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Tunnel 9 efforts in data reduction to benefit Air Force

By Deidre Ortiz
AEDC Public Affairs

A member of the AEDC Hypervelocity Wind Tunnel 9 staff in White Oak, Md., has optimized the data reduction process to expedite calculations and display of all data products, an improvement that will be of great benefit to the U.S. Air Force.

The person leading the effort is Mick Marana, a test data engineer for the Tunnel 9 Combined Test Force, and these efforts come at a time when the Air Force is focusing on hypersonic technology as one of its strategic goals in anticipation of several emerging acquisition programs.

"Tunnel 9 has been critical in advancing the technologies useful for missile systems associated with both Tactical Boost Glide and Conventional Prompt Strike," said John Lafferty, technical director of Tunnel 9. "Since flight experimentation is expensive and takes considerably more time than a ground campaign, Tunnel 9 was front and center in a three-year ground test campaign to accelerate technologies and help narrow the selection of relevant technologies for that potential acquisition program."

Lafferty added with four major programs needing test data, any increase in productivity or capability has a direct impact on future acquisition and development.

See **TUNNEL 9**, page 3

Mick Marana, test data engineer at AEDC Hypervelocity Wind Tunnel 9, has optimized the data reduction process to expedite calculated and display of all data products, an improvement that will be of great benefit not only to Tunnel 9 but to the U.S. Air Force. ***(U.S. Air Force photo/Arnold Collier)***

Study during Arcs upgrade results in major cost avoidance for AEDC

AEDC electrical engineers Tony Acklen and Howard Frederick review the Mid-Pressure Arc Heater project plans for adding electrical loads to an existing Plenum Evacuation System substation transformer at AEDC. ***(U.S. Air Force Photo/Rick Goodfriend)***

By Deidre Ortiz
AEDC Public Affairs

AEDC engineers performed a study during the Mid-Pressure Arc Heater (MPAH) upgrade project that led to a cost savings of approximately $3 million for AEDC.

The MPAH project is a Central Test and Evaluation Investment effort to upgrade the materials test capability of the H2 Arc Heater Altitude Test Cell at the Complex. Though initial calculations showed the MPAH upgrades would exceed the existing transformer's maximum load, a study performed by electrical engineers Howard Frederick and Tony Acklen determined it would support the load and not need to be replaced.

Frederick explained the 161-kV transformer refurbishment, which began in 2009, served as a catalyst for the review of the transformer and credits it for leading to this savings.

"In that project, the transformer's cooling system was restored to original condition," he said.

Martin Johnson, Air Force electrical asset manager who launched the 161-kV transformer refurbishment project, mentioned it was much needed.

"There are ten 161-kV transformers at AEDC that are over 60 years old," he said.

A transformer for the Engine Test Facility was refurbished first, then when one of the transformers for the Propulsion Wind Tunnel facility experienced an operational failure, then the remaining nine were refurbished.

See **AVOIDANCE**, page 3

AEDC Fellow Ronald Dawbarn's contributions remembered at Complex

By Raquel March
AEDC Public Affairs

AEDC Fellow Ronald Dawbarn

AEDC Fellow Ronald Dawbarn will be remembered for his contributions to the Complex after his passing on Aug. 17.

Dawburn was an engineering physicist for 32 years in the AEDC Space and Missiles Systems department and received the honor of being selected as an AEDC Fellow in 2005.

As an engineering physicist, his experience was in a broad range of technical areas such as condensation phenomena, cryogenics and vacuum technology, plume and molecular beam diagnostics, testing of space propulsion systems, infrared absorption, spectroscopy, gas chromatography, high speed photography, cryogenic thermometry and crystal microbalances.

His technical accomplishments are documented in his 74 technical papers and reports produced during his years at AEDC.

Dawburn's contributions to AEDC still have an impact on the future of space programs today. His contributions were realized from the Apollo missions in the 1960s continuing through to the contributions he made to the Space Based Infrared System.

Dawburn held a bachelor's of science degree in physics from the University of Missouri at Kansas City and a master's of science degree in physics from the University of Missouri at Rolla, Mo.

He passed away at the age of 81.

(Editorial Note: Some information in this story was collected from a previous High Mach article.)

See Dawbarn's Memoir he wrote to celebrate the AEDC 60th Anniversary on page 8.

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HIGH MACH

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- *Service before self*
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- Ethics. We are uncompromising in our integrity, honesty, and fairness.
- Safety & Health. We are relentless in keeping people safe from harm, and we provide a safe and healthy work environment.
- Excellence. We thrive on challenge, accomplishment, and mission success.
- Quality. We are passionate about doing our work right the first time.
- People. We have a mission-focused, inclusive workforce who have a diverse skill set, are committed to success, demonstrate innovation and have a can do attitude.
- Culture. Our team is proud of our diversity, inclusiveness, and collaborative work environment. We are proud of what we do and how we do it.
- Relationships. We build positive, long-term business relationships through trust, respect, and collaboration.
- Innovation. We overcome challenges through creativity, perseverance, technology, and flexibility. We actively seek to continually improve.
- Sustainability. We plan and act for the long term benefit of our communities and our environment.

Combating fraud starts with you

By SA Daniel Barthold
Arnold Air Force Base Office of Special Investigations

Wars cost money, as does maintaining vigilance.

The U.S. government spends hundreds of billions of your tax dollars each year on national defense. Uncle Sam utilizes these dollars to support weapons systems and platforms which equip our service members and workforce to maintain national security. When this resource is fraudulently wasted our capabilities are reduced because the money could have gone to other projects which maintain and improve our technological edge.

Fraud endangers the mission. There are many schemes and indicators to help you recognize fraud occurring on AEDC. Below is a description of some of the more common ways in which defense contractors have tried to defraud the federal government:

Product Substitution

Defense contracts frequently specify that the contractor use a particular grade, type or quality of product or parts. Defense contractors can often save costs, and maximize profits if they substitute cheaper or substandard parts. If a defense contractor does this without the permission of the government's contracting officer, it can violate the Federal False Claims Act.

Worthless or Substandard Products or Services

Due to the volume and complexity of the equipment and products the Air Force purchases, it is nearly impossible for the Air Force to perform a quality check on each item. In many cases, the Air Force relies upon the defense contractor to provide products that perform as promised per the contract.

Though there are cases of honest mistakes, there are also instances where the contractor knew, or was reckless in not knowing, the products they delivered would not perform as promised. Such worthless or substandard products can have devastating impact on the men and women of the military that use them and potentially violate the Federal False Claims Act.

Failure to comply with contract specifications

Reliability is critical and the Department of Defense requires its contractors to perform in accordance detailed product specifications. These specifications dictate the type of materials to be used and the appropriate quality assurance steps the company must follow to ensure product quality. Although the burdens imposed by the specifications are costly, the government covers those costs as part of the contractor's payment. If a company starts to overrun its budget on a contract, particularly a fixed-price contract, or falls behind in its delivery schedule, it may be tempted to cut corners by omitting required testing, quality procedures or other steps in the production process.

