AIAA Ground Test Technical Committee

GTTC Newsletter
Virtual
Summer 2021
Issue No. 51

Thank you for supporting the GTTC!

Please take a (virtual) copy of the newsletter with you.
Chairman’s Message

Thank you for reading through our Ground Test Technical (GTTC) Newsletter. This newsletter is meant to keep AIAA members and other interested people informed on the GTTC activities. I hope you will find that it serves its purpose well. Special thanks go to the newsletter editors, Bob Griffiths and Denise Choi.

While last year, 2020, was a challenging year as the world faced a global pandemic, this year, 2021, will hopefully yield the slow path to healing. While many are still suffering from the repercussions of last year, still struggling to be healthy and safe, and still working towards recovery, this year has given many hope that normality and safety may be within reach. Amazingly, the pandemic did not stop innovation. Ground Test facilities across the world continue onward with critical testing and advancements of important projects, adapting to the new world we now live in.

The GTTC is excited to be a part of the AIAA Aviation 2021 virtual forum, yet another adaptation to ensure the safety of AIAA’s members while maintaining their mission. We have contributed to the virtual activities by providing eight technical sessions. In addition to the forum’s technical sessions, the GTTC meets to support other activities such as conferences, awards, publications, standards, education and student activities, and overall TC direction and management. Our very active TC members also participate in working groups in nine technical focus areas.

If you are interested in becoming a GTTC member, you can apply through the AIAA web site at www.aiaa.org. TC membership nominations open in the fall and close early November.

With the virtual forum, it’s easy to advertise working groups that are meeting virtually and not all of our working groups are meeting. If you have an interest, you may contact me, and I can direct you to the working group’s chair.

The GTTC is a community of collaborators that extends far beyond just the TC membership, and you need not be a member to participate in working groups. We are honored to be a part of the AIAA mission and its forums to help promote the exchange of ideas, learning, advocating for our industry, and networking. We are also always looking for ways to improve not only the GTTC put also our field within the aerospace community. Your ideas and participation are greatly appreciated. If you have questions or want information about the GTTC, you can contact me directly at stephanie.simerly@nasa.gov and I will respond as best I can. We look forward to a year of moving forward. Stay safe!

Thank you,

Stephanie Simerly

GTTC Chairperson
**Upcoming AIAA Conferences**

**AIAA SciTech Forum 2022**
3-7 January 2022 | San Diego, CA

**AIAA AVIATION Forum 2022**
27 June – July 1, 2022 | Chicago, IL

**About the GTTC**

The GTTC is one of more than 60 technical committees sponsored by the American Institute of Aeronautics and Astronautics (AIAA). It is made up of approximately 50 professionals working in various areas of the ground testing world.

Our membership addresses important technical issues that affect ground testing through several means, including the development of guides and standards, dissemination of information through technical sessions at conferences, and the development and sponsorship of short courses.

The GTTC also participates in Congressional Visits Day, which is a vital tool for making sure that aeronautics and space-related research and testing are supported at required levels.

One of the primary functions of every technical committee is the sponsorship and development of conferences and technical sessions. The GTTC supports two conferences each year. Every January, the GTTC meets at the AIAA Science and Technology Forum and Exposition (AIAA SciTech), where we sponsor several technical sessions. In the summer, the GTTC also attends and sponsors sessions at the AIAA Aviation and Aeronautics Forum and Exposition (AIAA AVIATION).

**Chair:** Stephanie Simerly – NASA Glenn  
**Vice-Chair:** Ryan Kew – Calspan FMS  
**Secretary:** Chris Jorgens – Boeing

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**AIAA Ground Test Award**

The Ground Test Award is given to an individual or team that has made significant contributions to the field of ground testing in the aerodynamic and propulsion disciplines during their careers. Recipients are selected based on several criteria including: excellence in technical or managerial ground testing, participation in professional societies, authoring publications and papers, and teaching or mentoring activities.

Anyone can submit nominations for the Ground Test Award. Simply login to your AIAA account at [http://www.aiaa.org](http://www.aiaa.org) and click “Honors and Awards” to start a new nomination for the Ground Test Award. Nomination packages must be submitted no later than October 1 of a given year to be considered for the following years’ Ground Test Award. Please contact Stephanie Simerly (stephanie.simerly@nasa.gov) for more information.

