FO OUTLOOK
NASA AMES RESEARCH CENTER

Information for the NASA Ames Aeronautical Test Community Jaunary 3,2000

TiltRotor Aeroacoustic Model (TRAM) Tunnel Entry

By Jeff Johnson

As the Full-Span Tilt Rotor Aeroacoustic Model (TRAM) nears its installation date with the 40- by 80-Foot Wind Tunnel test section, it's appropriate to review this test program and the contributions it will make to the development of Civil Tiltrotors and test technology at Ames.


Bell Boeing V-22 carries a HUMVEE during external load tests at NAS Patuxent River

The purpose of the TRAM program, which began almost ten years ago, is to support both the Short Haul Civil Tiltrotor (SH (CT)) focused program and the Rotorcraft Base program. NASA places high importance on studying tiltrotor aircraft noise because tiltrotors, as short-haul commercial transport aircraft, hold great promise in relieving runway/airspace congestion at major airports. This makes civil tiltrotors a key element of the Aviation System Capacity goal for NASA. With airline passenger traffic forecasted to grow significantly over the next 20 years, runway independent aircraft such as the civil tiltrotor have the ability to bring passengers in and out of airports without adding to the overall congestion on conventional runways.

The successful introduction of civil tiltrotors for commercial use is dependent on the reduction of perceived noise levels in the communities that are frequented by vertical takeoff and landing aircraft. Take-offs and landings are the noisiest phases of flight and therefore, represent a key challenge for public acceptance of tiltrotor use. For this reason, the TRAM project is crucial for the understanding, prediction, and ultimate reduction of tiltrotor noise.

NASA has developed two comprehensive test platforms (models) to study the noise generating mechanisms of tiltrotor aircraft. The first is an isolated rotor model and the second, the full-span dual-rotor model. After a long design and fabrication phase (and a

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11-ft TWT IST, Phase V: Test Section Flow Quality

By Max Amaya and Frank Kmak


View of 8-ft Rake installed in 11-ft TWT Test Section

The Unitary Modernization Project (UMP) was undertaken to upgrade the Unitary Plan Wind Tunnel Facility (UPWT) meeting demands of future wind tunnel testing requirements and remaining competitive with other facilities in the wind tunnel industry. A primary goal of the UMP is to improve the level of flow quality in the test section. Flow quality is the degree to which the flow in a wind tunnel approaches the desired low disturbance conditions that prevail in free flight. High flow quality refers to a flow that is quiet, has low turbulence and possesses uniformity across the flow passage in the test section.

Early in the modernization project, a series of baseline tests were conducted in the 11-ft Transonic Wind Tunnel (11-ft TWT) to establish the existing levels of flow quality. These tests identified the settling chamber and annular/wide-angle diffuser as two areas that could benefit from some type of improvements. The information from the baseline

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Ames' Automatic Balance Calibration Machine

By Chris Lockwood

Modifications to the Ames' Balance Calibration Machine have recently been completed, making Ames one of only two facilities in the country with a fully automated balance calibration machine. The machine now has the capability to automatically simulate any 6-component load combination expected during a wind tunnel test. A load schedule in spreadsheet form, containing any number of these load combinations, can be entered into the machine's data system. Each load condition will then be sequentially generated, and the balance data acquired. Additionally, a recent improvement in reduction of balance data means that unlike previous reduction methods, that required very specific load combinations and sequences, we can now easily use any, and all, combination loads to characterize a balance for a wind tunnel test.

Ames Automatic Internal Balance Calibration Machine.

This automation of the machine has significantly improved productivity. Load conditions are generated much faster than before by feeding back machine load cell data to it's control system. Calibration data is now acquired, from installation to removal, in approximately two shifts (16-hours). Facilities with manual calibration techniques often take more than two weeks to complete the same calibration. This improved productivity certainly makes post-test calibration or check-loading much more feasible. With balance feedback, it is even likely that a test, or a portion of one, could be "re-flown" in the machine (by switching the feedback used to drive the calibration machine, from the machine's load cells to the balance load elements).

