

Aerospace Systems Concepts and Analysis Competency  
Key Activities  
August 5, 2002

ASCAC Office

Wendell R. Ricks represented the Inter-center Systems Analysis Team (ISAT) at the Aerospace Technology Enterprise's Program Managers Off-site Workshop, July 16-17, 2002, in Cleveland, Ohio. Mr. Ricks led a discussion on the status and future directions of the systems analyses supporting Enterprise strategic planning. One of the actions resulting from the discussion was to setup a workshop under the leadership of Terry Hertz, Director of the Code R Research and Technology Division, for the Program Managers and ISAT to establish additional metrics and methods that would enable the analyses to capture the benefits of more of the Enterprise's technology investments. (Submitted by Wendell R. Ricks, 46733)

John B. Hall was presented the International Conference on Environmental Systems (ICES) Technical Excellence Award on July 17, 2002, at the 32nd ICES Conference. Mr. Hall was presented the award for his many significant contributions to previous ICES conferences, including serving as General Conference Chairman and Deputy, organizing 15 previous ICES sessions, serving on the ICES Steering Committee, and the author/co-author of 10 ICES papers. (Submitted by Cynthia C. Lee, 46533)

Spacecraft and Sensors Branch

Twelve civil servants and contractors in the Aerospace Systems Concepts and Analysis Competency (ASCAC) received a three-day graduate-level course in the use of Kane's method and the software AUTOLEV to carry out dynamic analysis for systems in which several bodies are fastened together with joints. The method and software can be applied by engineers in ASCAC to numerous technical problems, such as spacecraft with rotating solar arrays, dual-spin spacecraft, space stations, remote manipulator arms, a parachute with a payload, and an aircraft launching a rocket from under the wing. The course was taught by Dr. Thomas Kane, Professor Emeritus of the Mechanical Engineering Department of Stanford University. In addition to serving as an aid in learning dynamics, the software AUTOLEV allows symbol manipulation on the computer to derive equations of motion, and then automatically code them up in a set of subroutines in preparation for numerical solution. The software can be used as a calculator to work on any problem involving vectors, dyadics, matrices, algebra, differential equations, and linearizations. In preparation for the course, arrangements between the students, instructor, and the Employee & Organizational Development Branch were made by Carlos M. Roithmayr in the Spacecraft and Sensors Branch. (Submitted by Carlos M. Roithmayr, x46778)

Multidisciplinary Optimization Branch

Andrea O. Salas attended both the 2002 iSIGHT User Conference held on July 16-17, 2002, and the FIPER workshop held on July 18, 2002. Both meetings were hosted by Engineous Software. During the iSIGHT conference, an Engineous representative discussed the iSIGHT product and technology roadmap. iSIGHT 7.0 will include

enhancements to the approximation, design of experiments, quality engineering, and optimization methods and will provide improved parallel processing capability. Future product features will provide more support for collaborative group work and visual pre- and post-processing for computer aided engineering (CAE) models. The presenters at the conference included iSIGHT customers and university and vendor partners of Engineous Software. The iSIGHT customers giving presentations included Pratt & Whitney, Boeing, Lockheed Martin, Toshiba, Rolls Royce, United Technologies Research Center, ALCOA, General Electric, and General Motors. The iSIGHT meeting was directly followed by the FIPER (Federated Intelligent Product EnviRonment) workshop. The FIPER project is a joint effort funded by National Institute of Standards and Technology to develop a collaborative design system. The FIPER technology will be commercialized in licensed software products that will be brought to market by Engineous Software. The FIPER team includes manufacturing companies, universities, and vendor partners. The workshop included overviews and demonstrations of a product prototype and presentations from FIPER team members. These meetings were attended to gather information for a computational framework evaluation activity being conducted under the Advanced Engineering Environment Project. Attendance was supported by the Employee and Organizational Development Branch. (Submitted by Andrea O. Salas, x45790)

#### Systems Analysis Branch

Robert J. Mack was contacted by David Cavalery of Bigalow Aerospace in Las Vegas by phone on July 25, 2002. Mr. Cavalery spoke of a Tech Brief summary entitled "Sonic-Boom Tests of Model of a Supersonic Business Jet Plane," LAR-16277, and requested a copy of the source report. Unfortunately, the release of the report is delayed because of a controlled-distribution reference. This reference has been rewritten and reviewed in the Systems Analysis Branch, and it is now being edited, so that it can be released for general publication and, thus, be referenced in the report Mr. Cavalery is requesting. In the interim, Mr. Mack faxed a list of sonic-boom references to him, so that he can become acquainted with some of the background material. (Submitted Robert J. Mack, x45988)

Charles A. Willits of NASA Headquarters visited Mark D. Guynn on July 2, 2002, to obtain assistance in developing a three-dimensional graphical representation of an advanced aircraft concept that Mr. Willits is pursuing. Mr. Willits' concept is aimed at increasing aviation system capacity, providing improved passenger ambiance, and reducing manufacturing and operating costs. Using the Rapid Aircraft Modeler (RAM) program, Mr. Guynn converted sketches of the configuration into a three-dimensional model and provided a set of graphics to Mr. Willits, which will enable him to illustrate key features of the concept. (Submitted by Mark D. Guynn, x48053)

#### Vehicle Analysis Branch

Brett R. Starr provided a POST 3-DOF (Degree Of Freedom) executable and simulation file of a towed launch vehicle delivering approximately 8 to 10 klb to Low Earth Orbit (LEO) for Northrop Grumman Corporation's Ryan Aeronautical Center in San Diego, California, and their subcontractor Aeronautical Enterprises Incorporated. Northrop Grumman's towed launch concept is being proposed for the RASCAL Project that is

studying Reusable Launch Vehicles for placing small payloads in LEO. Their launch vehicle concept is very similar to Kelly Space and Technology's k2h concept proposed for STAS and analyzed in ISTP, thus, they are being provided with the POST executable and simulation file from the Kelly study. The towed launch concept uses both rocket and jet propulsion following tow release which necessitates a modification to POST's executable propellant consumed calculations to correctly book-keep rocket propellant used and jettison weight at booster separation. The data contained in the Kelly simulation file could not be sent to Northrop Grumman due to proprietary considerations. As a result, Mr. Starr estimated weights and geometry for a slightly smaller vehicle and developed both projected gradient and NPSOL based optimization simulation files as a guide for their trajectory analysts. John T. Aguirre of ViGYAN, Inc. is assisting in this effort. Northrop Grumman and Aeronautical Enterprises run POST on a PC platform. As a result, Mr. Aguirre is compiling the POST executable for the PC and checking simulation results against results generated on the SGI platform. Mr. Aguirre is also handling the approval, legal documentation and media distribution. (Submitted by Brett R. Starr, x42977).

Advanced Aircraft Branch

None

Computational Aerospace Sciences Team

None