



# INVIEW

Volume 1, Issue 2, October-December, 2005

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**  
Independent Verification and Validation Facility

## 2 The view from here...

Welcome to IVView

In the closing months of 2005, as an organization and as individuals we have been working hard to complete deadlines, continue ongoing initiatives and projects, begin new and exciting work while taking stock of a year that has been both challenging and rewarding. From my perspective, 2005 was a great year for



our IV&V program and Facility. We can take particular pride in the consistently growing credibility and respect we enjoy in our discipline and throughout our Agency.

When asked to evaluate the quality and the value of the IV&V services that we provide them, our customers have responded with the highest praise we've ever received. Our effort to provide value above and beyond expectations has helped us accomplish our primary mission objective to increase the safety and reliability of our Agency's safety and mission critical software—as is our mission. Further, we have enhanced the understanding and appreciation of our discipline—as is our vision.

We can look to our visitor lists and our travel itineraries throughout 2005 with great pride and excitement. Those who care about software assurance and mission critical safety issues came to us from JAXA, ESA, NSA, NRO, DHS, and many other international and national agencies to learn more about what we do and how we do it so well. Our researchers presented and published before a variety of audiences to provide a broad spectrum of applicable and inventive research which will serve NASA and the nation as we pursue the vision for space exploration.

As I look forward to 2006 I see it filled with opportunity. For me it means leaving my “perfect job” for a new opportunity as the Director of Aviation Programs at the Volpe National Transportation Systems Center in Cambridge, Massachusetts. It is difficult to leave this team of value-driven civil servants and contractors. I am proud that this team never fails to conduct itself with great integrity, determination and innovation, not to mention generosity and good humor. But I leave them with the confidence that their opportunities are limited only by their collective imagination. And I leave with the confidence that they will continue to dream and dare to explore.

Sincerely,



Nelson “Ned” Keeler

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Cover: New Horizons is a mission designed to fly by Pluto and its moon Charon and transmit images and data back to Earth. It will then continue on into the Kuiper Belt where it will fly by a number of Kuiper Belt Objects and return further data. The primary objectives are to characterize the global geology and morphology of Pluto and Charon, map the surface composition of Pluto and Charon, and characterize the neutral atmosphere of Pluto and its escape rate.

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Please submit news items and/or photos to Kathleen.M.Millson@nasa.gov; 304-367-8445. Ideas for stories and article submissions are welcome; all submissions are subject to editing. Next Submission Deadline: March 15, 2006

# Coming Attractions: New Horizons

## New Horizons Pluto-Kuiper Belt (PKB)

IV&V Project Manager: Peter Medley

IV&V Contractor: L-3 Titan

Pluto, the smallest planet, is the only planet not yet visited by a spacecraft. Discovered in 1930, it is sometimes likened to a large asteroid or comet, or even a double planet system, since its moon Charon is about half the diameter and mass of Pluto. Today it is understood that both Pluto and Charon were former inhabitants of the mysterious Kuiper Belt which resides outside the orbit of Neptune. Most of what we know about Pluto we have learned since the late 1970s from ground-based observations, the Infrared Astronomical Satellite (IRAS), and the Hubble Space Telescope. Many of the key questions about Pluto and its satellite Charon await the close-up observation of a space flight mission. Recent discoveries of numerous planetoids outside of Pluto's orbit, some with companion moons, adds to the excitement of the riches that the New Horizons may return.

The spacecraft will use a remote sensing package that includes imaging instruments and a radio science investigation, as well as spectroscopic and other experiments, to characterize the global geology and

morphology of Pluto and its moon Charon, map their surface composition, and characterize Pluto's neutral atmosphere and its escape rate.



The Air Force C-17 cargo plane carrying the New Horizons spacecraft awaits unloading at the Shuttle Landing Facility, Kennedy Space Center, Fla., early on Sept. 24. The spacecraft and associated equipment had been transported from Maryland, where the probe was built and tested for its scheduled January 2006 launch and mission to Pluto.

Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute

IV&V is being performed on selected software components as described in the New Horizons Critical Functions List (CFL) Report created by IV&V. All major software subsystems of the project are being analyzed, including Guidance & Control, Command & Data Handling, Autonomy, Instrumentation, and Ground Systems. Requirements and design analysis have been completed, with code analysis and preliminary test analysis underway. IV&V has provided feedback to the project on issues that have been identified by the analysis being performed as well as on issues raised during appropriate project reviews and walkthroughs. IV&V has also provided feedback to the project on risk management processes and associated impact.

For further information about New Horizons, visit <http://solarsystem.jpl.nasa.gov/missions/profile.cfm?Sort=Target&Target=Pluto&MCode=PKB>



At NASA Kennedy Space Center's Payload Hazardous Servicing Facility, workers secure the New Horizons spacecraft onto a spin table. New Horizons is headed for a January 2006 liftoff, sent on a journey to Pluto and its moon, Charon. It is expected to reach Pluto in July 2015. Image Credit: NASA/KSC

## 4 Planning and Scoping

*Christina Moats* As part of preparing to transition the IV&V contracting efforts from the existing four IV&V contracts to the new Multi-Award Contract (MAC), there was a clear need to move away from contractor-defined software criticality analyses to a new IV&V Program defined approach to be used by the government and all of the contractors. In November 2004, a government initiative to define a new software criticality analysis process began. In only three months, the new process was designed, documented, and out for review. This process, the Software Integrity Level Assessment Process (SILAP) had some characteristics similar to each of our IV&V contractor's criticality analysis processes but also had some new ideas intended to resolve problematic issues of the past. As part of the MAC contract implementation, the initial SILAP would now be performed by government personnel instead of contractors. The government team is known as the Planning and Scoping (P&S) Team. The P&S team uses the SILAP to perform criticality analysis and define the appropriate set of IV&V tasks for each Project. This task set is utilized in the Request for Offer and is used to define the expected work for each Task Order under the MAC contract. Members of the P&S team also support the Source Evaluation Board for each Task Order proposal set.