Two things make the Ames Balance Calibration Machine unique. The first is it's capacity: It can accept a balance six inches in diameter and 36 inches long; 10,000 lbs. of Normal Force; 5000 lbs. of Side Force; 1500lbs of Axial Force; 30,000 in*lbs. of RM; 40,000 in*lbs. of Pitch Moment; 20,000 in*lbs. of Yaw Moment.

The second item of distinction is that this machine is considered a repositioning machine. This means the orientation of the balance relative to the input load struts remains constant i.e., the deflection (the "springing") of the balance, while it's being loaded, is absorbed on the support or tunnel side of the balance while the model side remains precisely oriented to the machine load cells. The productivity, safe operation and capacity of this machine put Ames at the forefront for calibration of higher capacity wind tunnel balances.

Many people have contributed to the resounding success of this project. Recognition is given to Dr. Johannes M. van Aken for his Multi-Component Balance Data Reduction ToolBox. Thanks also go to all those involved over the life of the modification project. Finally, Dave Husmann (FEE) in particular is recognized for his efforts. He was the project manager for a number of years accommodating many changes in project scope and schedule to align with necessary changes in the Center's focus and philosophy in wind tunnel testing. Dave was largely responsible for the success of this project. §

11ft Static Pipe Calibration

By Joel Hoffman

As the Unitary Modernization Project comes to an end, the impact of the tunnel flow quality improvements on the test section wind speed (Mach Number) and flow quality must be validated. Any changes in these two parameters down the entire length of the test section would effect the previous tunnel calibrations and the ability to compare data from earlier test programs.

Static Calibration Pipe poised for testing in the 11ft test section.

The Static pressure data is acquired at 3-inch intervals along the 6-inch diameter pipe from the test section inlet flex wall through the entire length of the test section. The static pressure calibrations develop a relationship between the test section centerline static pressure and the settling (plenum) chamber static pressure. This relationship is used by the Facility Control System to automatically set a desired centerline test section speed, and by the Standard Data System (SDS) program to calculate the centerline air speed at any given position throughout the length of the test section. The measured pressure variation along the test section centerline is also used in SDS to compute a buoyancy correction for the test article.

The test is repeated, once at tunnel centerline and once along a second elevation 33 inches below the centerline. The centerline Mach calibration is used for full span models that are mounted to a rear sting model support, while the 33 inch data defines conditions for semi span models mounted to a turntable in the floor. Each test employs a separate cable assembly to hold the front end of the pipe at centerline with the rear supported by the model support.

The static pipe assembly is anchored to the upstream tunnel walls at the contraction cone with four cable connections. At the downstream end, the assembly is anchored by a hydraulic cylinder arrangement that is attached to the rear sting model support. This system is pre-tensioned with about 7500 pounds of axial force to minimize the catenary angle of the pipe. The design and implementation of the static pipe was a cooperative effort between Boeing and NASA. Boeing designed and built the static pipe and clamp connections and NASA designed the cables, cable attachments, wall penetrations and hydraulic tensioning system. §

TiltRotor Aerocoustic Model Tunnel Entry...

(Continued from page 1)

lot of hard work) the isolated (single) rotor version of TRAM was made operational in the Fall of 1997. In December 1997 and April 1998, the TRAM isolated rotor test program was completed in the Duits-Nederlandse Windtunnel (DNW) in the Netherlands. These tests produced the first ever simultaneous wind tunnel database of tiltrotor airloads coupled with near-field acoustic measurements. NASA Ames Research Center Code A and F personnel were nationally recognized with the American Helicopter Society (AHS) Grover E. Bell award for this noteworthy accomplishment.

The second major phase of the TRAM Project is the development of the dual-rotor, full-span version of TRAM. The full-span TRAM is a quarter-scale model of the V-22 Osprey tiltrotor currently in production for the U. S. Military. The reason the V-22 was selected as a baseline for TRAM design was because its gross weight is very close to that of the proposed 40 passenger Civil Tiltrotor. The model replicates the entire V-22 airframe including the rotors, nacelles, wing, and control surfaces. The TRAM model is scheduled to be lifted into the NFAC 40- by 80-Foot Wind Tunnel test section on December 20, 1999, completing its checkout prior to an 11-week research test starting early March 2000.