Federal Employees' Compensation Act (FECA) Fraud

Air Force civilian employees injured while performing their official duties are eligible to obtain compensation under provisions of the FECA. Although the FECA is administered by the Department of Labor, payments are charged back to the individual employing agencies, e.g. the Air Force, for reimbursement. The Air Force pays a significant amount of money for legitimate claims made by individuals who had been injured while on the job and who can no longer work because of those injuries. However, some individuals will fake or exaggerate an injury in order to receive money from the Air Force.

AFOSI needs your help to identify potential fraud in the work place. Defense contractor fraud remains one of the most active areas of false claims litigation under the Federal False Claims Act. We all have a part in the fight. If individuals believe they have information pertaining to potential fraud, they can immediately report it to the local OSI detachment. Detachment 106 is located in Bldg. 100, Suite C305 on Arnold Air Force Base. OSI works to prevent fraud and to recover losses to the U.S. government. If you would like a fraud brief in your section let us know. For more information, contact AFOSI Detachment 106 at 931-454-7820 or text the AFOSI Anonymous Tip Line by texting "AFOSI" plus your tip information to 274637 (CRIMES).

Smoking Policy

1. The following revised Arnold AFB smoking policy is effective immediately and applies to all individuals on Arnold AFB.
2. Traditional Tobacco products (e.g. cigars and cigarettes):
   a. Smoking is permitted solely in Designated Tobacco Areas (DTAs) shown in the attached map and identified by designated signage. If no signage exists, smoking is not permitted in that area. It is the responsibility of all smokers to keep DTAs clean of cigarette butts.
   b. Tobacco use on the Arnold AFB Golf Course is permitted, but discouraged based on the health hazards of tobacco use and secondhand smoke. No smoking is permitted within 50 feet of golf course buildings except in the approved DTA.
   c. Smoking in government-owned/leased vehicles is strictly prohibited. Personnel are allowed to smoke in their personal vehicles at any time; however, at no time will personnel discard cigarette butts outside their vehicle.
   d. For government employees, the fact that a person smokes has no bearing on the number of breaks they may take. Breaks should be taken in accordance with the current supervisory and personnel policies that afford all employees the same break opportunities consistent with good work practices and accomplishment of the mission.
3. Smokeless Tobacco products (e.g. snuff and dip):
   Smokeless tobacco products are not to be restricted to DTAs. Smokeless tobacco use will be permitted in all workplace areas (inside and out) subject to reasonable safety and sanitary conditions. Specifically, containers of tobacco waste product, including sealed containers, must not be left unattended or disposed of in trash receptacles. Users of smokeless tobacco must flush tobacco waste down the toilet.
4. Electronic Cigarettes (also known as "e-cigs"):
   Pursuant to Air Force Instruction (AFI) 40-102, Tobacco Free Living, e-cigs are considered to be equivalent to tobacco products; however, e-cigs are not restricted to DTAs and are allowed to be used outdoors at a minimum distance of 25 feet from building entry/egress points. (This policy is dated July 27, 2016)

Action Line

Team AEDC

I believe in free and open communications with our Team AEDC employees, and that's why we have the Action Line available. People can use the Action Line to clear up rumors, ask questions, suggest ideas on improvements, enter complaints or get other issues off their chests. They can access the Action Line via the AEDC intranet home page and by calling 454-6000.

Although the Action Line is always available, the best and fastest way to get things resolved is by using your chain of command or by contacting the organization directly involved. I encourage everyone to go that route first, then if the situation isn't made right, give us a chance.

Col. Rodney Todaro
AEDC Commander

Wilhite supports Joint Innovative Readiness Training Project

By Deidre Ortiz
AEDC Public Affairs

Cmdr. David Wilhite of the U.S. Navy Reserve, Commander of the Naval Mobile Construction Battalion 14, attended a Distinguished Visitor Day in support of a Joint Innovative Readiness Training (IRT) Project. Wilhite also serves as the Simplified Acquisition of Base Engineering Requirements program manager at AEDC.

Naval Mobile Construction Battalion 14, with the assistance from the 7th Naval Construction Regiment and Naval Construction Group 2, staffed and deployed five Detachment Rotations in support of the IRT Project to construct a Dining Facility at Camp William Hinds in Maine from June to August 2016. NMCB 14, along with the 141st Prime Beef Civil Engineering Squadron and the 155th Prime Beef Civil Engineering Squadron, provided multi-disciplined construction support.

Maine Gov. Paul LePage was the distinguished visitor at Camp William Hinds Boy Scout Camp in Raymond on July 26, as the Innovative Readiness Training Program, through the military, hosted its Distinguished Visitors Day.

The program focuses on real world experiences in military training, and the project benefits the Boy Scouts through building a dining hall at their camp site, an addition they needed to bring in scouts from across the United States.

Cmdr. David Wilhite, left, of the U.S. Navy Reserve, Commander of the Naval Mobile Construction Battalion 14, presents a Command Coin to Maine Gov. Paul LePage, right, during a Distinguished Visitor Day at Camp William Hinds in Maine. The event was held in support of a Joint Innovative Readiness Training (IRT) Project at the camp. In addition to his duties as commander of NMCB 14, Wilhite also serves as the Simplified Acquisition of Base Engineering Requirements program manager at AEDC. ***(Courtesy photo/David Wilhite)***

The materials were donated through local building suppliers and donations.

Scout Executive Eric Tarbox also noted that the dining hall would not have been possible without the military's help.

"We would never have been able to afford the labor and the materials and the effort, the experience that the military brings to the table, we're not only helping them train around the world to do their job, but we're also enabling a facility that we'd never be able to build ourselves," he said.

Some of the information included in this release was taken from the Aug. 11 issue of the Seabee Courier.

AEDC announces schedule for security area deer hunt briefs

By Shannon Allen
AEDC Natural Resources

The mandatory pre-season deer hunting meetings for the AEDC Security Area will be held at the Arnold Lakeside Center Sept. 7 at 4 p.m. and Sept. 15 at 4:30 p.m.

A make-up session will be held in building 100, room B-313 Sept. 20 at 7 a.m.

Hunters must attend one of the meetings or they will not be allowed to hunt.

Hunting permits may be purchased at the Arnold Services Outdoor Recreation for $12.

For more information, call 454-5466.

Human factors can contribute to accidents

By AEDC Safety

According to the National Safety Council, there are some common human factors that contribute to accidents.

The most common factors include:

- Negligence – Failure to observe safety rules or instructions or to maintain equipment.
- Anger/Temper – Causes one to become irrational and to disregard common sense.
- Hasty Decisions – Acting before thinking can lead people to take hazardous shortcuts.
- Indifference – Lack of attention to the task; not alert; daydreaming.
- Distractions – Interruptions by others (perhaps caused by family troubles, bad news, horseplay) while someone performs normal job duties or non-routine hazardous tasks.
- Curiosity – Workers do something unexpected just to see what happens.
- Inadequate Instruction – Results in an untrained or improperly trained worker.
- Poor Work Habits – Cluttered work place, floor, loose clothing, wearing jewelry.