### **What we've done:**

The requirements levied upon the P&S team were: 1) to use a well defined process (the SILAP) to determine the criticality of and IV&V task set warranted for each Project's software components, 2) transition all current IV&V efforts from the existing OMNI contract by 10/31/05, and 3) transition all current IV&V effort from the existing BPA contracts by 12/31/05. Since March 1, 2005, the P&S team has maintained a very aggressive schedule and very strong personnel commitment, enabling the completion of criticality analysis and IV&V task identification using the SILAP for nine projects. (When contractors had been tasked to perform the initial criticality analysis under previous contracts, the effort ranged between three and four months for robotic projects and often longer for human-rated missions). During this same time, the P&S team supported eight Source Evaluation Boards, provided training/mentoring to peers and IV&V contractors on the SILAP, and contributed to other key IV&V Program initiatives.

### **Accomplishments and Impact:**

1. The expertise of the P&S team and the use of the SILAP have enabled at least a threefold increase in efficiency for the initial criticality analysis.
2. The SILAP can be utilized to assess software of any level of detail (system, subsystem, CSCI, CSC, etc) and requires very little input from the Project; instead it relies heavily on Project documentation and the occasional Project response when information is missing, unclear, or contradictory.
3. The SILAP requires strong, detailed, technical rationale for each score for each evaluation criteria, providing a very clear means of communicating results both to the Projects supported by IV&V and to the IV&V contractors. As a result, more constructive conversations occur.
4. IV&V tasks can no longer be selected based on "engineering instinct or experience" but now are selected based upon a set of underlying scores for each evaluation criteria. This methodical approach provides consistency in IV&V task selection for all IV&V efforts across the IV&V Program.



(From left to right): Christina Moats, Ken Costello, Melissa Northey, Marcus Fisher, Tom Macaulay, Frank Huy, and Markland Benson.

Using one process for criticality analysis and IV&V task selection across the whole IV&V Program resolves the differences between contractor-defined approaches of the past (some of which were proprietary). With both the government and IV&V contractors using the SILAP, there is now a shared vested interest in ensuring the continued accuracy, appropriateness, and quality of the results.

## IV&V Board of Directors

*Wayne Frazier* The IV&V Board of Directors (IBD) is chartered to (1) advise the Chief Office of Safety and Mission Assurance on the funding for the IV&V Facility service activities, and (2) review IV&V performance on support to programs. The Chair is the Chief Mission Assurance Officer and voting members are the Chief Engineer, the Chief Information Officer, and the Associate Administrators for the Mission Directorates (Aeronautics Research Mission Directorate, Science Mission Directorate, Space Operations Mission Directorate, and Exploration Mission Directorate), The Goddard Space Flight Center Director, and the Director, IV&V Facility.



The IBD met twice this year due to the uncertainties in the final prioritization of the IV&V projects for the FY06 and FY07 budgets. The first meeting was on August 29<sup>th</sup> at HQ to review the preliminary IV&V project prioritization for FY06 and FY07 and assign actions to improve Directorates' prioritization, and the second meeting was on November 21<sup>st</sup> at HQ to review action items on project risk matrixes, lessons learned, IV&V metrics, and finalize the IV&V project prioritization.

The IBD agreed to fund IV&V on LRO, MSL, Glory, IBEX, and GPM in FY06. The IBD also agreed to fund IV&V on CEV/CLV, Lunar Lander, and SIM in FY07. The IBD expressed a consensus at the August 29<sup>th</sup> meeting that once a project is approved for funding, the project will continue to receive funding to project completion or cancellation, consistent with project schedules and slips. This was a major decision, in that it means with expected new starts in FY07 involving mostly the ESMD programs, along with the continuing "run outs" of the projects approved in FY06 and years prior, there is not enough budget to support the total FY07 IV&V program. The IBD discussed this at length, but in the end they decided to take a risk based approach and approve start-up funding for all high priority projects in FY06 and FY07. If in FY07, the actual costs from the FY06 run outs plus the identified FY07 new starts holds as predicted and results in a FY07 budget shortfall, the IBD will either advocate for more IV&V funding through a service pool approach, more IV&V funding via the existing G&A account, or request specific projects to fund the remaining IV&V work out of program funds. In reality, given projects' slips in schedules, the potential reduction in identified IV&V work on existing mature programs (such as Shuttle), and more firm cost estimates as time passes, the IBD felt that this was a safe risk to take. The IV&V facility also agreed to hold less "carryover" at the end of the year to help soften the potential impact of the projected FY07 shortfall.

The IBD also discussed IV&V Return on Investment

metrics, the status of the Chief Engineer's IV&V lessons learned request, the need to better define an out year budget "wedge" for SMD IV&V project estimates, and assigned actions for the next IBD on common quality metrics, a test of the software risk rating matrix, and to determine a more defined role for IV&V in project prioritization. The next IBD will be scheduled for the early summer of FY06 to review updated budget predictions, and to review action items status.

## IEEE Working Group

*Ken Costello* The IV&V Facility hosted the recent quarterly meeting of the IEEE 1012 Software Verification and Validation Standard Working Group on November 2-4, 2005. The Working Group consists of a cross-cut of the verification and validation community with representatives from the health industry, the nuclear industry, the defense industry and the space industry from both commercial and governmental organizations and academia along with international participation. The quarterly meeting is a part of an on-going series of meetings intended to update and expand the standard.



The current version of the IEEE 1012 standard is one of the mostly widely used standards for software verification and validation throughout the software industry. However, it has been recognized here at NASA and throughout the systems engineering community that the development of software can not be seen as a stand-alone effort, but rather as a critical part, along with the hardware and other factors, of the overall system. Building on this understanding, the current plan for the 1012 standard is to expand its breadth to cover not only verification and validation of software but verification and validation of the entire system development (i.e., hardware, human factors, etc). This is an ambitious plan and will require input not only from the software community but also from the hardware community and the systems development community.

