Scott, David A., *A Dynamic Response Model for Pressure Sensors in Continuum and High Knudsen Number Flows with large Temperature Gradients*, AIAA Paper 96-0563, *Presented at the 34th AIAA Aerospace Sciences Conference-- Reno, NV January 1996*

20) Whitmore, Stephen A., Fife, Michael, J., and Brashear, Logan, A., Development of a Closed-loop Strap down Attitude System for a High Altitude Flight Experiment, AIAA Paper # 97- 0537, Paper accepted for presentation at the 35th AIAA Aerospace Sciences Conference-- Reno, NV January 1997.

21) Whitmore, Stephen A., Cobleigh, Brent R., and Haering, Edward A., Design and Calibration of the X-33 Flush Air Data Sensing (FADS) System, NASA/TM-1998-206540, Jan 1998. *Presented at the AIAA Aerospace Sciences Meeting and Exhibit, January 12-15, 1998, Reno, Nevada, AIAA-98-0201*

22) Whitmore, Stephen A., and Moes, Timothy R., A Base Drag Reduction Methods on the X-33

Linear Aerospike SR-71 Experiment (LASRE) Flight Program, AIAA 99-0277, January 1999. (Also available as NASA TM-1999-173015)

23) Whitmore, Stephen A., Hurtado, Marco O., and Rivera, Jose A., Rivera, and Jonathan W. Naughton, "A Real-Time Method for Estimating Viscous Forebody Drag Coefficients," AIAA-2000-0781, Jan. 2000 (also available as NASA TM-2000-209015).

24) Whitmore, Stephen A., Naughton, Jonathan W., and Sprague, Stephanie, Wind-Tunnel Investigations of Blunt-Body Drag Reduction using Forebody Surface Roughness, AIAA-2001-0252, January 2001. This paper was presented at the 39th Aerospace Sciences Meeting and Exhibit, 8–11 January 2001 in Reno, NV.

25) Li, Weixia, Decker, Robert K., Lew, John W., Naughton, Jonathan W., and Whitmore, Stephen A., Characteristics of Turbulent Boundary Layers on Rough Surfaces with Favorable Pressure Gradients, AIAA paper #2001-2915, June 2001. Presented at the 31st AIAA Fluid Dynamics Conference, June 11-14, 2001/Anaheim, CA

26) Decker, R.K. Naughton, J.W. , and Whitmore, S. A., Modification of Base Drag through Boundary-Layer Manipulation, AIAA-2002-0273, January 2002. This paper was presented at the 40th Aerospace Sciences Meeting and Exhibit, 14-17 January 2002 in Reno, NV.

27) Pienkowski, John P., Whitmore: Stephen A., and Spencer: Michael G., "Analysis of the Aerodynamic Orbital Transfer Capabilities of X-37 Space Maneuvering Vehicle (SMV), " AIAA paper # 2003-0908, January 2003. paper presented at the 41st Aerospace Sciences Conference, Reno, NV, Jan 6-9, 2003.

28) Whitmore, Stephen A., and Dunbar, Bonnie, J., "The Orbital Space Plane: Past, Present, and Future", AIAA Paper # AIAA-2003-2718, July 2003. Invited paper for AIAA/ICAS International Air and Space Symposium and Exposition: The Next 100 Years, The Future of Flight Testing for Access to Space: US Viewpoint, July 14-17 Dayton, Ohio.

29) Whitmore, Stephen A., Cobleigh Brent R. Jacobson Steven R., Jensen Steven C., and Hennings, "Development and Testing of a Drogue Parachute System for X-37 ALTV / B-52H Separation ", AIAA Paper # AIAA-2004-0873, Paper Presented at 42nd AIAA Aerospace Sciences Meeting and Exhibit, 5 - 8 Jan 2004, Reno, Nevada

University Publications

1) Whitmore, Stephen A., Formulation and Implementation of a Practical Algorithm for Non-Stationary Adaptive State Estimation with Applications to Air Mass Reference Measurements, Master's Degree Thesis, University of California, Los Angeles, University Microfilms Intl., December 1983

