

The Crew of Columbia

The seven STS-107 crew members. Seated in front: astronauts Rick D. Husband (left), mission commander; Kalpana Chawla, mission specialist; and William C. McCool, pilot. Standing are (from the left) astronauts David M. Brown, Laurel B. Clark, and Michael P. Anderson, all mission specialists; and Ilan Ramon, payload specialist representing the Israeli Space Agency.

Credits: NASA



IVHM System Modeling Environment Accelerates the IVHM System Engineering Process

News Release - NASA Ames Research Center

Developing the next generation of safer, more reliable, and less expensive launch vehicles requires a well-defined systems engineering process. As a system-wide technology, Integrated Vehicle Health Management (IVHM) will play a critical role in designing a robust vehicle system capable of predicting, detecting, isolating and recovering from identifiable failure modes.

As part of NASA's Space Launch Initiative (SLI), Northrop Grumman, DSI International and NASA Ames Research Center are developing a preferred systems engineering solution for IVHM design. ISME, the IVHM System Management Environment, creates a cooperative development environment to bring together a diverse group of users and their domain knowledge expertise. The success of ISME allows information reuse between reliability, testability, systems, and software engineering, yielding higher fidelity design assessments and trade studies in a more timely manner. The latest ISME Client/Server prototype was recently demonstrated at Marshall Space Flight Center.

"Entering information only once and then reusing it many times will enable repeated cost savings throughout the life of the program" said Bill Kahle of NASA.

System Reliability, Maintainability, and Supportability requirements are established as early as possible in the design process and tracked by ISME. Translators embedded within ISME facilitate the seamless reuse of data and allow the engineering disciplines to analyze and trade proposed system designs while the design is still fluid. The information stored in ISME can again be translated for reuse in higher order diagnostic models.

These model based and rule based reasoners such as Stanley II/Livingstone (developed by NASA Ames), BEAM (developed by NASA JPL) and Shine (developed by NASA JPL) then provide these models to the software engineers to integrate the algorithms with the IVHM run-time system. This is all facilitated and managed through ISME.

We are well into the next generation of vehicle health management and technologies such as ISME provides for safe, reliable and cost effective SLI operations.

Inside this Issue...

Embedded Diagnostics Demonstrator & IVHM Executive (EDDIE)	2
Data Alone Isn't Knowledge	3
Training Schedule	3
DSI Welcomes Mariam Razeghi	4
Call for Papers	4

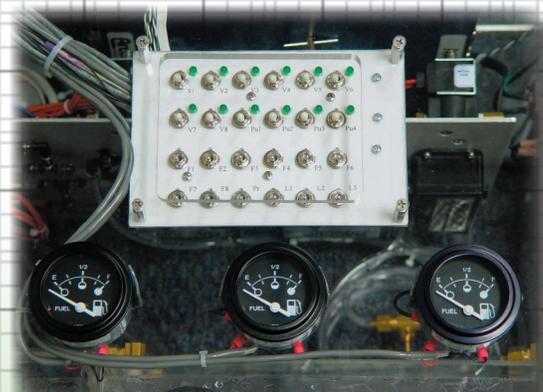
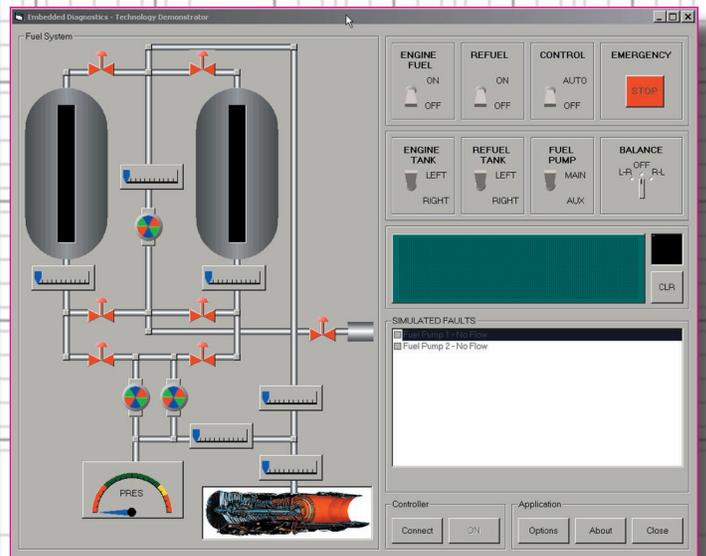
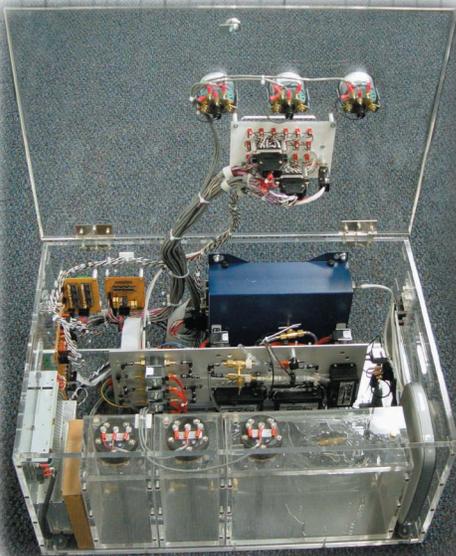
Are You Ready... for EDDIE?