At the quarterly meeting held at the IV&V Facility, the Working Group Chairman, Dr. Roger Fuji, gave a presentation on "State of the Standard" for the entire IV&V Facility explaining the plan that the group has developed for creating this system level verification and validation standard. The goal is to have the standard completed within the next 18-24 months. During this meeting the Chief Engineer for the IV&V Program, Kenneth Costello, was elected the Vice-Chairman of the Working Group. The next meeting of the IEEE 1012 Working Group will be in February in Orlando, Florida.

## 6 IV&V of Neural Nets

*Markland Benson* Computer scientists and engineers strive to make computers behave in ways that are more useful with less user intervention. Over the years computers have evolved from punch card interfaces to command lines to graphical user interfaces to make user accessibility easier. In the same way, computer behaviors have been improved so that misplacement of a comma, for example, does not cause hours or days of downtime on a shared computer system. All such improvements have hinged on the ability of the designer to anticipate user needs and problems that might occur and to create computer responses that prevent or minimize undesirable behavior. As computer systems and the problems solved by computer systems become more and more complex, designers are challenged to anticipate every set of events that must be accounted for in a given computer application.

Dealing with complexity under changing circumstances is a constant pastime of human beings. Humans have an ability to reason that is unique and far from completely understood. Artificial intelligence is a field that attempts to make computers problem solve more like humans. One area of study within artificial intelligence is that of artificial neural networks (ANNs). ANNs are computer software or hardware that attempt to model the inner workings of the human brain and consist of neurons and synapses, which are connections between neurons. Different ANN designs provide different interpretations of how to create and remove neurons and synapses as well as the relative impact that these entities have on the output solution. In general, an ANN receives an input, transforms the input as it passes through the layers of neurons and synapses, and outputs the result.

An ANN requires some amount of initial training, where for each input provided a human lets the ANN know whether the output emitted is correct or incorrect. The ANN adjusts its internal structure based on the input and feedback to yield better answers in the future. The idea is that, given sufficient

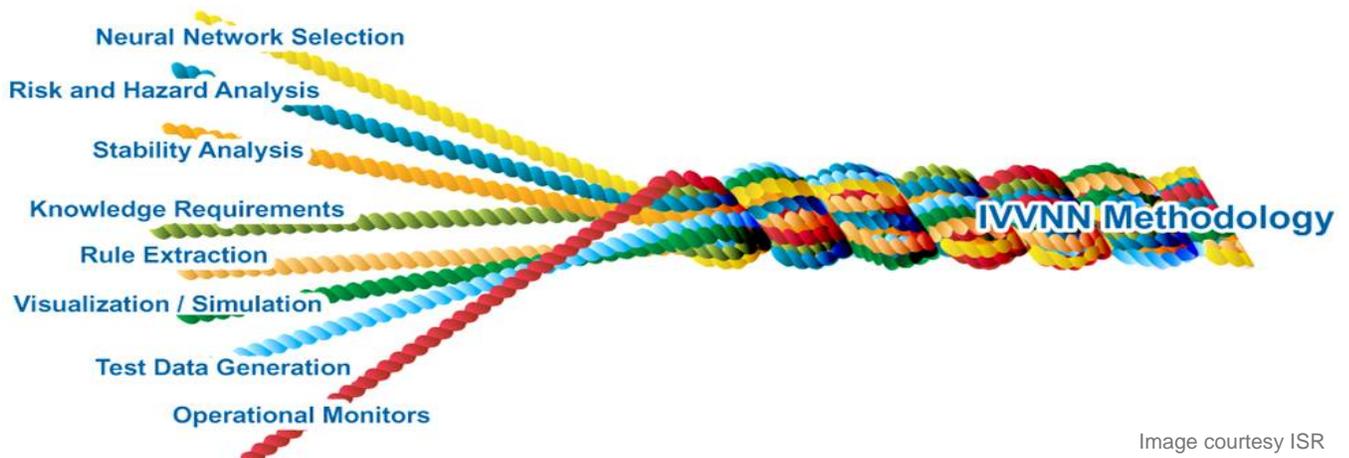


exposure to training data and feedback, the ANN will be able to provide a correct output for any new input that was not used for training. After training, an ANN can be forced to stop adjusting its internal structure. It then becomes somewhat more like traditional software.

Alternatively, it can be allowed to continue to adjust itself without human feedback to perform a kind of self improvement based on the data it receives.

ANNs are attractive for systems where detailed requirements are not well known or solutions are very complex. Spacecraft autonomy falls into this problem domain. As spacecraft work on more complex scientific tasks or fly farther from Earth where round trip communications time is prohibitive, autonomous systems like ANNs are very desirable. Developers can select an ANN and provide it a set of training data and human feedback rather than codify the results of every conceivable scenario. Safety is enhanced when the spacecraft can react successfully to unexpected situations without waiting for ground commands. Science opportunities are enhanced when the spacecraft can determine optimal pointing and filtering as data is collected rather than after the fact.

Traditionally, software assurance personnel rely on analysis of the source code of software coupled with test execution of the software to determine nonconformance to requirements. Source code is the mechanism used to implement requirements and thus its examination provides an objective statement of quality. A failed test can point a developer to a defect in a particular portion of source code. It is not possible to look at the source code or circuit design



# IV&V of Neural Nets (continued)

of an ANN and determine what output will be produced for a given input. The structure and arrangement of the neurons and synapses determine how an input is transformed to an output. Testing is still a valid technique but does not point the developer to any particular defect source.