Kneeling (l to r): *Shawn Meszaros, Rod David, Jeff Johnson, Marty Peterson, Gavin Botha, Leon Quintela, Larry Young, Lex Alday, Randy Oldham*
Second Row: *Howard Clark, Lewis Ford, Steve Cunningham, Robert Kornienko, Dora Cunningham, Ardith Richardson, Chuck Meade, Ralph Briones, Jim Toso, Mike Appio, Bob Olgiati, Megan McCluer, Scott Torok, Dan Martin*
Third Row: *Marty Galinski, Emmet Quigley, Tom Burnett, Kare Savage, Steve Swanson, Jan van Aken, Mike Derby, Farid Haddad*

The TRAM 40x80 entry will be the first rotor test to take advantage of the new acoustic test section, expanding upon acoustic work from the isolated rotor DNW test. Full-scale rotor tip speeds including a wider flight envelope will be investigated using far field in flow microphones. Tiltrotor noise mechanisms that can only be studied using a full-span aircraft model are of great interest to rotor acoustic researchers. For the first time, the aerodynamics of TRAM rotor/wing/fuselage interactions will be studied, with insights gained into rotor/airframe acoustic interactions. All of this acoustic/aerodynamic work will add significantly to the understanding of tiltrotor aeroacoustics. The TRAM aeroacoustic database consists of seven main measurement types. These include rotor structural loads, rotor performance, wing static pressures, rotor airloads, acoustics, rotor wake flow visualization and velocity measurements.

The TRAM models are easily the most sophisticated rotorcraft wind tunnel models developed at NASA Ames Research Center. The full-span model incorporates two rotors that are geometrically, aeroelastically and kinematically scaled to the V-22 aircraft. A sophisticated rotor control console was custom built to "fly " the rotors in the wind tunnel. The rotors are powered by two 300 HP pulse-width modulated controlled drive motors mounted inside the fuselage. A drive train comprised of couplings, gearboxes and drive shafts transmits power to each rotor. This drive train operates at 18,000 rpm from the drive motors, through the wings and out to the nacelles. At the nacelles, a gearbox reduces the speed to 1588 rpm, which enables the TRAM rotors to match the full-scale aircraft tip speeds.

In addition to being mechanically complex, TRAM is the most heavily instrumented rotor model ever tested at Ames. The FOI Instrumentation Group has developed a unique system for gathering all the safety and flight instrumentation signals. The full-span TRAM has more than 600 individual measurements to satisfy the research, health monitoring and safety-of-flight data requirements. There are three six-component strain gauge balances (one on each rotor and one in the fuselage), 150 Kulite dynamic pressure transducers in the right hand rotor blades, 100 static pressure transducers in the wing, an onboard rotating amplifier capable of conditioning 264 channels, and over 100 temperature and pressure measurements for health monitoring.

The NFAC NPRIME Group handles the huge volumes of data coming from TRAM. In order to satisfy research requirements for high fidelity data, the blade pressure and tunnel microphone data are acquired at 2048 samples per revolution. Since the TRAM rotor spins 26.5 times per second, that is over 54,000 samples per second per channel! And we have more than 160 high-speed channels! Because a typical data point has 64 revolutions of data (about 2.4 seconds), you can imagine how big TRAM data files get. On a good day of acquiring test data in the 40 x 80 the test team hopes to acquire up to 3 Gigabytes of data.

In order to operate the TRAM model safely and efficiently, a large number of remote control functions are required. As mentioned previously, a dedicated rotor control console was developed to control the rotors during wind tunnel testing. This console allows the rotor operator to maintain proper thrust and trim states of the spinning blades during all phases of wind tunnel testing. The FOW Controls Group is responsible for setting up, calibrating and maintaining the rotor control console. This is just one of many systems the Controls Group has developed for TRAM. Special consoles have been built to control all the model utilities such as oil pumps, oil mist lubrication, balance heaters, etc. In addition, TRAM has several control surfaces such as flaperons and elevators, which must also be remotely controlled. (The Controls Group has designed and built a console to control these surfaces as well.)