By identifying the human factors and being responsible for each other, and ourselves we can reduce the number of accidents caused by "human factors."

How, you ask?

- Knowledge – By knowing and observing safety rules or instructions, and maintaining equipment.
- Relax/Calm Down– If you find you are angry or your temper is flaring, take the time to relax, address the issue, and calm down before you proceed with the work.
- Think Before You Act – Take a few minutes to think of the work to be done and identify the potential hazards and what you can do to avoid or prevent an accident.
- Focus – Focus at the task at hand and keep you mind on your work.
- Minimize Interruptions – Interruptions by others may be one of the easiest to identify, but one of the most difficult to control. However, as an example we can turn off cell phones when they are not needed or cannot be answered safely.
- Don't Experiment – Don't do anything unless you know what the results will be and it is required for the project.
- Proper Training/Instruction – Train and instruct your team and yourself on the proper and safe way to complete the project. If you feel uncomfortable about performing the work, ask someone with more experience for some help.
- Proper Work Habits – Keep your work area clean and free of hazards. Wear the proper clothing and personal protective equipment for the project.

Are these easy? No!

In fact they are very hard in some cases. However, we cannot minimize these human factors if we don't know what they are; and we don't attempt to control them. If you identify these in you or in someone else, then shouldn't we be obligated to try and correct them?

TUNNEL 9 *from page 1*

The new data reduction process allows test engineers, analysts and customers the ability to efficiently review the expanded data sets acquired in a single run and develop educated technical decisions based on a more complete understanding of the flow physics.

Joe Coblish, Tunnel 9 lead project manager, explained Marana re-wrote many of the decades-old data reduction routines to bring them up to modern coding standards.

"The higher-level parts of the data reduction codes were converted to MATLAB to speed up the code development cycle, while keeping some of the computation-heavy algorithms in FORTRAN to maintain execution speed. MATLAB's numerical toolsets allowed him to focus on overall efficiency improvements and data display improvements, rather than developing mathematical routines from scratch."

Tunnel 9 is continually improving and expanding its high-speed data measurement capabilities to observe freestream noise and boundary-layer transition, and using a high-speed data acquisition system collects billions of data points in seconds.

"Efficiency improvements were made to existing pressure fluctuation data reduction codes, allowing results to be available in minutes instead of hours," Coblish said.

One of the most marked improvements was in the processing of the temperature sensitive paint data.

"The TSP system acquires images of surface temperature time histories on the test article to back out critical heat transfer data to help investigate complete hypersonic flow structures. High-resolution images from multiple cameras are mapped onto a virtual model. Once the image data has been mapped, millions of points on the virtual model are converted to surface temperature and surface heat flux," Coblish said.

Marana created an in-house mapping software as an improvement over a previous commercial software, increasing automation in the image mapping steps. He also implemented efficiencies in the heat-transfer and post-processing codes.

Before these improvements, reduced TSP data would take anywhere from four to eight hours after the run to process to final heat flux. Now an initial assessment of the TSP data can occur as soon as an hour after a run, allowing the test team the ability for a more thorough assessment of the data before moving onto the next run.

Dan Lewis, project engineer, agreed the benefits of Marana's new data reduction improvements are much appreciated by the Tunnel 9 team.

"Mick's capability to provide real time guidance to both the test engineer and customer is observed throughout the course of each Tunnel 9 wind tunnel test," he said. "His comprehensive knowledge of the data reduction process has resulted in him becoming an integral part of the entire test process. Someone with the ability to support preliminary test planning, real time data analysis and final data processing is invaluable to delivering a successful product."

AVOIDANCE *from page 1*

"The transformers now have solid state controls and are connected to a new Supervisory Control and Data Acquisition system with fiber optic," Johnson said. "The old SCADA was a computer that was a 1986 version."

According to Acklen, these 10 older transformers are only a portion of the thirty 161-kV transformers on base, and when upgrades occur at the test facilities, it takes some research to decide on how to best meet any changes regarding power.

"The age old question at AEDC seems to be where to get power for large new equipment," he said. "Determining the size of the transformer actually needed is something that's a little tricky too."

Acklen also mentioned that AEDC Power Control has been documenting the connected loads of electrical equipment.

"During the course of this documentation it became apparent that all of the equipment rarely runs at the same time, and it just made sense to explore the possibility of feeding the new load from an existing transformer in the Propulsion Wind Tunnel Plenum Evacuation System (PES) substation," he said. "Especially since four were recently refurbished under the Air Force contract with the manufacturer. The coolers that were installed are very good at keeping the temperature under control.

"Howard studied PES-2 because the secondary substation had the desired 6,900 volts. It had less existing load than the others, and most evident was the fact that the temperature had not exceeded 45 degrees Celsius which was way below its rated limit. Also key was complications, that I knew from experience, can arise from making a new transformer fit into the same space as an old one."

Therefore, Acklen and Frederick calculated the new load and added it to that of the current load of the transformer.

"While the total of the two lists exceeded the rating of the transformer, we knew that electric utilities see similar 'overload' conditions at peak power conditions," Frederick said. "We also knew that the IEEE (Institute of Electrical and Electronic Engineers) had a standard method for calculating effects of short-term loading of oil-filled transformers beyond that of the nameplate rating."

After preliminary calculations, it appeared that the transformer would be able to handle the load profile required. The results were shared with Harry Clark, Air Force project manager for the MPAH project, who requested a finalized analysis. After further review, Acklen and Frederick's findings were accepted.

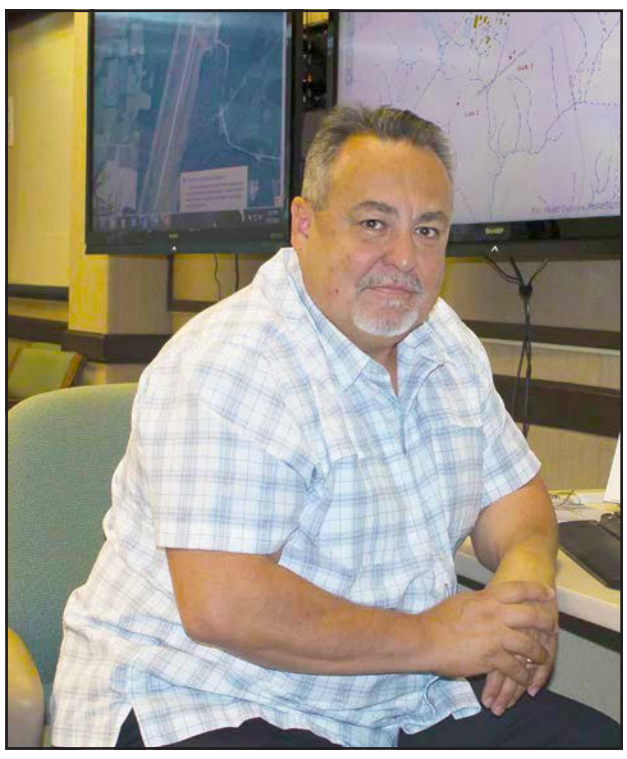
"Their attention to the engineering detail required for an accurate design and their concern that taxpayer dollars be best used to meet the project requirements led to a determination that an upgrade to PES-2 was not required, saving the project an estimated $3 million."