DESCRIPTION: The Embedded Diagnostic Demonstrator and IVHM Executive (EDDIE) emulates the operational functionality and failure mechanisms of a real fuel system. The emulation includes valve and state switching, fuel level and flow rate monitoring, and component redundancy. EDDIE also has been designed with an embedded computer that performs real time diagnosis for the purpose of intelligent remediation and remote health monitoring.

People stared at Jim Lauffer and looked a bit perplexed when Jim expressed that EDDIE was locked in the box that was being wheeled across the exhibit floor in San Francisco last month. EDDIE was Jim's companion on the road trip to and from the Embedded Systems Conference, where EDDIE's unpredictable personality was showcased and quickly became the spectacle of the conference. Fortunately, he's not a high maintenance companion, although he does look a bit threatening to airline security personnel.

EDDIE rapidly became an outstanding role model for us at DSI. He is not timid about demonstrating all he can be, and then some. He's a quick study, always perceptive and alert, knows how to monitor his own health, manage his priorities, make decisions for himself based on his knowledge of his own changing environment, tell others when he may soon need their help, and even remedy his own behavior when he slips up or gets out of line.

We're proud of EDDIE and reward him by letting him out of his box from time to time. EDDIE is anxious to show you the special tricks that only he can do! Feel invited to make a date with EDDIE. Call Dave Tyler at 315-336-6579 or Jim Lauffer at 909-735-1611 for personal appearance and booking arrangements with EDDIE. EDDIE loves to travel and meet new and exciting professionals that can appreciate his special talents!



Data Alone Isn't Knowledge!

“Not everything that can be counted counts, and not everything that counts can be counted”

- Albert Einstein (1879-1955)

Since the Columbia Shuttle disaster in February, scientists and engineers have been gathering and analyzing data in an attempt to determine the primary cause of the tragic events.

The investigation, though considering a wide spectrum of causes, kept returning to a series of images caught on video during take-off. The video shows a piece of debris, determined to be foam, striking the left wing of the Shuttle as it took flight. The damage may have caused the over-heating of the left wing upon reentry and resulting explosion which killed all seven astronauts.

Using the video as a starting point, engineers at NASA collected data and began to construct a model to determine if the estimated 910g piece of foam that came off the shuttle's external fuel tank had in fact caused sufficient damage to the left wing.

A program called Crater matches the size of debris strikes with damage to protective heat tiles based on tests and observations from previous shuttle flights. The spreadsheet based model concluded that the debris did not cause sufficient damage to the wing to result in the disaster.

However, the results from the Crater model were apparently incorrect. The model apparently failed to see the significance of damage caused to the shuttle by the falling debris since it was based only on experiential and test data.

In hindsight, the space agency was initially led to the “obviously...wrong” conclusion that Columbia was not seriously

damaged by the incident, said Ret. Admiral Harold Gehman Jr, chairman of the Columbia Accident Investigation Board.