Success on a project as large and complex as TRAM is dependent upon the expertise and dedication of a large team, whose members span a wide range of disciplines and responsibilities. There are more than 30 people on the TRAM team. Personnel from NASA and the U.S. Army, Codes AR, FO, and FM are all working together to perform this world-class tiltrotor research. I extend my sincere gratitude to the TRAM team members for their ongoing dedication, commitment and hard work on the difficult task of bringing the Full-Span TRAM to operational readiness. Twenty years from now, when catching a civil tiltrotor flight is a commonplace experience, we will be able to look back with pride knowing we played a part in bringing a new transportation system into existence. **§**

Final Phase of XV-15 Noise Reduction Test Completed!

By Mark Betzina

Front Row (L to R): *Ken Horn, Lex Alday, Felton Smith, Romeo Montano, Ed Nebre, Frank Rosal, Bill Peneff, Rod David.*
Middle Row (L to R): *Mike Reinath, Mark Betzina, Jim Barnes, Cahit Kitaplioglu, Lich Tran, Gene Devargas, Michelle Foster, Steve Nance, Bob Olgiati, Tom Burnett.*
Back Row (L to R): *Bob McKenzie, Tim Gildersleeve, Rob Fong, Ralph Briones, Jason Brown, Ira Chandler, Khanh Nguyen, Alan Wadcock, Ben Bailey, Martie Peterson, Larold Pruett, Alex Sheikman, Benton Lau, Doug Lillie.*

Concluding a series of tests that began over 4 years ago, the XV-15 Noise Reduction test program was successfully completed on October 29. The purpose of the test program was to investigate Blade Vortex Interaction (BVI) noise reduction techniques. Major test objectives included flow visualization with both Laser Light Sheet and Planar Doppler Velocimetry, the use of subwings, Higher Harmonic Control (HHC), and a four-blade rotor. The final phase incorporated a fourth XV-15 rotor blade on a 4-blade hub designed and built specifically for this test. The objective was to determine the fundamental differences between three and four blades in terms of BVI noise for tilt-rotors in approach flight conditions. The maximum BVI with four blades occurred at slightly different flight conditions, but in general the peak levels were about the same as the three-blade rotor. However, by reducing the rotor tip-speed on the four-blade rotor so that the total thrust was equivalent to the three-blade rotor thrust, BVI noise was reduced. This was expected because rotor tip-speed is an important factor in determining BVI noise levels.

The most significant results came from the last phase of the three-blade test in August, where we exceeded the noise reduction goal of the Short Haul Civil Tiltrotor (SHCT) program by demonstrating BVI noise reduction of 16.5 dB utilizing a combination of tip-path-plane angle change and HHC. The tip-path-plane angle change from +3 degrees to –3 degrees can be accomplished in flight by varying the nacelle angle, wing flap position, and approach glide slope. HHC involves high-frequency inputs to the rotor controls, resulting in 2-, 3-, and 4-per-rev blade pitch oscillations on the three-bladed rotor. By making these inputs at the proper phase relative to the blade azimuth position, a large reduction in the rotor's noise signature was produced. SHCT Program Manager, John Zuk, said "this achievement is the equivalent of breaking the sound barrier by fixed wing aircraft." While it was expected that HHC could be used to reduce noise, no one anticipated the magnitude of the reduction.

The SHCT program, which is an element of the Aviation Systems Capacity program, funded the 80x120 testing because noise is a key issue for the future of commercial tilt-rotor aircraft. BVI occurs during descending flight conditions typical of landing approach, creating high noise levels under the path of the aircraft. A future vision for these aircraft is that they will fly into city centers and land at building-top vertiports, thus relieving congestion at major airports. BVI noise reduction is considered an important technology enabling this vision. The large noise reduction achieved in this test may lead to future full-scale testing in the NFAC on current tilt-rotors, i.e. the V-22 Osprey and the Bell Augusta 609, to develop HHC noise reduction systems for these aircraft.