Johnson commends Acklen, Frederick and all the experienced power personnel at AEDC for their support leading to this success.

"We have had a very good Power System Analysis program, which is headed by Beth Baker," he said. "This allows us to determine the condition of our electrical equipment and if the equipment can handle any additional loads.

"Howard Fredrick and Tony Acklen have always been very helpful and honest when I ask about electrical issues. I have a very good working relationship with them. There was a Service Life Extension Plan that was developed in 2013 for the electrical equipment and [they] were the main drivers in the plan."

Aguirre gives AEDC direction through geographical mapping



Armando Aguirre serves as the geospatial information specialist and Geospatial Information Office manager at AEDC, where he manages and provides geographic data for the AEDC region. *(U.S. Air Force photos/Holly Peterson)*

Armando Aguirre, geospatial information specialist and Geospatial Information Office manager at AEDC, reviews Arnold Air Force Base geographical information with AEDC Emergency Management Program manager Lee Smith, using the Arnold AFB GeoBase Viewer. As a GIS and GIO manager, Aguirre manages and provides data about AEDC locations that aid in land surveying, natural and cultural resource management, emergency management, utilities operations, air and space operations, security and other areas. *(U.S. Air Force photos/Holly Peterson)*

By Raquel March
AEDC Public Affairs

Many AEDC organizations depend on Armando Aguirre's skills as the geospatial information specialist and manager of the Geospatial Information Office for the Complex.

As a GIS, Aguirre manages and provides data about AEDC infrastructure that aid in land surveying, natural and cultural resource management, emergency management, utilities operations, air and space operations, security and other areas.

The data may include coordinates of streets, buildings, vegetation or steams and they are managed through a geographic information system or Air Force system known as GeoBase. The information may be mapped and provided to project managers who can use the data to see how the geographical items relate to each other.

Clark Brandon, deputy of the AEDC Test Support Division, recognizes Aguirre's contributions in support of the base.

Brandon said Aguirre "consistently provides accurate maps and data sets to numerous customers to support a wide range of tasking from Enhance Use Lease exploration, Tennessee Air National Guard inquiries, and Arnold Civil Engineering support to the Installation Restoration Program and Military Munitions Response Program, and support during base exercises. He is the 'go-to' person on AEDC for all mapping needs."

Aguirre described the personnel structure for a base GeoBase program.

"Typically GeoBase Programs at other Air Force Bases have several GIS subject matter expert (GIS-SME) personnel under them, each assigned to a specific realm of system such as a GIS-SME for an installation's communications infrastructure, GIS-SME for environmental remediation, GIS-SME for electric utilities and GIS-SME for real property inventories," he said. "At AEDC I take on the default GIS-SME role for all the aforementioned realms. I manage all these GIS data since they reside within the GeoBase Program database, inclusive coordination of IT [information technology] maintenance for the GeoBase system servers."

While managing the multiple areas within the GeoBase Program at Arnold, Aguirre has revamped many geographic information system data.

"Much of AEDC's data is not created by us, it is compiled by outside vendors and their data, beyond trying to ensure locational accuracy, lacks being labeled and categorized to match required DOD Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) format," he said. "The most challenging and time consuming part of my job had been spending hours on 'scrubbing' or retrofitting vendor GIS data to meet the required SDSFIE format."

As a solution to aligning the data to the SDSFIE format, Aguirre communicates to the AEDC project managers the importance of using GeoBase services in the early stages of the project planning. He offers parameters to include as part of the contract project specifications, outlining the important factors that make the data SDSFIE compliant.

"Also, offering to disseminate our accurate data SDSFIE stencil database so vendors can populate our stencil with their project data input, results in deliverables that attain maximum interoperability with AEDC GeoBase GIS data," Aguirre said.

His work also includes cartographic support or plotting maps, standardization of geographic data and meshing of regional installation picture resources. AEDC uses the maps through the Arnold AFB GeoBase Viewer.

"GeoBase Viewer for years has saved many analysis hours by being a quick and reliable AEDC data analysis tool for AEDC staff," Aguirre said. "The GeoBase Viewer is a web mapping tool that can readily merge together AEDC's many informative data sets into one place. It has proven to be an excellent service to the [AEDC] Emergency Operations Center. The GeoBase Viewer also allows AEDC users to not only merge a plethora of data to answer their queries, but it also allows users to draw labels and graphics onto it and custom create maps on the fly."

Currently Aguirre is working on collecting geographical data for the reactivation of the Arnold AFB Airfield.

He has managed the GeoBase Program at AEDC for nine years and has 25 years of GIS experience.

Aguirre is a resident of Franklin County.

Luke receives Air Force's 100th F-35

By Tech. Sgt. Timothy Boyer
56th Fighter Wing Public Affairs

LUKE AIR FORCE BASE, Ariz. (AFNS) – The F-35 Lightning II program took another huge step forward Aug. 26 when the Air Force's 100th F-35, designated AF-100, arrived here following the recent announcement of the fifth-generation jet fighter's initial operational capability.

"This marks a milestone and shows the fact that the F-35 program has continued to grow, progress and support initial operational capability," said Brig. Gen. Brook Leonard, the 56th Fighter Wing commander. "It is also a 'scare factor' for our enemies that we are able to produce such an incredible platform at such a high production rate and that it's getting out in the field in larger and larger numbers."

Luke Air Force Base received its first F-35 in March 2014 and developed the training and tactics for the program. The fleet has since grown to more than 40 F-35s at the base, including those of partner nations such as Australia and Norway. The base also recently activated its third F-35 unit – the 63rd Fighter Squadron.

"A lot of people put the blood, sweat and tears into making sure we could have an agreement with the community that would allow us to train and continue to produce the future of airpower," Leonard said. "Standing up the third squadron marks the halfway point as we grow up to six squadrons. It also comes with the heritage of the 63rd, which is incredible, and to be able to see that take new form in the shape of a Lightning aircraft is phenomenal."

From the first training sortie on May 5, 2014, to the arrival of the first partner-nation F-35 on Dec. 18, 2014, and more recently beginning its first-ever F-35 mission-ready Airmen training class for maintainers, Luke AFB is no stranger to F-35 milestones.