The Development of Methodologies for IV&V Neural Networks initiative (called IVVNN) was initiated at the IV&V Facility in 2002 to address the need to provide assurance that ANNs for a given mission will not jeopardize the mission but will instead meet mission requirements. This initiative started at the ground level, with the contractor, the Institute for Scientific Research (ISR) with help from West Virginia University (WVU), researching fundamental ideas of ANNs to understand their inner workings and to see how the current state of practice of IV&V applied. This work was followed up by selecting the best known techniques for assuring ANNs and developing some new techniques where holes existed. These techniques were refined and meshed into the form of a guidance document that maps to the IEEE Std. 1012-1998, from which the IV&V Facility has tailored its tasking definitions. The result is a set of background knowledge related to ANNs (and to some degree, autonomous systems in general) coupled with techniques for software assurance practitioners to use to determine if a given ANN implementation meets its requirements.

The methodology developed by IVVNN was tested by ISR on the F-15 Intelligent Flight Control System (IFCS) project from Dryden Flight Research Center (DFRC). IFCS was an experiment using ANNs as part of the F-15 control system to improve aircraft safety by compensating for failures in the aircraft's control surfaces. IFCS used two different ANN designs in two generations of development, permitting ISR to validate the IVVNN methodology on both designs. After the initial IVVNN guidance was developed and tested with

the IFCS, feedback was sought from the IV&V Facility, WVU, DFRC, Ames Research Center, and the Air Force Research Lab. Feedback was incorporated and further refinements made to the guidance.

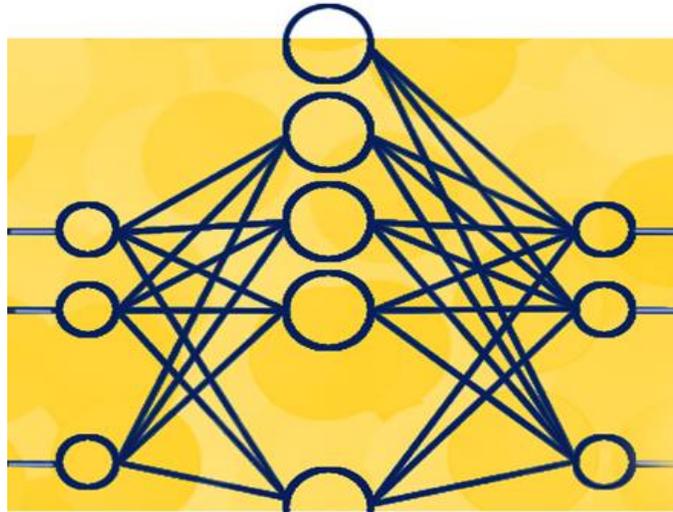


Image courtesy ISR

The detailed methodology was published in book form. The IEEE Std. 1012-1998 mapped guidance is in the process of publication. Online training materials were developed based on the IVVNN research to provide an introduction to the concepts needed to provide assurance of ANNs. This material is available now and is being transitioned to NASA's online learning system. Development of tools in support of this methodology is a desire for the future to streamline the assurance of ANNs.

IVVNN paved the way for more confident use of ANNs in safety critical systems in NASA. The methodology and guidance are not limited to use by the IV&V Facility but are applicable to assurance personnel throughout NASA and anywhere else ANNs are used.

## New Year, New Lead

Donna Ozburn A new year brings new leadership to IV&V's pillar of Research. Marcus Fisher assumed the role of Research Lead on January 1st. Marcus has been transitioning

to this position over the past several months while previous Lead, Ken McGill, prepared to begin providing IV&V services to the CEV. Marcus took on his responsibilities by initiating an off-site meeting with research team members to map the progress and direction of IV&V research initiatives to the IV&V Facility's implementation plan. Marcus began his career at IV&V as a co-op in the research group in 1998. Since that time he has served as project manager for the International Space Station, AURA, and several other IV&V projects. He also served as a team member in the Planning and Scoping group, performing criticality analysis and defining the appropriate set of IV&V tasks for each project.



Marcus is an instructor in Verification and Validation methods at West Virginia University, and is authoring a textbook on the subject. Marcus is a 2004 recipient of NASA's Space Flight Awareness Award.

### How's the Weather?

**Todd Ensign** If you have traveled passed our Facility in recent days you have probably noticed the three story rocket in our front lawn, but did you also catch the new automated weather station? As a component of the teacher outreach performed by the Educator Resource Center (ERC), the West Virginia Office of Climatology at West Virginia State University has donated a Davis Automated weather station, the DataLink computer connection, and WeatherLink data logging software (a \$600+ value). Dr. Tina Cartwright, the state climatologist (pictured above, right) and Steven Fleege (pictured above, left) have been working with



the ERC for two summers facilitating teacher workshops on NASA's GLOBE Program. They have presented topics at the ERC including methods for collecting observations of clouds, temperature, precipitation, relative humidity, barometric pressure, and the prediction of weather based on these data. The ERC uses the Davis weather station not only for demonstrations to teachers on installation and use an automated station, but the collected data is also included in learning activities developed for teachers and their students. In the near future, the ERC hopes to have the collected data continuously posted to a website for educational purposes, and so you can check the weather before you head into work.

### The ERC has a GIS Lab and a new Partnership!

Geographic Information Systems (GIS) is a technology that is used to visualize and analyze data from a geographic perspective. Using GIS, you can link information with locations as layers of a map to gain a better understanding of how they interrelate. It is similar to using transparencies, for example, where you may put a topographic map of West Virginia on the bottom and overlay a population layer to determine which areas are most likely to be affected by a flood. Through a generous donation from ESRI, the ERC is now running ArcView 9 on all lab machines for use in teacher workshops.