As a result of the outstanding job accomplished by the NFAC test crew, directed by Rob Fong, this test was one of the most successful ever accomplished in the NFAC. Some (but not all) of the many people who made significant contributions to this success are shown in the crew photo above. §

11-ft TWT IST, Phase V: Test Section Flow Quality... *(Continued from page 1)*

tests and the projected needs of future wind tunnel testing were used to establish several flow quality goals. Goals were established for turbulence, flow angularity, temperature and Mach number stability for a Mach=0.8 and PT = 4597 psf: (see table)

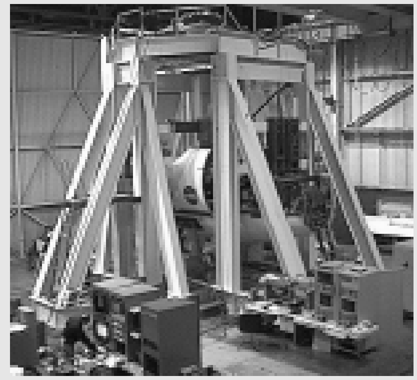
UMP Flow Quality Goals at M = 0.8 and PT = 4597 psf		
Turbulence	u'/U (10 Hz < f < 10 kHz)	≤ 0.2%
Flow Angularity	Alpha and Beta averaged over the test volume	Ave. < ±0.05° Standard deviation < 0.1°
Temperature	TTF	< ±4°F
Mach Stability	Mach (10 sec interval)	≤ 0.001

To meet the flow quality goals, the UMP made several flow quality enhancements to the transonic circuit: a Turbulence Reduction System (TRS) and a back-leg Diffuser Flow-Smoothing System. The TRS, which consists of a honeycomb followed by two screens, was installed in the settling chamber to reduce the streamwise and lateral convective turbulence entering the test section. The honeycomb is made of 0.010" stainless steel and consists of 1" hex cells, which are 20 inches deep. The screens are made of 6 mesh, 0.041" stainless steel wire.

LRTA Balance Calibration

By Patrick M. Shinoda

The Large Rotor Test Apparatus (LRTA) is being developed at the NASA Ames Research Center. The LRTA will be used for testing large, full-scale rotor systems in the 40-by-80-Foot and 80-by-120-Foot Wind Tunnels. Power to these rotor systems is provided by two 3,000 hp electrical motors, which are located forward and aft of the LRTA transmission. A six-component strain gauge balance is mounted on top of the transmission. The rotor shaft upper housing is mounted onto the metric side of the balance. The upper housing contains the thrust bearings, which transmit all rotor loading, except rotor shaft torque to the upper housing and into the metric side of the six-component balance. A separate balance flex-coupling is installed between the transmission output shaft and the rotor shaft. This flex-coupling is instrumented to measure shaft torque. The maximum load capabilities of the LRTA balance are listed in the Table below:



LRTA installed in the calibration test stand.

Maximum LRTA Balance Load Capability

	Steady	Unsteady
Thrust Up	40,000 lbs.	12,000 lbs.
Thrust Down	3,000 lbs.	
Torque	157,000 ft-lbs.	7,800 ft-lbs.
Hub Shear	10,000 lbs.	5,000 lbs.
Hub Moment	29,000 ft-lbs.	21,000 ft-lbs.

(With Rotor Hub Loads At 60 in. above balance moment center)

Experience with the Rotor Test Apparatus (RTA), a smaller version of the LRTA (see X-15 Noise Reduction Photo) presently in operation, has found that installed calibrations of a multi-component balance gives better results than "bench-top " calibration. A review was conducted to determine the feasibility of reusing the existing calibration/check-load hardware used to calibrate the RTA multi-component balance. It was found to be inadequate for use in calibrating the LRTA balance. Therefore, a new calibration rig was developed at NASA Ames Research Center to allow for the installed calibration of the LRTA's multi-component balance.

The new calibration rig consists of an open structural box constructed from I-beams. The box-structure has a 40 ft- by –40 ft base foot print and is 25 ft. tall. The LRTA is installed in this rig using the same three LRTA support points that are used to install the LRTA on the three support struts in the NASA Ames wind tunnels. A calibration body is installed onto the LRTA rotor shaft spline in a manner similar to the way a rotor system would be mounted. A loading tree, consisting of a loading rod, a hydraulic actuator, and an in-line load cell, forms the connection between a calibration body load point and the non-metric frame of the calibration rig, surrounding the LRTA. A total of eleven loading trees, all operating in a tension mode, are used to apply the balance loading. A hydraulic control system has been developed to control the hydraulic actuators, using the output of the in-line load cells in a closed loop feedback system. This control system allows for single and multi actuator operation so as to apply single and multi-component loading to the balance. A separate data acquisition system has been developed to acquire both the applied loading as measured by the in-line load cells and the response of the rotor balance gauges.