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**2021 GTTC Best Paper Award**

The AIAA Ground Testing Technical Committee hosts technical sessions in the summer AVIATION and winter SciTech conferences. GTTC annually recognizes several outstanding papers from both the AVIATION and SciTech conferences. These “Outstanding Papers” are reviewed each spring to select one “Best Paper” for the entire previous year. The 2021 Ground Testing Best Paper Award was: “Infrared Thermography on a Biconic Model in Hypersonic Expansion Tube Flows” (AIAA 2021-0873) as authored by:

Timothy G. Cullen (Lead) (t.cullen@uq.edu.au),  
Christopher M. James, (c.James@uq.edu.au)  
Ranjith Ravichandran (r.ravichandran@uq.edu.au),  
Matthew Thompson (m.thompson@uq.edu.au),  
Michael E. Moran (m.moran@uq.edu.au),  
Ranjini Ramesh (r.ramesh@uq.edu.au),  
Richard G. Morgan (r.morgan@uq.edu.au),  
Thirukumaran Nadesan (thirukumaran.nadesan@nus.edu.sg).
Focus Groups

The primary function of a Focus Group is sharing of information within the ground test community. Focus Groups typically meet twice a year at AIAA conferences where members exchange of ideas, lessons learned, and build technical knowledge.

Current GTTC Focus Groups

US Industry Test Facilities
Chair: Tom Wayman (Gulfstream)

Statistically Defensible Test Methods
Chair: Matt Rhode (NASA-Langley)

Turbine Engine Test
Chair: Robert Ciero, Jr. (Honeywell)

Dynamics Space Simulation
Chair: Ryan Schmit (USAF/AFRL)

Writing Quality
Chair: Pat Goulding (AEDC-NFAC)

Dynamic Force Measurement in WTs (New)
Chair: Ryan Schmit (USAF/AFRL)

Additive Manufacturing (New)
Chair: Devin Burns (NASA-Langley)

Active Working Groups

GTTC working groups are established to address technical needs in the aerospace ground testing community. These provide a forum for discussion and the development of solutions and standardization in technical areas. Members include GTTC, non-GTTC, and non-AIAA industry and academia experts. Anyone interested in these working groups are encouraged to attend the meetings. See the end of the newsletter for meeting rooms and times. The active GTTC Working Groups include:

Future of Ground Testing
Chair: Steven Dunn (NASA Langley)
Vice-Chair: Vic Canacci (Jacobs, GRC)

Develop a roadmap for non-engineers demonstrating the importance of experimental and computational tools necessary to support aerospace mission requirements.

Model Attitude Measurement
Chair: Kenneth Toro (NASA Langley)
Vice-Chair: Eric Schuch (Calspan)

Develop a recommended practice that discusses methods to measure model attitude in wind-tunnel testing.

Model Deformation Measurement
Chair: Melissa Rivers (NASA Langley)
Vice-Chair: Harold Quix (ETW)

Develop a recommended practice that discusses methods to measure model deformation and twist in wind-tunnel testing.
**Measurement Uncertainty Standard**  
**Chair:** Erin Hubbard (NASA Glenn)  
**Vice-Chair:** Tyler McElroy (NASA Glenn)

Develop best practices and/or standards for the measurement and reporting of experimental uncertainty associated with wind-tunnel testing.

**Wind Tunnel Flow Quality**  
**Chair:** Rajan Kumar (Florida State Univ.)  
**Vice-Chair:** TBD

Develop best practices and standards for the measurement and reporting of unsteady or fluctuating flow parameters related to wind-tunnel testing.

**High Speed WT Calibration**  
**Chair:** Matt Rhode (NASA Langley)  
**Vice-Chair:** Mike Mills

Develop a recommended practice AIAA document for the calibration of high speed (supersonic and higher) wind tunnels.

**Wind Tunnel Model Design Guidebook (New)**  
**Chair:** Doug Weber (NASA Langley)  
**Vice-Chair:** TBD

Develop a guidebook of recommended best practices in the design of wind tunnel models. This guidebook will capture the knowledge and experiences from practitioners across the aerospace industry and made available to model designers and engineers.