See **F-35**, page 5

Reception Welcomes New UTSI Executive Director

Pictured left to right is Dean Wayne Davis, University of Tennessee College of Engineering; University of Tennessee Space Institute Executive Director Dr. Mark Whorton; and UT Chancellor Dr. Jimmy Cheek. *(UTSI photo)*

By UTSI Office of Public Relations

TULLAHOMA, Tenn. – The University of Tennessee Knoxville chancellor, Dr. Jimmy Cheek, hosted a welcome reception Aug. 3 at the University of Tennessee Space Institute (UTSI) in Tullahoma honoring its new Executive Director, Dr. Mark Whorton.

Approximately 150 people attended to show their support.

Cheek opened the reception with welcome remarks noting the great turnout and acknowledging the tremendous support of UTSI.

He said, "UTSI is a world class and nationally competitive institution holding on to its rich tradition and proud heritage as we continually develop."

Cheek alluded to Butch Jones' philosophy in describing UTSI's growth process as "brick by brick we will build a strong foundation" so we can look back and see what productive years we have had and our accomplishments.

Whorton received his doctorate in aerospace engineering from The Georgia Institute of Technology and his master's in aerospace engineering from The University of Alabama at Tuscaloosa. He comes to UTSI having been a branch chief at NASA Marshall Space Flight Center and more recently president of Teledyne Optech, Inc. and chief technologist at Teledyne Brown Engineering.

UTSI's new Executive Director addressed the group stating how fortunate he feels to receive the opportunity to join UTSI which is a world class one-of-a-kind research facility on a beautiful campus setting.

Whorton's vision for the Institute is to continue being a place of distinction and a destination of choice for students.

Chancellor Cheek noted the presence of Charles Wharton, a member of the UT Board of Trustees; Senator Janice Bowling; Col. Rodney Todaro, commander of the Arnold Engineering Development Complex, Arnold Air Force Base; Dean Wayne Davis, UT College of Engineering; and Anthony Haynes, vice president for Government Relations and Advocacy.

Whorton is a native of Alabama.

F-35 *from page 4*

Maj. Matt Strongin, a 62nd Fighter Squadron F-35 Lightning II pilot, is met by a 62nd Aircraft Maintenance Unit Airman Aug. 26 after landing the Air Force's 100th F-35. This milestone comes on the heels of the Air Force's announcement of the F-35's initial operational capability. *(U.S. Air Force photo/Tech. Sgt. Luther Mitchell Jr.)*

"Last year we began U.S. Air Force and partner pilot training at Luke AFB in Arizona, where a blend of U.S. and partner instructor pilots are helping to train U.S. Air Force and other partner pilots," Lt. Gen. Christopher Bogdan, F-35 Joint Program Executive Officer, said during an April 26 hearing with the Senate Armed Services Committee.

As Luke AFB continues to perfect F-35 training, the Air Force has moved beyond training with the Aug. 2 announcement of the fighter's IOC accomplishment.

"The Air Force is now receiving F-35As at Hill AFB in Utah," Bogdan said.

With the reception of the 100th F-35, Luke AFB is quickly transitioning to the only active-duty Air Force F-35 training base, providing the world's greatest F-35 fighter pilots to the new operational squadrons and eventually to combat.

"The F-35 is going to be the backbone of the fighter fleet in the United States Air Force and for our partner nations," Leonard said. "There are going to be more F-35s than any other fighter platform, and all that training starts right here at Luke AFB."

F-35 surges forward with record-breaking weapons tests

By Christopher Ball
412th Test Wing
Public Affairs

Maj. Douglas Rosenstock fires an AIM-120 AMRAAM from an F-35 Lightning II during a recent weapons test surge at Edwards Air Force Base, Calif. By the end of the surge the F-35 Integrated Test Team released 30 weapons in 31 days, a first in flight testing. Ground testing of the F-35 has also been conducted in the 4 foot and 16 foot transonic wind tunnels at AEDC several times over the last decade to evaluate weapon separation characteristics of the aircraft. *(Lockheed Martin photo/Darrin Russel)*

EDWARDS AIR FORCE BASE, Calif. (AFNS) – The F-35 Integrated Test Force at Edwards Air Force Base recently completed 25 missions comprised of 12 weapons delivery accuracy and 13 weapon separation tests as part of a month-long weapons firing test surge.

Historically, WDAs take place once a month given the myriad of coordination required. The highest number previously accomplished in a month was three in November 2014 during block 2B software testing.

Ground testing of the F-35 has also been conducted in the 4 foot and 16 foot transonic wind tunnels at AEDC several times over the last decade to evaluate weapon separation characteristics of the aircraft.

Maj. Charles Trickey, interim director of operations for the 461st Flight Test Squadron, flew the final mission of the surge Aug. 17. The mission was completed at White Sands Missile Range, N.M., where F-35 Lightning IIs shot two advanced medium-range, air-to-air missiles at a QF-4 drone.

"Some of these WDAs were particularly challenging events," Trickey said. He said the final mission was actually the fourth attempt to complete this test. "It was really cool to see the satisfaction of the team, and to get that feeling of accomplishment after doing something that challenging."

All told, the F-35 ITF deployed 30 weapons in 31 days, which included 12 WDAs and 13 separations, according to Trickey.

"Thirty separations in 31 days; that's never been done before in flight test," said Capt. Brett Tillman, a flight test engineer with the 461st FTS. "The fact that we could get everything together to do that number of separations in that few days is pretty amazing."

These successful test events – performed using the F-35's newest block 3F software – demonstrated the accuracy of the aircraft. Five of the test events featured dropping multiple weapons.

The effort for this surge wasn't limited to the F-35 test team. There were a number of units outside the F-35 ITF that put in extra effort and time to make the surge successful, including Edwards AFB airfield and tanker operations, the 416th FTS and the F-35 Joint Program Office.

The F-35 weapons test team was given exclusive use of the Sea Test Range, an instrumented Pacific Ocean test area off the central coast near Point Mugu, Calif. Tests were also conducted at the U.S. Navy's China Lake weapons range in California and White Sands missile range.

"The amount of coordination and teamwork from the ITF and the outside organizations to enable this is unprecedented," Tillman said. "The work these team members put in is amazing. It couldn't have been done without them."