The purpose of this first balance calibration is to prepare the LRTA for measuring UH-60 Helicopter rotor system rotor loads during testing in the NASA Ames Research 80-by-120-Foot Wind Tunnel. This test will take place in June of 2000.

As of mid-November, the main calibration frame structure has been installed around the LRTA. The anchor hardware to which the hydraulic actuators are attached are installed, and the operational checkout of the hydraulic control system and load cells has been completed.

Alignment and installation of the loading trees should be completed by the end of November. Balance calibration should begin in early December and be completed by January of 2000. **§**

11-ft TWT IST, Phase V: Test Section Flow Quality

The addition of the TRS addresses one of the primary sources of turbulence. Turbulence resulting from acoustic disturbances generated by the test section slot/baffles, compressor drive tones, and main diffuser were not affected by the UMP circuit modifications.

The back-leg Diffuser Flow-Smoothing System includes the addition of Annular Turning Vanes (ATVs), and Annular Diffuser Flaps (ADFs), focused on reducing the long-period velocity fluctuations that affect the tunnel Mach number stability. The ATVs were installed at the entrance to the Wide-angle Diffuser (WAD) and are designed to redirect flow towards the walls improving the overall flow distribution at the face of the aftercooler. A better distribution in the aftercooler results in a better temperature distribution in the test section. The ADFs installed on the compressor nacelle in the annular diffuser eliminate the unsteady separation phenomena at the exit of the annular diffuser, and energize the outer wall flow layer prior to the sharp turn at the WAD.

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11-ft TWT IST, Phase V: Test Section Flow Quality

(Continued from page 5)

Improvements in test section flow quality were verified during Phase 5 of the 11-ft TWT Integrated Systems Test (11-ft IST). Measurements of the turbulence, acoustics, and temperature fields at TS 185 and the flow angularity at TS 164 were made using sensors mounted on an 8-ft span rake. The 8-ft span rake was instrumented with a 5-hole cone probe, single-and dual- element hot-wires, 10° unsteady pressure cone probes and total temperature probes. The five-hole cone probe was installed on the rake centerline.

Flow quality data were acquired for Mach numbers ranging from 0.2 to 0.95 at the four total pressure set points of 0.5, 1, 1.5, and 2.2 atmospheres. The three tunnel configurations tested include the baseline with the tunnel in a normal configuration, the second with the floor slots covered to simulate semi-span testing configurations, and the third with all of the wall slots taped over. The solid wall configuration was tested to document a baseline for potential slot baffle treatment improvements in turbulence and acoustics. The horizontally instrumented rake was also moved vertically to survey a cross section of the tunnel from 14 inches "waterline" up to 94 inches "waterline".

The test finished on September 28, 1999 after three weeks of occupancy. Analysis of the flow quality data is currently underway, however preliminary results show significant improvements in flow quality.