As the investigation continued, the conclusion has “changed”. The board now suspects the foam may have breached the Thermal Protection System, allowing super hot gases to penetrate Columbia's left wing on re-entry.

“The model has a lot of limitations. It's not really a computational model. It's just a bunch of data based on previous experience and some testing,” Mr. Gehman said.

“Neither NASA or [the board] are satisfied that this model is good enough for what we need it for.”

Mr. Gehman's comments illustrate that data alone is not adequate either for failure prediction (prognostics) or post failure analysis.

Analysis must be embedded within a system engineering process where the interrelationships and dependencies are well defined, related and “linked”. eXpress is such a tool that enables the engineer to create analytical models which capture all influences such as internal (design constrained) and external (environment, remote telemetry, human machine interfaces). These models are then used to synthesize the analysis to support allocations, predictions, diagnostics, and prognostics.

The system engineering and diagnostic development process combined with Integrated Vehicle Health Monitoring (IVHM) Systems are required for safety, mission success and low cost. Today, new NASA programs have looked to eXpress to be the tool to bring this technology and capability to next generation of Space Flight Vehicles.

“You can only find truth with logic if you have already found truth without it.”

- Gilbert Keith Chesterton (1874-1936)

Training Schedule

Course Number	Pre-requisite	Course Description	Dates	Location	POC
100		Concepts and Applications	12 May, 2003	Orange, CA	Denise Aguinaga , DSI
110		Basic Modeling	12-14 May, 2003	Orange, CA	Denise Aguinaga , DSI
120	110	Test Concepts and Development	15-16 May, 2003	Orange, CA	Denise Aguinaga , DSI
200	120	Diagnostic Development and Assessment	2-3 June, 2003	Orange, CA	Denise Aguinaga , DSI
210	200	FMECA Development and Assessment	4 June, 2003	Orange, CA	Denise Aguinaga , DSI
220	210	eXpress Interoperability	5 June, 2003	Orange, CA	Denise Aguinaga , DSI
100		Concepts and Applications	6 Aug, 2003	Orange, CA	Denise Aguinaga , DSI
110		Basic Modeling	6-8 Aug, 2003	Orange, CA	Denise Aguinaga , DSI
120	110	Test Concepts and Development	11-12 Aug, 2003	Orange, CA	Denise Aguinaga , DSI
200	120	Diagnostic Development and Assessment	13-14 Aug, 2003	Orange, CA	Denise Aguinaga , DSI
210	200	FMECA Development and Assessment	15 Aug, 2003	Orange, CA	Denise Aguinaga , DSI

Congratulations Mariam!



Another Angels Fan

DSI would like to include all our readers in on our congratulations to Mariam Razeghi for being awarded her U.S. citizenship last November! This special day was celebrated with an after lunch office party that included, of course, Apple Pie and an Angels Baseball cap!

Mariam has been greatly assisting us with her advanced software programming skills for much of our NASA related contracts. DSI is extremely proud of her and grateful to have her as an integral part of our DSI advanced technology scientists. DSI unanimously ranked her performances over the last year as "A - Number 1"; Just like the Anaheim Angels! Way to Go Mariam!



eXpress Users Group Call for Papers!

AutoTestCon 2003 is quickly approaching and DSI will once again be hosting the annual eXpress User's Group meeting in conjunction with the convention. AutoTestCon 2003 will be held in Anaheim, California on September 22-25. The eXpress User's Group will be held on Friday, Sept. 26. Time and Location TBA.

We would like to invite our users interested in presenting a paper at the eXpress User's Group to contact:

Denise Aguinaga at DSI (714) 637-9325)

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As the leading seller of Diagnostic Software, DSI understands the importance of quality service and support. To meet the needs of our customers, we offer a wide array of technical support and service programs developed to address the time-critical issues and stringent diagnostic requirements prevalent on many of today's programs. DSI is ready to help with specialized software development, diagnostic modeling and analysis, advanced mentoring, data management processes and a host of customizable support services to address specific customer needs.

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The eXpress™ Newsletter is published quarterly

by DSI International

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