One way to use GIS is the analysis of NASA satellite imagery which is exactly what about 10 higher education faculty did at our first GIS workshop on Nov. 4 presented by the director of West Virginia View, Dr. Rick Landenberger of WVU's Geography department. WV View ([www.wvview.org](http://www.wvview.org)) is a



USGS funded program that collects, disseminates, and educates the public on remotely sensed imagery. While participating in an ERC workshop on the GLOBE program where teachers utilized Landsat imagery to measure types and changes in land use, Dr. Landenberger (pictured above, standing on left) realized that the missions of WV View and the ERC overlap. So, on October 31, 2005, the ERC under the guidance of Principal Investigator Dr. Deb Hemler of Fairmont State University signed a memorandum of Understanding establishing a formal partnership by which the ERC will continue to provide high-quality teacher professional development opportunities and WV View will support those activities by providing imagery and training materials, and will collaborate on future workshops.

### New GPS Units for GLOBE Teachers

Dr. Rico Gazal (pictured right) is an instructor of forestry and Geographic Information Systems at Glenville State College and a Co-Principal Investigator on a National Science Foundation and NASA research project studying the effects of urbanization on budburst. He has traveled to seven countries training teachers and students in the process of measuring budburst and connecting the protocols to local educational curriculum. In November, the Educator Resource Center partnered with Glenville State College to deliver a Global Positioning System session as part of a multi-day teacher workshop on NASA's GLOBE Program. The workshop was funded by a grant from the WV View Program and included teachers from across the state. Through the generosity of Glenville State College and WV View, five surplus Garmin GPS units were purchased for the workshop and donated to the ERC for use by GLOBE certified teachers.



## Outreach Means Reaching Out

*Jerry Sims* Images of the devastation that resulted from Hurricane Katrina in August were enough to inspire all of us to want to help out. The immediacy of need and the overwhelming destruction of lives and property motivate us to feel the need to assist in a manner that is more personal than just writing a check. I really felt an obligation to help out in any way that I could after hearing first hand from my cousin in New Orleans how his house had been destroyed. Driven by this sense of obligation, I volunteered to spend a month working for the Federal Emergency Management Agency (FEMA) this past October and November. On October 14, I left my home in West Virginia and traveled to the airport in Pittsburgh with a one way ticket to Atlanta and no idea of what would happen when I arrived. What followed was a combination of “hurry up and wait” and what seemed like an episode of TV’s “The Amazing Race”.

I checked in at the in-processing site the next morning and spent the next 5 days filling out paperwork, having medical check ups and shots, and receiving FEMA Community Relations and Individual Assistance Training. By this time, Hurricane Wilma was an extremely strong Category IV hurricane that was wreaking havoc on the Yucatan Peninsula with a projected path towards south central Florida. So, on Thursday, October 20, our training group (approximately 150 people from various Federal agencies) was given two hours notice to find our way to the Joint Field Office (JFO) in Orlando, Florida. For the next several days, we received further training as we waited for the storm to hit. On Monday, October 24, Wilma made her way across the state as a Category 2/3 storm. During the storm, I was assigned to a team leader with a group of 30 and told to make my way to Lee/Collier county (initially assessed to be one of the hardest hit areas of the state) area as soon as the storm was past. For the first several days, we assisted at Points of Distribution (PODs) in Ft. Myers where we helped the National Guard distribute water, ice, and food to residents affected by the storm.

After a couple of days, I was pulled from this duty and assigned my own team of 15 people with the responsibility of canvassing hard hit neighborhoods in the Ft. Myers and Naples areas and informing victims of where and how FEMA and other aid agencies might be able to provide them necessary relief.



On November 1, I was contacted by the regional manager and given a new list of 50 personnel that I was to organize, contact, mobilize, and have back in Orlando by 10 the next morning. I organized this group into four teams, and we reported back to the JFO to receive further training on running FEMA Disaster Recovery Centers (DRCs). The next morning, we were to be in Ft. Lauderdale, ready to open up four DRCs that had already been advertised in the local papers. The next several days redefined the term “management by reaction” for me. It took three days to get the necessary resources to actually open the sites and begin taking applicants for FEMA registration. I coordinated logistics, personnel, state and local agencies, FEMA contractors, law enforcement, and representatives from other aid agencies (American Red Cross, Salvation Army, Job Corps, et al) to set up Disaster Recovery Centers in areas that had been hit very hard by the storm. Through the dedicated work of the people working these DRC’s, we were able to help 1500 to 2000 people a day.

I returned to West Virginia on November 10, simultaneously exhausted, frustrated, enriched, and educated by this experience. It would be nice to say that I made a difference but I don’t think anyone there was able to help anyone as much as they might have liked. I would strongly recommend that anyone who wishes to help victims of a natural disaster do so by donating time or money to a relief agency such as the Salvation Army, the American Red Cross, or Habitat for Humanity. From what I witnessed, these agencies were consistently able to provide the best and most immediate aid to people in need. I appreciated the hard work, long hours, emotional investment, and patience of all the people from other Federal agencies who worked with me during my time with FEMA. Additionally, I would like to thank our Facility Director, Ned Keeler, my supervisor and Deputy Director Bill Jackson, and Shirley Simmons for providing their support. Without them, my participation couldn’t have happened.



# 10 Outreach Means Enjoying our Neighborhood

*Aaron Wilson* In early October, Aaron Wilson and Van Casdorff coordinated the first ever NASA IV&V Facility softball team to play in the local Co-Ed Corporate Softball Tournament and pig roast know as Hogwars. A total of eighteen NASA IV&V Facility employees joined the team to strut their stuff on the field.

On October 8, 2005, a cold and drizzly day the NASA IV&V Facility Softball team stepped onto the muddy field with an unbelievable level of morale. At the first sight of the field and playing conditions, most would have run home, but Ken Vorndran dove head first in the mud during warm-ups and showed us all that a little mud and cold weather was not about to stop this game.



With only one practice under our belts, we took on the well seasoned Mylan Pharmaceuticals softball team. Simply put, they handed it to us. However, that loss did not bring us down, for we knew that one of the most important games was about to take place, NASA IV&V versus West Virginia High Tech Consortium. The first match-up that seemed to have established what will be a long rivalry. The Director of the NASA IV&V Facility, Nelson "Ned" Keeler, showed that he was not afraid to get his boots muddy and umpired this historic game.