2) Whitmore, Stephen A., Leondes, Cornelius, T., Formulation and Verification of a Technique For Compensation of Pneumatic Attenuation Errors in Airborne Pressure Sensing Devices, Doctoral Dissertation, University of California, Los Angeles, University Microfilms Intl., June 1989

Book Chapters

1) Whitmore, Stephen A., Formulation of a Minimum Variance Deconvolution Technique for Compensation of Pneumatic Distortion in Pressure Sensing Devices, Advances in Control and Dynamic Systems, Volume XXXVI, Academic Press, San Diego, 1990

2) Whitmore, Stephen A., Moes, and Leondes, Cornelius T., Development of a Pneumatic High-Angle-of-Attack Flush Air Data Sensing System (HI-FADS), Control and Dynamic Systems: Integrated Technology Methods and Applications in Aerospace System Design, Volume 52, Academic Press, San Diego, 1992

3) Whitmore, Stephen A., and Weeks, Thomas J., "Measuring the Velocity and Altitude of Aircraft," Encyclopedia Americana, June 2002.

REFERENCES

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STATEMENT OF PROFESSIONAL INTERESTS

Please allow me to preface these paragraphs by an excerpt from Secretary of Defense Donald Rumsfeld's, 18 Oct 2002 Memo "National Security Space Management and Organization".

.. The Secretaries of the Military Departments shall . . . assure space education . . . at all levels to ensure the cadre of space-qualified professionals . . . have a direct understanding of space activities and how space capabilities and applications are integrated into military operations. In addition, the number of advanced technical degree programs offered to space professionals shall be increased. ...

So while it seems that the NASA space program and aeronautics research initiatives are clearly in fiscal decline; DoD efforts in this arena are bound to grow in the coming decades. The current dangerous state of the world demands this growth. From a DoD perspective, space-related capabilities help national leaders implement American foreign policy. Unfortunately, traditional reconnaissance satellites are both highly observable and fixed in their orbits. This property makes fixed-orbit satellites predictable and vulnerable to enemy weapons. The political, economic, and military value of space assets makes them attractive targets for entities hostile to US interests. As harmful as the loss of commercial satellites or damage to civil assets would be, an attack on intelligence and military satellites in time of crisis would be even more serious for the nation. One of the centerpiece hardware components required for deploying and defending essential DoD space assets is the development of a reusable space plane -- the "Space Maneuvering Vehicle (SMV)." The SMV is envisioned as a reusable vehicle carried to orbital by an expendable launch stack. Accomplishing DoD objectives requires that the SMV be capable of rapidly maneuvering to any point in low earth orbit (LEO) space in a strategically meaningful period of time. A key feature of the military SMV would be the ability to rapidly vary orbital parameters, making it difficult for hostile forces to predict the footprint of any onboard sensors, or weapons systems.

Unfortunately, this high orbital maneuverability comes at a high price. The required " V " to change orbital planes in low earth orbit is extremely large. While certain technology thrusts such as high-energy propellants, and medium-thrust electric propulsion systems offer some increase in on-orbit agility, the use of aerodynamic maneuvering (*aero-assist*) is by far the most energy effective means of accomplishing this objective. Clearly an *aero-assist* vehicle will be *part spacecraft, part aircraft*. Three critical research thrusts that could facilitate the deployment of an operational *aero-assist* SMV are 1) *High L/D Hypersonic Airframe Configurations*, 2) *Hypersonic Sharp Leading Edges and High Temperature Leading Edge Material*, and 3) *Precision Deep-Throttled Orbital Maneuvering Engines*. To date my research thrusts have concentrated on elements 1 and 2 above, and I anticipate that this interest would be expanded to include all three elements should I become a member of your department at USU. While "rocket science" is clearly my first love, my background in flight test has allowed me to develop a broad base of multi-disciplinary skills. These skills include parameter and system identification, non-linear estimation and Kalman-filtering, instrumentation system design, signal processing and digital filtering, geodetics, aircraft and space vehicle dynamics and simulation, computational and experimental aerodynamics, systems engineering, and program management. Because of my background in trans-atmospheric flight, and my connections within both NASA and the Department of Defense, I feel that I can help uniquely position your department to take advantage of the challenge issued by the Rumsfeld Commission. Hopefully my multi-disciplinary skill mix will be a good complement with your USU Space Dynamics Laboratory.