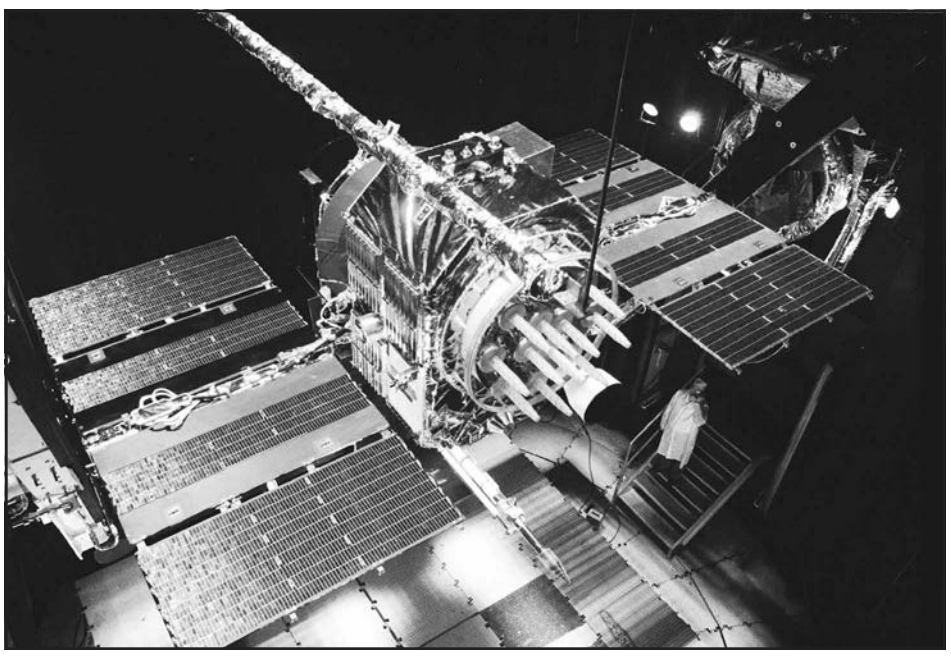
During this surge period, a total of 30 weapons were dropped or fired, including the joint direct attack munition, AIM-120 advanced medium-range, air-to-air missile, GPS-guided 250-pound small diameter bomb, AIM-9X Sidewinder supersonic, heat-seeking, air-to-air missile and GPS laser-guided munition.

"The WDAs rely on the full capability of the F-35 – multiple sensors, navigation, weapons envelope, mission planning, data links and inter-agency range scheduling – all working in sequence to put steel on target," said Lt. Gen. Chris Bogdan, an F-35 program executive officer. "This was a tremendous effort by the F-35 test team. They surged and worked seven days a week for more than a month to expend 30 ordnance and advanced weapons testing. This testing has moved us that much closer to delivering the full F-35 capability to warfighters within the next two years."

The F-35 is a multi-role, next-generation fighter that combines advanced stealth with speed, agility and a 360-degree view of the battlespace. The F-35 will form the backbone of air combat superiority for decades to come and replace legacy tactical fighter fleets with dominant air-to-air and air-to-ground capabilities to deter and defeat potential adversaries.

The Marine Corps declared the F-35B combat ready, or initial operating capability, in July 2015; the Air Force declared F-35A IOC on Aug. 2; and the Navy intends to attain F-35C IOC in 2018. More than 200 F-35s have flown in excess of 66,000 fleet-wide hours, with over 300 F-35 pilots and 3,000 maintainers trained to operate and support this next-generation aircraft.

My memories for the 60th anniversary of AEDC



A Global Positioning System Satellite Block II test in the Mark 1 Space Chamber, 1985. *(AEDC photo)*

Taken in 1963, this photo shows the two-stage launcher for the 1,000-foot hyperballistic Range G which uses black powder, a piston and compressed hydrogen gas to propel models at velocities up to 23,000 feet per second. *(AEDC photo)*

By Ronald Dawbarn
AEDC Fellow

(AEDC Fellow Ronald Dawbarn submitted his memoir about AEDC in 2011 to celebrate the 60th Anniversary of AEDC. Dawbarn passed away Aug. 17.)

I was fortunate to start work at AEDC when the Air Force decided to add space testing to their complex of test facilities. I studied the physics of condensation and published a paper on the topic. It was read by Ken Templemeyer who was in charge of developing the space chambers. At issue was the production of the high vacuum conditions in the various test chambers.

It was state-of-the-art to use oil diffusion pumps and the current large Mark I space test chamber was fitted with some of the largest commercially available pumps. However, the concern was that in the event of a loss of integrity of the vacuum, the oil would migrate back into the test volume and contaminate the test article. Since the chamber was designed to test complete satellites costing millions of dollars, this risk was unacceptable.

AEDC invested in some large helium refrigerators which could provide 15 degree Kelvin cooling (well below the temperature of liquid air). The hope was that the diffusion pumps could be replaced with cryogenic pumps which would freeze out the atmospheric molecules and provide an ultra-clean vacuum test environment. The problem was one of the gases to be pumped was hydrogen which required much colder temperatures to freeze out. I was hired to help develop a pumping system using these refrigerators.

The space chamber facility had a research laboratory in which I, along with other physicists, worked to develop not only the cryogenic pumps but also much of the diagnostic instrumentation which eventually was used in the test chambers.

Unlike the other test facilities which focused on a somewhat restricted field of testing such as jet engines, rocket motors or wind tunnel aerodynamics, the space facilities attracted a wide variety of test requirements. During my time at AEDC the initial work on developing cryogenic pumping extended to designing and building some massive hydrogen pumps for Oak Ridge National Laboratory and also the fusion Tokamak Fusion Test Reactor (TFTR) at Princeton, N.J.

Because of the ability to provide space vacuum conditions and the specialized instrumentation for use in these test chambers, we extended the work to evaluate satellite attitude correction thrusters. The first tests were chemical thrusters using hydrazine finally resulting in testing electric propulsion engines with a whole new set of problems in maintaining a space vacuum environment and major issues in developing specialized diagnostic instruments.

At retirement I came back to design a refit of one of the larger vacuum chambers from a solar evaluation chamber to an electric propulsion test facility.

The types of tests designed and conducted over the years ranged from building space test facilities, to evaluating long wave infrared space telescopes for early warning satellites, to testing the first GPS satellite, to evaluating infrared guided interceptors for defense against intercontinental ballistic missiles.

The focus on the process of condensation also led to work beyond the vacuum chambers. NASA asked us to evaluate the potential problems with their shuttle launches where the solid rocket booster exhaust sometimes resulted in acid rain which led to problems with the Florida fruit growers. We developed a test program involving firing scale models of the thrusters in controlled environmental conditions, taking instruments developed at AEDC to NASA rocket tests at Redstone outdoor test stands and then to actual shuttle launches at Cape Kennedy. From this data we developed a set of launch constraint guidelines when acid rain was expected.

The Air Force also asked us to evaluate the potential contamination problems in massive fuel dumps from their refueling planes when they were required to jettison fuel after a missed rendezvous with the fighter jets.

One of the more interesting requests was to develop a test to evaluate new solid rocket fuels being developed as a low smoke propellant for aircraft launched missile systems. The problem was not just in burning the fuel but in the complex mixing of the exhaust products with the ambient atmosphere. I proposed and conducted a test using the AEDC ballistic gun range. This was an interesting test.

I suggested that the range could be used to test samples of the new fuels in scaled test rockets flying at realistic speeds through a controlled upper atmospheric simulation. The first part of preparation for the tests was to use the AEDC machine shop capabilities to make the model rockets and the special sabots used to house them in the gun.