**GTTC Task Subcommittees**

Task Subcommittees (SC) are comprised of current GTTC members and are responsible for most of the duties necessary to operate the GTTC each year. This includes planning conference sessions, awarding outstanding papers and workers in the field of ground testing with nationally recognized awards, maintaining and generating new publication materials, recruiting, and appointing new members, and coordinating student outreach and educational activities.

**GTTC Steering Committee**  
**Chair:** Stephanie Simerly (NASA Glenn)  
**Vice-Chair:** Ryan Kew (Calspan FMS)  
**Secretary:** Chris Jorgens (Boeing)

The Steering committee provides the bulk of the administrative efforts for the GTTC. The Steering committee reviews policy, AIAA business and all matters of global interest to the GTTC. The Steering committee is composed of the GTTC chair and vice-chair as well as the Primary and Tasks subcommittee chairs and vice-chairs.

**Program Steering Committee**  
**Chair:** Tom Wayman (Gulfstream)  
**Vice-Chair:** Vic Canacci (Jacobs, GRC)

Promote advancement of aerodynamic ground testing technology, while serving as liaison to other AIAA and non-AIAA organizations and provide forum for discussion and establishment of aerodynamics-related working groups

**Awards and Upgrades**  
**Chair:** Brandon Chynoweth (Purdue)  
**Vice-Chair:** Rebecca Rought (AEDC)

The Awards and Upgrades Subcommittee coordinates and participates in the selection process for the annual Ground Testing Award presented by AIAA for outstanding achievement in the ground testing field. The committee also manages the Outstanding Paper Award process that recognizes the technical quality, relevance, presentation, and readability of papers presented at the various GTTC sessions.

**Conferences**  
**Chair:** Pat Goulding II (AEDC NFAC)  
**Vice-Chair:** Chris Nykamp (AEDC NFAC)

The Conference Planning Subcommittee plans and organizes GTTC conferences and sponsored sessions for the annual SciTech forum in the winter and the AVIATION forum in the summer.
Activities include electing conference chairs, selecting session chairpersons, planning the conference program and the site meeting rooms, preparing the Call for Papers, and planning of coordinated short courses, tours, luncheons, and special exhibits.

**Education and Student Activities**

**Chair:** George Moraru (AEDC)  
**Vice-Chair:** TBD

The Education and Student Activities Subcommittee encourages interaction between GTTC members and their local schools. New ideas for experiments and/or testing kits for students who want to learn about flight and aviation are always needed.

**Membership**

**Chair:** Ryan Kew (Calspan FMS)  
**Vice-Chair:** Chris Jorgens (Boeing)

The Membership Subcommittee, comprised of the vice chair of the GTTC and the vice-chairs of the Aerodynamics and Propulsion subcommittees, strives to provide a balance in the technical background and represented organizations when reviewing applications for new members. Selected new members are notified in March. Applicants who are not selected in the year that they apply are eligible for consideration the following year.

**Publications**

**Chair:** Bob Griffiths (Aerogene LLC)  
**Vice-Chair:** Denise Choi (General Atomics)

The Publications Subcommittee promotes the efforts of the various GTTC subcommittees through dissemination and publication of technical information, journal articles, and use of other forms of media. In addition to the annual Aerospace America “Year in Review” article, the committee is responsible for preparing the GTTC newsletter, flyer, posters and maintaining the technical committee’s web site & social media content. Ground-testing-related articles and news items for use in Aerospace America “Year in Review” and the GTTC newsletter are solicited from current and former GTTC members and others in the ground testing community.

**Standards**

**Chair:** Steve Amanda Chou (NASA Langley)  
**Vice-Chair:** John Laffen (WSU – NIAR)

The Standards Subcommittee oversees the AIAA standards, recommended practices, and guides that are created and maintained by the GTTC. Activities include working to get documents approved and published by AIAA and determining when a document needs updates.

**GTTC Liaisons**

GTTC maintains contact with other Technical Committees through liaisons. This relationship is typically reciprocal.