Some felt Ned would umpire with a bias, but there was no disputing the talent of the NASA team as we dominated the field and took our first victory against our new rivals. This win placed us in the 4<sup>th</sup> seed in the tournament bracket against Augusta Systems. After another seven innings of dominating the field, we claimed another victory and moved to the semi-finals where we would play, once again, the most dominate and seasoned team in the tournament, the dreaded Mylan Pharmaceuticals. This time was different; we

came out swinging to a 5-3 lead after three innings. We only had a few minutes left in the game and it was Mylan's last bat. All we had to do was stop them one more inning and we would be on to the championship. Then, one of the men hit a ball over the fence with two people on to win the game. Even though the Hogwars rules stated that all men that hit over the fence only get a single, Mylan decided to change the rules and claimed victory (I'm still a little bitter).

Congratulation goes out to all of the NASA IV&V Facility softball team members. We all look forward to next year!



Above: IV&V Project Manager Ken Vorndran who took the first dive in the mud! Left: IV&V Director Ned Keeler calls the plays fair and foul from behind the plate.



(Left to Right) Top row: Markland Benson, David Sheldon, Keith Lesch, Aaron Wilson, Thomas (Robbie) Robinson, Phillip Merritt, Van Casdorff, Judi Connelly. Bottom Row: Ken Vorndran, Natalie Alvaro, Kaci Reynolds, Danielle Lesch.

*David Sheldon* Physical security is something that many of us take for granted. Jeremy Titus and the Team of eleven guards keep us safe by assuring the security and integrity of the IV&V Facility and property. Our security staff are on constant watch 24 x 7 providing a safe environment to allow us to do our work without worry. During our Facility safety campaign in December, Jeremy shared with us how the security force is our first response for all medical emergencies. He reviewed basic first aid and CPR and explained the use of one of the latest tools that is available to save lives, the automated external defibrillator. An automated external defibrillator (AED) is now available for immediate use in case of sudden cardiac arrest. Located at the 2<sup>nd</sup> floor security desk, the (AED) is checked daily and ready for use if needed. Do your part, display your badge at all times, report security concerns and tell the security staff thanks for a job well done. They take care of the facility, while you take care of customers.



etc.). We currently have separate systems that house all of this data. The goal is to consolidate this Information to one area so that multiple instances of this information can be managed effectively, archived when needed and incorporate some process flow within the technology to notify process owners when data is created, modified, archived.

Safety is our #1 value. In December we held our annual safety stand-down day. We actually had two ½ day events to allow for more participation and flexibility. Over 21 people signed up and opened their offices up for an ergonomics evaluation. The goals of our Ergonomics training was to provide more effectively for safety-Injury/illness prevention; the comfort- of the individual; performance-increased productivity; and to ensure that all office areas are properly equipped. The Safety Campaign was a great success.



The plant operations and maintenance services provided by our Crothall team does an outstanding job supporting the Facility,

grounds and equipment. Providing an environment that is safe and comfortable, it allows us to concentrate on our customers. Technicians James Grippin and Joe Irons ensure that our investment is protected by performing preventive and corrective maintenance on the equipment that we all rely on. Our building and grounds are sizable assets on our balance sheet; therefore, the O&M team is always seeking new and creative solutions to lower operational costs and be more efficient. Some examples are lighting upgrade to a more environmentally friendly energy efficient type; photo-cells on exterior lighting; automatic lighting controls for the rooms which are not occupied on a continuous basis; and, variable speed drives on our equipment for energy efficiency.

Our Adnet team addresses the challenge of Information Architecture. Information Architecture is made up of several components; file storage, e-mail storage, database storage, IV&V Tools and associated storage (artifacts, source code, data,

## Landing a Rocket: The Gallery



# The Cube

...where you'll find our colleagues



## Scholarly Pursuits

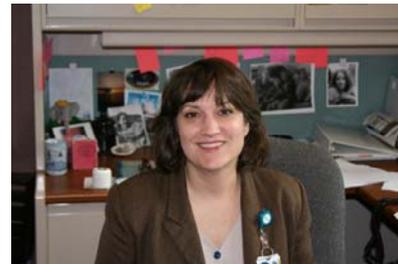
The Part-Time Graduate Study program enables a limited number of employees to pursue advanced academic study relevant to the Facilities needs and to enhance their ability to make significant contributions to the Goddard Space Flight Center and the IV&V Facility. To qualify for the PTGSP, supervisors of the individuals must identify the long-range benefits to the IV&V Facility and endorse the proposed plan of study as appropriate for this purpose. Employees selected may be released, with supervisory approval, for a maximum of 16 hours per week from scheduled work to pursue these studies. Although the PTGSP does not promise promotion or entry into a new career field, it does provide the opportunity for employees to further develop and expand their career prospects. The IV&V Facility has the ability to participate in this educational program and currently four members of the IV&V Team are utilizing this opportunity. They are: Markland Benson, Judi Connelly, Kaci Reynolds and Dan Solomon.

Markland Benson is an AST Software Systems Computer Engineer at the Facility. He spends the majority of his time performing technical analysis for the Planning & Scoping Team to support transition from the OMNI contract to the new MAC contract. Additionally, he manages the IV&V of Hubble Space Telescope Servicing Mission 4 and he is the POC for the Neural Networks research initiative. Markland also helps co-coordinate civil service engineer training in IV&V analysis techniques for our Facility. In school, Markland is working towards a Ph.D. in Computer and Information Sciences with an emphasis in Combinatorial Computing and Discrete Mathematics. Markland said, "My favorite type of class is one where I can actively problem solve on realistic problems rather than just be a receptacle for information and regurgitate it back on an exam or in a report." Markland



feels that a lack of time is the biggest challenge he has but believes in always placing his family first. This occasionally has meant lesser grades but is far more rewarding to him. Markland is able to draw strength from God and said, "What inspires me is that an all powerful God who does not need me but cares enough about me to sustain me day by day. In every success I see His hand, in all my failures I see that I have tried to leave Him behind and perform on my own strength. What inspires me is that even though my best effort is insufficient, things work out for the good." Markland also enjoys racquetball, volleyball, acting, music, reading and computer games.