This model consisted of three parts machined from aluminum. One component was the fins and rocket nozzle. This was threaded so that it could be screwed onto the cylindrical body of the rocket which would house the hollow cylindrical sample of the new test fuel.

The third component was the most complex and consisted of a hollow nose cone which housed the ignition mechanism, which were a tungsten firing pin and a percussion igniter cap. The proposed ignition of the fuel in the rocket body was for the tungsten pin to be forced into the firing cap by the enormous acceleration of the complete rocket as it was fired out of the launch gun. The nose cap was also screwed onto the rocket body somewhat in the fashion of a flashlight end cap.

The next construction was to build a test section half way down the 1,900-foot-range which could simulate altitude, temperature and humidity. The test range itself has pumps to reduce the pressure to simulate the altitude and we had a styrofoam box built to control the temperature and humidity. This closed box was made of two one-inch thick styrofoam sheets and was a five-foot by five-foot cross section and 20 feet long. At the entrance end of the closed box, there was a one foot by one foot hole and a cover door of styrofoam was suspended over this hole with a relay operated latch which could drop this door as the test rocket approached. The far wall of the box was a single sheet of styrofoam and the test rocket pierced a hole as it passed through. There was a plexiglass window in the side of the box just opposite to one of the range's windows and its high speed camera.

See **60TH**, page 11

AEDC Fire-Rescue participate in base emergency training

The AEDC Fire-Rescue team simulate extinguishing a truck fire.

During a recent base emergency training exercise, the AEDC Fire-Rescue personnel responded to an emergency simulation involving a chlorine incident as part of the exercise. The simulation included a truck, which was carrying chlorine, catching on fire near the AEDC Fitness Center where one person was killed and three others were injured. The base conducts emergency training periodically to prepare for real life emergencies. *(U.S. Air Force photos/Jacqueline Cowan)*

AEDC Fire-Rescue team members discuss emergency exercise details.

AEDC Fire-Rescue personnel examine training mannequins that represent injured persons during the emergency simulation.

The AEDC Fire-Rescue team transport the training mannequins to emergency personnel for examination.

AEDC Fire-Rescue team members simulate examining training mannequins during the emergency base exercise.

AEDC Milestones

Thomas Phillips
35 years, nLogic

Margaret Smith
35 years, nLogic

Curtis Walters
35 years, nLogic

35 YEARS
Mark Ellis, NAS
Charles Mangino, NAS

30 YEARS
Richard Cox, NAS

Robert Grimes, NAS
Terry Rayfield, nLogic
Bonnie Sherrell, ASO
Erik Wineland, AF

15 YEARS
Charles Falk III, nLogic

10 YEARS
Mark Andrews, AF
Rickey Bruce, ASO
Harry Cooper, nLogic
Michael Tyler, AECOM/URS

5 YEARS
Gary Wayne Bise, NAS
Pam Gibson, ASO

NEW HIRES
David Barrera, ASO
Caleb Caldwell, ASO
John Casey, AECOM/URS
William Corrigan, NAF
Archie Custer, PSI
Jason Freeman, ASO
Erik Graubner, nLogic
Jeffery Hackworth, AECOM/URS
Jonathan Hoold, AF
Spencer Jackson, ASO
Karen Johnson, NAF
Johsua Keith, ASO
Stacey Lamb, AF
Kristi Martin, AF
Stephanie McClintock, ASO
Buck Montgomery, ASO
Brian Neal, ASO

PROMOTIONS
Lindsey Amacher, AF
Edward Crenshaw, AF
Chris Fanning, AF
Malisa Ford, AF
Richard Shleicher, AF

DEGREES AND CERTIFICATES
Alan Clark – Master of Arts in Conflict Resolution

Influenza vaccine update for Airmen, families

By J.D. Levite
Air Force Surgeon General Public Affairs

FALLS CHURCH, Va. (AFNS) – The yearly influenza vaccine is one of the most important regular immunizations for Airmen and their families. This year will be different because the Centers for Disease Control and Prevention has recommended not using the live attenuated influenza vaccine commonly known as FluMist. All the military services will follow their recommendation.

This is because an independent panel of experts, known as the Advisory Committee on Immunization Practices, has found over the past few seasons FluMist has become less effective than other forms of the vaccine.

"People should be reassured that this is exactly how the system is set up to work," said Col. John Oh, the chief of preventive medicine for the Air Force Medical Support Agency. "We are testing the effectiveness of the vaccination annually, and we're taking the appropriate policies to make sure our Airmen are going to be protected."

The absence of FluMist doesn't change anything else going into the immunization season. It's still recommended that people get vaccinated, to include age groups from children as young as 6 months to adults 65 years and older.

According to the CDC, more than 200,000 people are hospitalized from flu-related complications, and as many as 171 children die from the flu every year.

"The flu virus has to be respected. We just really can't underestimate its potential to cause harm," said Maj. Ryan Gottfredson, a pediatrician and Uniformed Services University of the Health Sciences preventive medicine resident. "I think flu becomes commonplace because it recurs every year. So it's easy for people to get lulled into a sense of normalcy and not recognize this as a threat to their health and to their families' health."

He said there are certain groups of people that really need to get the vaccine: children less than 6 years old, adults over 65 years old, pregnant women, anyone with certain chronic medical conditions like asthma, and people with weakened immune systems, among others. The CDC tracks the rates of vaccinations among high-risk groups.

"This is a safe and effective vaccine," Gottfredson said. "Recent studies have shown that the flu vaccine in children can decrease their risk of being admitted to the pediatric intensive care unit by 74 percent, and there's about a 71 percent reduction in flu-related hospitalizations overall."

He added there is a 92 percent decrease in hospitalizations of newborns with the flu whose mothers were vaccinated during pregnancy.

Oh said, "It's pretty clear the influenza vaccination has a lot of really good benefits. We encourage everyone to get it."

There are a lot of ways for Airmen to get the influenza vaccine as it becomes available. Airmen can contact their local military treatment facilities to see if the vaccine is in stock, several clinics and bases do large immunization days where Airmen and their families can show up and get the vaccine quick and easy, and Airmen can also get the shot from retail pharmacies as long as they're a TRICARE participating provider.