**GTTC Liaison to Public Policy**
Steve Dunn

**GTTC Liaison to Applied Aerodynamics TC**
Steve Helland (AATC: Nathan Hariharan)

**GTTC Liaison to Flight Test TC**
Joe Patrick

**GTTC Liaison to Fluid Dynamics TC**
Rajan Kumar (FSTC: Jenna Eppink)

**GTTC Liaison to V/STOL TC**
Pat Goulding

**GTTC Liaison to AMT TC**
Ryan Kew (AMTTC: Greg Jones)

**GTTC Liaison to SAE International**
Vic Canacci

**GTTC Liaison to Continuing Education**
George Moraru (CETC: Angela Trego)
GTTC Liaison to Cybersecurity WG (ISG) - New
Vic Canacci (CyberWG: Sam Adhikari)

AIAA Standards, Recommended Practices, and Guides Published by the GTTC

AIAA Recommended Practice for Wind Tunnel Testing — Part 1 (AIAA R-092-1-2003e)

AIAA Recommended Practice for Wind Tunnel Testing — Part 2 (AIAA R-092-2-2003e)

AIAA Recommended Practice: Calibration and Use of Internal Strain-Gage Balances with Application to Wind Tunnel Testing (AIAA R-091A-2020)

AIAA Recommended Practice for the Calibration of Subsonic and Transonic Wind Tunnels (AIAA R-093-2003e)

Assessment of Experimental Uncertainty with Application to Wind Tunnel Testing (AIAA S-071A-1999e)


Dual Flow Reference Nozzles for Verification of Sub-Scale Thrust and Airflow Test Rigs: Dual Separate Flow Reference (DSFR) and Dual Mixed Flow Reference (DMFR) (AIAA R-146-2020)

Facility Improvements, Return to Service & Novel Testing Techniques Showcase Critical Ground Testing

RUAG Large Wind Tunnel Emmen (LWTE), Switzerland

Submitted by: Dr. Peter Aschwanden, RUAG

To serve the growing interest of Urban Air Mobility (UAM) companies for aerodynamic and aeroacoustic wind tunnel tests, several additions to the RUAG Large Wind Tunnel Emmen (LWTE) were recently implemented to expand the capabilities of the facility for testing either scaled models or full-scale flight hardware. Provisions to ensure sufficient electrical power for UAM test articles and more flexible means to perform aeroacoustic tests were added.

Isolated test for an Urban Air Mobility (UAM) propulsor in the LWTE 5x7m Test Section
For more conventional aircraft configurations, hydraulic power remains the power option of choice for models tested in the LWTE. Corresponding developments are on-going. The first specimen of a new compact hydraulic motor family in the >100kW (>135HP) range with maximum speeds in excess of 30,000 RPM is in the last stages of testing on the brake before it drives a scaled turbofan simulator in the LWTE in support of the EU sponsored TRUflow project later in 2021.

**Japan Aerospace Exploration Agency (JAXA) Highlighted Achievements**

*Submitted by: Dr. Natsuki Tsushima, Aeronautical Technology Directorate, JAXA*

The Aeronautical Technology Directorate within the Japan Aerospace Exploration Agency (JAXA) demonstrated their new approach for efficient wind tunnel model construction via application of the additive manufacturing (AM) technique. By taking advantage of additive manufacturing, structural (i.e., stiffness/mass distributions and strength) and aeroelastic characteristics of wing models can be controlled for specific test conditions of interest with an elaborately designed internal structure, which would be difficult to be manufactured by traditional techniques. In contrast to a conventional design of wing models as an assemblage of multiple components (e.g., spars, ribs, and surface panels), the tunable aeroelastic design is easily described in a structural model. Such a single structural model helps to ensure accurately capturing structural characteristics and to focus on investigations of aerodynamic and aeroelastic phenomena.

Using this approach, half-span wing models for transonic testing in the JAXA 0.6 m by 0.6 m Flutter Wind Tunnel (FWT) were fabricated by the Powder Bed Fusion (PBF) process with Ti6Al4V or AlSi10Mg powder. The flutter test results showed good agreements with numerical aeroelastic solutions since the structural characteristics and surface forms precisely corresponded to the numerical model using the new design approach. The test campaign demonstrated the feasibility and capability of this unique methodology for the construction of transonic flutter wing models. Further applications of the method on more sophisticated wing designs will be explored to investigate detailed capabilities and limitations.