Judi Connelly is the IV&V Project Manager for the THEMIS mission and also the POC on the research effort Probabilistic Risk Assessment. Judi is working towards obtaining a Ph.D. in



Physics with a specialty in Space Plasma Physics. Judi feels that her favorite classes were due to

a combination of the topic and professor. She said, "So far I've enjoyed Astrophysics because the topics are stuff sci-fi movies are made of and the professor had a very interesting hairdo. Experimental physics emphasized hands-on work requiring a combination of skills in electronics, computers, detection equipment and theoretical understanding. Computational Physics was interesting because it required creativity in producing models of physical principles. Also, the teacher was the first and only female physics professor I've ever had." Judi tries very hard to be focused at the task at hand, whether that task is school work, home life or work at the Facility. Whenever Judi can find a moment of time for herself, she enjoys a variety of crafts, painting, cross-stitching and a mutated form of alchemy with essential oils. "Driving is a fabulous pastime during which I usually end up somewhere I want to be. On occasion though, I end up just somewhere. It reminds me of the satisfaction in the journey not necessarily the destination."

**Kaci Reynolds** is a Budget Analyst responsible for the creation and maintenance of the IV&V Facility's financial records. Kaci monitors our financial standing, presents monthly budget review to senior management and mentors new members of the RMO staff. Kaci is working towards an Executive Master of Business Administration at West Virginia University. She has really enjoyed a Management Science class and said, "The class centers on solving management issues using



cold hard numbers and boy do I love numbers! This takes the subjectivity out of management problems and focuses in on the objective facts." There are of course time challenges that stem from pursuing education and career simultaneously and all too often she feels that her family gets placed on the back burner. However, she believes that her hard work now will benefit her family in the future and that is what inspires her to keep going. Kaci said, "I continually try to better myself to improve my family's quality of life and to serve as an inspiration to them. My family has given me so much, the courage to move forward with dreams, accolades when I have succeeded and comfort in times of failure. I think of my family as one unit; through bettering myself, I feel that I can better the whole." When asked about her hobbies, Kaci replied, "Hobbies? Who has time for hobbies?"

**Dan Solomon** has many duties around the Facility. He currently is the REATSS and Mars Phoenix Project Manager, co-champion for Goal B of the IV&V Facility Implementation Plan and a POC for several different



research initiatives. While performing all of these duties, Dan is also working towards his Ph.D. in Mathematics. Dan tries to find a balance between classes and work responsibilities but sometimes finds his schedule to be a challenge. He is willing to work through stressful and difficult time periods because he regrets leaving graduate school, more than twenty years ago, without his Ph.D. and is thrilled to be working towards it now. Dan is inspired by the large scale structure of the universe and said, "nowadays physicists are thinking the universe might actually be a ten or eleven dimensional space, with most of the dimensions rolled up so tightly we don't notice." Dan also enjoys coaching youth sports and genealogy.

**Leigh Gatto** From a personal perspective, 2005 has been an incredible year. In April, I was offered and accepted the IV&V Services Lead position. Both my family and I were thrilled to be returning to West Virginia. When I reported for



duty in May of 2005, I was pleased to find that the Facility had continued to grow and mature in many ways. I found that our customers, throughout the Agency, acknowledged and appreciated our efforts; that our Agency and Center management valued our contributions; and that our staff was well trained, motivated, and eager to make a difference. The Facility had certainly come of age. As Services Lead, I am thrilled with both the depth and breadth of our involvement throughout the Agency. We provide analysis on the Agency's most critical software efforts and we are fortunate to support every NASA Center. Currently the Services Organization is preparing to support one of man's most exciting adventures, returning to the moon and then on to Mars. The efforts we support are historic and our participation is vital. We do all this from the beauty of the West Virginia countryside, what could be better.

**John C. Hinkle**, Thomas Wolfe was wrong – you can go home again. And, in my case, it's even multiple times! Leigh's description above is a wonderful summary of the Services as we see them today. The strides that have



been made from our Rodney Dangerfield-ish existence ("I get no respect") when we began have been phenomenal. It often seemed we walked into a room and potential customers held up a cross to try to ward us off! Now we are not only accepted, but even welcomed due to our excellence. It's a privilege to be back again, both professionally and personally. Professionally, because I'm part of a high-performing group working on the most important projects in NASA with the enviable charter to make them successful. We have more impact per hour spent than any other organization on a NASA project. We've always believed that, but now we're getting the Return on Investment data to prove it! Our research program has matured to tackling some of the most difficult problems faced in software development. Coupled with those, we are helping a region move beyond an extraction economy that will better the lives of all concerned. What noble causes we have. Personally, I couldn't be happier being where my roots go back hundreds of years (there's a reason there's a Hinkleville near Buchannon. We've been here awhile). I can only echo Leigh: "We do all this from the beauty of the West Virginia countryside, what could be better!"

## Still In Service: The Heroes Among Us

*Natalie Alvaro*

Have you ever wondered what it would be like to develop Intelligence software that may actually be used in warfare, thus provoking a conflict of inner convictions? Or have you ever considered what it might be like to navigate a helicopter, under fire, into a combat zone in order to rescue a fellow comrade, replenish his resources or simply provide him a final transport? Have you even pondered the possibility of such a dilemma? I wonder what it might be like to voyage off to another continent for a year or more only to return to what seems like another world.....sometimes because society forms beliefs on mere speculation, but sometimes because our perspective has been altered in a profound way.