Northern Lightning 2016

F-35A Lightning IIs from the 33rd Fighter Wing taxi down the flightline at Volk Field, Wis., during Northern Lightning, Aug. 22. Northern Lightning is a tactical-level, joint training exercise that emphasizes fifth- and fourth-generation assets engaged in a contested, degraded environment. *(U.S. Air Force photo/Senior Airman Stormy Archer)*

2016 September

ALC – Arnold Lakeside Center, 454-3350
Café – Café 100, A&E, 454-5885
ODR/ITT – Outdoor Recreation, 454-6084
RRRP – Recycling, 454-6068
Marketing/Sponsorship – 454-3128
Barber Shop – 454-6987
GC – Arnold Golf Course, 454-GOLF
MG – Mulligan's Grill, GC, 454-FOOD
FC – Fitness Center, 454-6440
WI – Wingo Inn, lodging, 454-3051
Resource Management – 454-7425
Admin – 454-7779

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Combat Support & Community Service
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Arnold AFB Services

ALC FREE THURSDAY MOVIE 6:30PM

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Movie: The Shallows, PG13	2 **ALC Jam Night** cancelled	3 ** ALC Closed ** **GC Fall Open** 8 am 2 day stroke play $40 per person Sign up by Sep 2 454-GOLF
4 **GC** Fall Open	5 **Café 100** Closed	6	7	8 Movie: The Legend of Tarzan, PG13	9	10 ** ALC Closed **
11 FootGolf 454-GOLF Arnold Golf Course 3pm-dusk Wed, Fri, Sat, & Sun	12	13	14 **Café 100** *National Hoagie Day* Hoagie combo $6.50	15 **ALC Brushes & Bottles** $25 GLC 6pm **Sign up by Sep 9** Movie: Warcraft, PG13	16 **AF Birthday Fair** 1-3:30pm ALC back lawn Open to all AEDC personnel *See above*	17 ** ALC Closed ** **ALC Dining Room Hours** **Thu 5-8pm Fri 5-9pm** **Sat NO open dining** ***Sat available for special functions only***
18	19	20	21 Fitness Center **Fall Fun Run/Walk** **Wednesday September 21** Complete 2 laps (3.5 miles) on Fitness Center trail Anytime between 5am-7:30pm Call 454-6440 to sign up First 30 to sign up and complete receive event t-shirt	22 Movie: The Jungle Book, PG	23 **Café 100** *White Chocolate Day* White Chocolate Mocha $3.75 venti	24 ** ALC Closed **
25	26 **Café 100** *National Pancake Day* Pancake Combo $4	27	28	29 Movie: Ice Age: Collision Course, PG	30 **ALC Trivia** 6:30pm	

★★★ U.S. AIR FORCE
AF 2016 '47
THE TRADITION CONTINUES
AF actual Birthday – 18 Sep

Happy Birthday

AF Birthday Fair!
Arnold Lakeside Center
16 Sep 16 1-3:30pm
Free Cake! DJ Door Prizes
Clan Destiny Circus (roaming/interactive acrobats)
Fitness Resources w/mini classes & massages,
ODR Rental Equip Demos, & fun photo booth

HAPPY BIRTHDAY Air Force

Come to The Landing at Arnold Lakeside Center to celebrate TGIF with your friends and coworkers.
Open 3pm every Friday
Social Hour & Snacks 3:30pm

Stop by Outdoor Rec and check out our new rental equipment
Open Thu-Tue 8am-6pm

60TH *from page 8*

The test program was to consist of the first scale rocket loaded with the standard propellant and fired down the range. The data from the cameras were to record the rocket exhaust plume as the rocket passed through the environmental chamber, the mixing of the cold ambient air and the development of the visible plume. This data would be compared to data taken from a fighter plane launch of a full-scale rocket and the plume formation taken by a chase plane that photographed the launch and the resulting contrail.

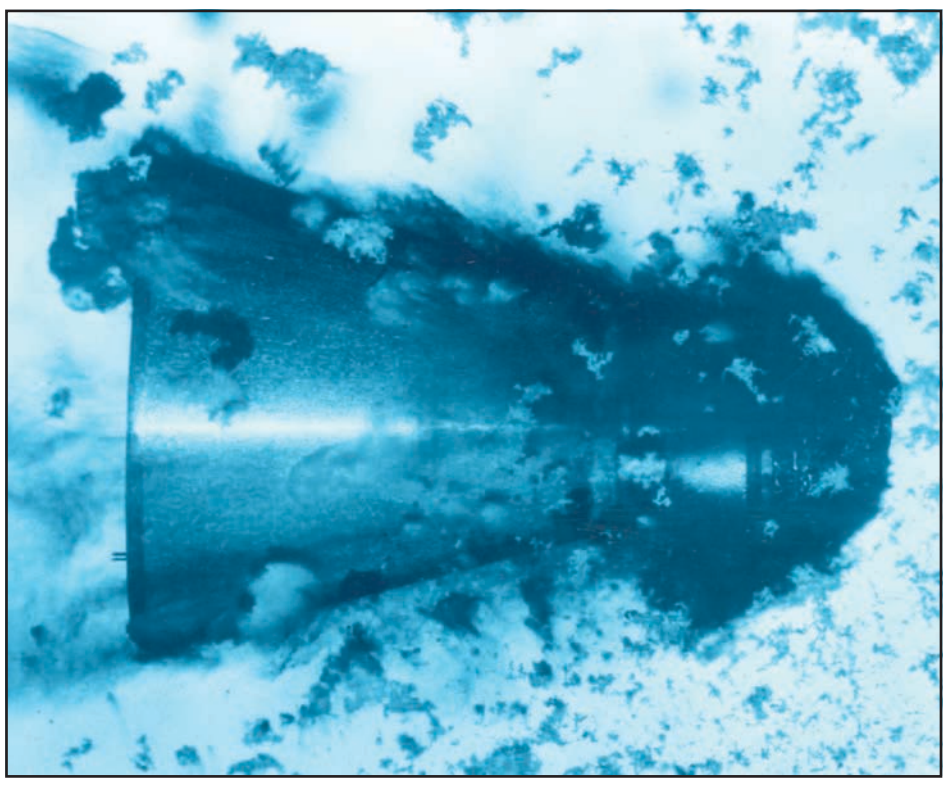
Since there were several precise sequences which must all be accurately timed to the millisecond we allowed three launch attempts in the gun range to make any adjustments in the timing sequence.

To most everyone's surprise the first launch was a complete success. The rocket fuel ignited upon leaving the gun and the model flew down range with the initial launch velocity plus the thrust from its own fuel. The environmental door dropped on time and the rocket flew through the environmental chamber on centerline. Even with the high speed cameras we only caught one blurred frame of the rocket itself. However the remaining film recorded the first primary smoke plume and then the resulting turbulent mixing of the cold moist air and the full development of the condensation trail. This data compared favorably with the chase plane photographs of a real flight under similar altitude, temperature and humidity conditions.

The rest of the test sequence consisted of building additional model rockets loaded with the various test propellants. In the sequence, there were only two failures which were due to the fact that the fuel formulations were too fragile to withstand the launch accelerations. In these models the fuel in the rocket body evidently collapsed into the nozzle and when the igniter cap fired the complete body exploded.

The final product of these tests was data that allowed comparison of the simulated flight tests to static burn tests in relatively small test chambers at the fuel manufacturer's site. This eliminated the need for the expense of further tests of additional formulations in the range.

The time spent at AEDC during these years was very rewarding in the many challenges which were met and the successes achieved in the many varied test programs. I could not have had a more congenial and helpful set of co-workers both with the contractor personnel and the Air Force staff.



Reentry vehicle material test in the hyperballistic Range G using snow. ***(AEDC photo)***