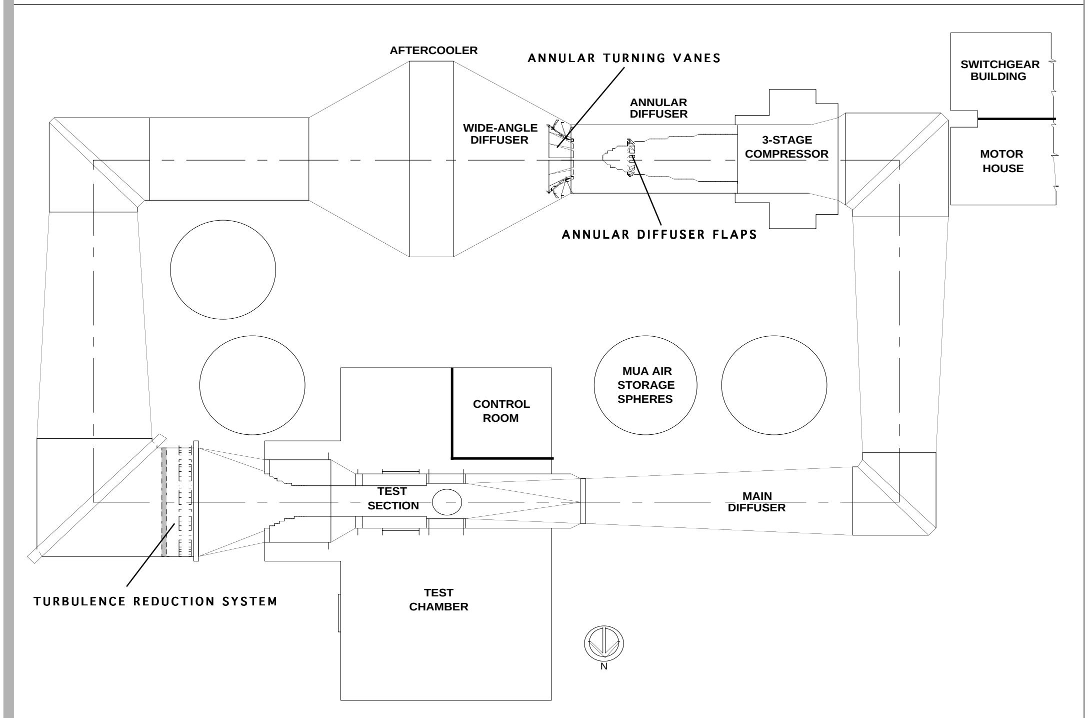
Pre-modernization flow field survey data showed indications of a vortex near centerline near test section waterline 40 with a crossflow gradient of up to 0.6 degrees over a 10 inch vertical region with the test section in a solid floor configuration.

Data taken with the same tunnel configuration show no such vortex. Preliminary crossflow data show that the variations are within 0.10 degrees.

Preliminary turbulence data show that at a Mach number of 0.80, the baseline u'/U turbulence level has been reduced from 0.33% to 0.24 % at a nominal total pressure of one atmosphere. With all test section slots covered, the turbulence is further reduced to 0.17%. The turbulence gradient throughout the test section was also noted to be much more uniform than the pre-modernization levels.

The test provides a preliminary look at the improvements to the 11-ft test section flow quality. The "Flow Uniformity" and "Turbulence and Acoustics" tests will evaluate the flow quality in more detail. The Flow Uniformity Test maps the flow angularity, total pressure, static pressure and total temperature at two test section planes. Measurements are made using a traverse system that allows the flow quality probes to be positioned off-centerline.

11-ft Transonic Wind Tunnel Circuit



The Turbulence and Acoustics test uses the 8-ft Rake populated with additional turbulence and acoustic sensors. Both tests evaluate flow quality for both subsonic and supersonic test conditions at four total pressure set points. §

FO OUTLOOK

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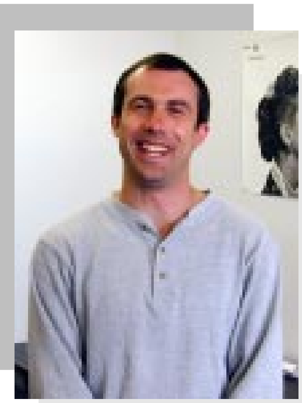
Employee of the Month Awards

Alex Sheikman



Branch FOI would like to commend Mr. Sheikman for his role as an instrumentation engineer when our branch lost two instrumentation engineers on the XV-15 (3-bladed) test program. Even though he has been detailed to the ARA organization, he was willing to help our branch. Alex recognized a sense of urgency in providing instrumentation engineering support and took charge immediately of the situation.

Alex invariably came in early to catch up with documentation, resolve technical problems, coordinate instrumentation activities with the dayshift crew, and still managed to work on swing shift! His ability to analyze and identify problem areas made the research-testing run smoothly.

He was one of the key contributors to the success of the program, which included a significant noise level reduction by maintaining all critical instrumentation for the XV-15 and Rotor Test Apparatus.

In summary, Alex has performed in a manner that is worthy of recognition for the Civil Servant of the Month Award. His planning, execution, and enthusiastic dedication on the XV-15 test project have made him a valuable asset to the test team, our branch, his new organization, and to the research community.