On November 11th of this year, our nation celebrated the courage and sacrifice that so many men and women unselfishly gave through the United States Armed Forces. It was on October 8th, 1954 that the President of the United States of America, Dwight D. Eisenhower issued the very first "Veterans Day Proclamation." It was this declaration that instituted a homeland tradition, the annual observance of a rare, but truly defined altruism. We observe Veterans Day as an appreciation to those veterans living with the memory of past service and to those who have given the ultimate sacrifice. Here at the IV&V Facility, we recognize the importance of this occasion and acknowledge, along with other federal, state and local agencies, Veterans Day as a holiday to be reflected upon, celebrated and commemorated. We remember our civil rights as Americans. It is for life, liberty and the pursuit of happiness; these liberties we so often take for granted. We, as Americans, know of veterans and the many sacrifices that have been made. We have heard the stories, even seen the photos through history books and more recently the mass media. We know they are out there, but do we truly understand. It is simple to see superficially in the minds eye a

representation of this icon, the ghost veteran, but to appreciate his or her character in its many shades is another thing entirely. Right here in the IV&V Facility, we have heroes among us.

Within the IV&V Facility are veteran men and women who have not only made a commitment to the country that we call home, but who are now making a difference in the NASA community, as well as our society. These men and women symbolize the vastness of our country's pride. They magnanimously devoted themselves, sacrificed their own safety and proudly went forth in honor and allegiance to protect the precious freedoms that we enjoy today. They are a reconnaissance-oriented group. They have reached beyond the boundaries of citizenship in order that we may thrive in our tomorrows; such is the determination that we find in NASA.



According to the Department of Veterans Affairs, there are nearly 25 million veterans with more than half of them under the age of 65. Of the general population in the United States, 9% are veterans. Here at the IV&V Facility in West Virginia, veterans represent roughly 20% of our workforce, spanning all five of the Armed Services. Our veterans have occupied numerous military specialties to include, Aviation Anti-Submarine Warfare, Missile Combat, Combat and Counter Intelligence, Search and Rescue, Strategic Air Command, just to name a few and their support has crossed the realms of various military

operations, conflicts, and wars. We have Operators, Pilots, Technicians, Paramedics, Technical Advisors, Instructors, Presidential Honor Guards, Military Police, Infantryman, Intelligence Analysts, and unsurprisingly, Project Managers. We even have among us a former member of the Air Force Bobsled Team. In speaking with some of the veterans, it was apparent that many of their objectives for enlistment were similar, and the benefits they described also ran parallel. James Dalton, Principal Analyst, L-3 Communications/Titan Group, explained, "I gained a true appreciation for my

## Still In Service: The Heroes Among Us

(continued from page 14)

country after experiencing other cultures, and realized that we have so many liberties that we take for granted.” This theme of nationalism was common with most of the veterans when asked to reflect upon what they gained as a result of their military experience. Another shared conviction that was expressed in the majority of veterans was the high regard for camaraderie that was instilled in them. Nelson Keeler, the IV&V Facility Director expressed, “I felt a sense of purpose and belonging in the Coast Guard, and that I was somehow contributing to humanity as well.” The “Esprit de Corp,” as Frank Huy, NASA Project Manager, described it, was obviously embedded within the core of these individuals, a virtue that seemed inherent. The military brought forth clarity of national spirit, an authentic patriotism that these veterans know all too well. With every story, there is a lesson, and with every lesson a reward. Sometimes the rewards came in chaotic and sorrowful packages such as understanding the true value of human life, but at other times they were pivotal and invigorating as articulated by Michael Hieber, IV&V Senior Program Manager, SAIC, as he expressed “One course that I took was funded by NASA, and it changed my career and my life.” He went on to explain, “I decided that I needed to get out of the service and join the space program...”

With such greatness among us, it is significant that we take a moment to reflect on what it is that these veterans represent, and say thank you, which seems diminutive when weighted against the level of dedication and selflessness they have bestowed. The world in which we live today is one of ever-changing boundaries and rapid progression. We find that our old ways of thinking are not necessarily effectual as we move into an era that is contaminated with security vulnerabilities that threaten the safety of our nation and disrupt our lives in a way that we no longer feel unconditionally safe. We no longer define global fear as the possibility of conflict, or worse yet, war, with a subliminal assumption that this will take place in another country, someone else’s land, what seems like another world. This eerie threat has crept within the confines of our once cosseted borders to infiltrate our air space, postal transports, and even our local neighborhoods. But we retaliate, we protect and we refuse to give way to such perilous tactics. At the forefront of this battle for sovereignty is the American sentinel, our veterans of the past and those who are currently pulling up the rear. They are our protectors of Freedom, a liberation that did not come easy. Lest we forget, in our lives often filled with profusion and content, that it is the United States Soldier who shed their fears in order to extinguish ours.

The following represents the NASA IV&V Facility veteran population. To all of you, we salute.

Mike Beims, Air Force	Natalie Alvaro, Army	Randy Copeland, Navy
Mike Chapman, Air Force	Ken Costello, Army	James Dalton, Navy
Leigh Gatto, Air Force	Gerald Gilley, Army	Debbie Radabaugh, Navy
Roger Harris, Air Force Res.	Nick Guerra, Army and Navy	Tom Robinson, Navy
Michael Hieber, Air Force	Edward Howes, Army	Dave Sheldon, Navy
Ken McGill, Air Force	John Marinaro, Army	Scott Sorensen, Navy
Bill Koselka, Air Force	RJ Netz, Army	Don Thompson, Navy
Peter Medley, Air Force	Jerry Sims, Army	Frank Huy, Marine Corp
Steve Pukansky, Air Force	Jesse White, Army	Greg Miller, Marine Corp
Phil Slider, Air Force	Llew Williams, Army	Tom Uldrich, Marine Corp
Thomas Wilhelm, Air Force		Joel York, Marine Corp
		Ned Keeler, Coast Guard