Mike Reeves

The use of infrared imaging for preventive maintenance was started at the NFAC approximately two years ago by NASA Engineering Technician Mike Reeves. He researched industry preventive maintenance best-practices and successfully advocated getting the equipment and capability established in the wind tunnels. The equipment is now used by both Sverdrup and NASA to assist in machine health monitoring in the interest of preventing failures and providing critical data.

Following a recent coil failure and repair on the critical NFAC drive motor-generator, preventive maintenance procedures using infrared thermography were implemented. As the newly repaired machine was restarted, the IR Thermography alerted the NFAC staff to an impending failure by displaying hot spots on the motor coils. If the failing coils had not been detected and repaired, they would have arced and blown out as the first coil did. High voltage stator coils failing under load can cause significant collateral damage to the adjacent coils and the stator core. If they had failed, it would have at best resulted in several weeks of tunnel down time for unscheduled repairs, and at worst could have caused damage not repairable except by a total rewind. For his exceptional effort and dedication Mike Reeves is the Employee of the Month for November.

Why is Safety Important?

By Phil Stich and Mike George

We all have an important role in preventing accidents. There are three motivational factors for preventing accidents; moral, legal and economic. In a safe and successful organization all three of these must be present, with moral motivation being the most prevalent. The organization has the moral and legal obligation to provide a workplace that is free from recognized hazards, which are likely to cause serious physical harm to the employees. Effective training, proper equipment and strict adherence to safety standards are essential elements to meeting this obligation.

> **"Safety is a requirement, not an option!"**

Accidents are abnormal, unacceptable occurrences, which are the result of an organizational failure where one or more components have not performed properly. Accidents are costly, in addition to personal injury, there is loss of work time, medical bills, workman's compensation and equipment repairs. Accidents are caused and can be prevented. If you eliminate the cause, you will eliminate the accident. The FO NASA and Contractor organizations will continue to do whatever is necessary to ensure the safety and well being of our employees. §

Employee of the Month Awards

Ronnee Gonzalez

Ronnee, with the able assistance of Scott Clayton, got a procurement solicitation and award accomplished in record time. The award had the potential value of $400K. Ronnee looked at various procurement strategies and consulted with other procurement officials to suggest an approach to the technical personnel and then guided them through the steps necessary to award. The rapidity of which things happened amazed the vendors and our own PBC contractor. When people say things have changed in the government procurement system they are correct but it takes people like Ronnee to really make things happen.

Scott Clayton

Scott Clayton is a De Anza student working under Ronnee Gonzalez' mentoring. Scott took the write-ups from the technical personnel and formatted them for the web posting. He worked closely with everybody to make sure things were done correctly and timely. This was a learning experience for him and it was done error free. For this effort Scott Clayton is given the first ever Student of the Month Award.

Jill Kulpinski

Jill Kulpinski has been a Computer Systems Analyst at the 12' Pressure Wind Tunnel nearly continuously since she came to Ames two years ago. Her degree in aeronautical engineering certainly gave her a valuable insight into the data which is our end product, but it could not have prepared for the challenges and frustrations of quickly becoming THE DATA SYSTEM REPRESENTATIVE on a running shift.

However, Jill is unceasingly cheerful, unfailingly modest and unquestionably talented. She works well with our customers providing answers, results and training as appropriate. She knows when to pursue solutions to problems on her own and when to call for help to minimize lost time. She comes to work an hour early, usually on her mountain bike - 5 miles before sunrise, to ensure that the data system is performing well to facilitate instrumentation checks and calibrations before the scheduled running shift.

Jill has shown particular resourcefulness in creating a Summary Report script in the PERL language. The output from this program, sent to a Macintosh from the System Management Processor (SMP) using a file transfer protocol (FTP), gives the test manager an essential tool for monitoring certain measures of data quality. It also provides a clear as-run log of configurations and test conditions. The test managers for the High Wing Transport, Trapezoidal Wing and Technical Concepts Airplane programs all used Ms. Kulpinski's Summary Report as part of their formal transmittal documentation.

Without this new utility, the test manager would be required to scan, sort, compare, manipulate, organize and report data from his entire test database in much less efficient and less accurate processes. For all her good work, Ms. Kulpinski is congratulated and awarded a Contractor Employee of the Month Award for September.