**New Capabilities at the European Transonic Windtunnel (ETW)**

*Submitted by: Harold Quix, European Transonic Windtunnel, Germany*

The European Transonic Windtunnel (ETW) in Cologne, Germany, is Europe’s unique testing facility for high Reynolds number testing, enabling aircraft manufacturers to test their designs at flight Reynolds and Mach numbers under defined aeroelastic conditions. To provide more valuable data and to increase its productivity, ETW continuously seeks new methodologies to expand its capabilities. In 2021 this process continues via implementation of the following two achievements.
Commissioning of the new Lean Secondary Roll Mechanism (LSRM)

The Lean Secondary Roll Mechanism is a slender double roll mechanism designed for low interference, wings-level yaw measurements of transport aircraft configurations up to high yaw angles, thereby enlarging the capabilities for sideslip testing combined with excellent productivity. The LSRM enables affordable flight Reynolds number handling quality testing in addition to the capability of applying all advanced optical measurement techniques on the model surfaces. Especially suited for laminar wing design concepts, continuously driven wings-level yaw measurements are essential for the determination of robust wing designs.

Successful application of a Remote Controlled Aileron Actuator (RCAA) for a Cryogenic Highspeed Full-model Test

Robust, remotely controlled control surfaces at full-model similarity parameters achieve a step change in productivity in ETW's cryogenic operating environment. A newly commissioned patented concept enables efficient performance and handling quality testing at true flight conditions. A team of experts from Deharde GmbH and ETW targeted the application of a remotely controlled aileron installed on a highspeed full model. This device has been designed to be adjusted wind-off while remaining in the test section at cryogenic and pressurized conditions over the complete range of deflections encountered at highspeed conditions – no transport or manual rigging efforts needed. A first test series in 2020 successfully demonstrated this capability on a representative full model at transonic Mach numbers, and at flight Reynolds numbers. The tests included two deflected aileron settings together with an undeflected datum configuration.
Fan blade failure

In October 2019, NRC’s Altitude Icing Wind Tunnel in Ottawa, Ontario suffered a catastrophic fan failure. All 32 of the composite blades were severely damaged along with many of the cast aluminum stator vanes. At the time of the failure, the facility was operating an icing test at high speed under high altitude and low temperature conditions. The Altitude Icing Tunnel fan is a two stage, high hub-to-tip ratio machine with inlet guide vanes.

Following the failure, the facility staff conducted an inspection of the debris field hoping to find an obvious root cause. However, nothing was found other than composite blade fragments. The initial investigation of the rotors revealed that all of the blades sheared off from their aluminum holders at the root - except for one blade which had completely released, leaving behind a clean holder. It is believed that the release of this blade from its holder (due to the failure of the adhesive bond at the blade/holder interface) was the root cause of the failure of both rotors.
Return to Operation

The facility had a full spare set of blades and holders for immediate installation but no spare stator vanes. Given the age of the facility, the manufacturing drawings for the stator vanes no longer existed. As a result, the facility team made use of a 3D laser scanner to generate a CAD model of an undamaged vane for subsequent manufacturing.

Prior to installing the spare set of blades, an investigation was carried out on the bonding technique and fabrication of the blades. Ultimately for the blade that cleanly released from its holder, it was determined that a critical step in the preparation of the bonding surface had been missed. This led to the bond strength being far below the value required for safe operations. In comparing the blade holder drawing to the physical part, it was noticed that the surface roughness specified on the aluminum-holder bonding surface had not been specified on the drawing. The holder had a smoother surface than prescribed in the design specifications leading to the determination that it was this step that was missed during manufacturing. Evidently, this called into the question whether the same step had been missed in the fabrication of the spare set of blades.

Test blades and holders were fabricated with and without the missing surface preparation step. Each of the blades was then pull tested and the blade release loads were recorded. Not surprisingly, the blades with the missing step failed at a much lower load value. The spare set of blades was then pull tested to the same load as the faulty blades failed; fortunately, none of the spare blades failed giving confidence that this critical step had not been missed during their fabrication. All this testing activity took place in parallel to the fabrication of the new stator vanes.

Example of a pull test on a test blade and holder without the surface preparation step

As this facility is utilized heavily (40 weeks of running time per year), there was tremendous pressure to return the tunnel to service as quickly as possible. The facility team was able to clean up the debris, carry out a root cause analysis, fabricate the damaged stator vanes, carry out pull tests of the blades, re-install the fan and carry out validation tests in just under three months.

NRC’s Propulsion Icing Wind Tunnel – Remotely Piloted Aircraft System (RPAS) Testing

Submitted by: Luc Levasseur, Aerospace Research Center, National Research Council (NRC), Canada

In the summer of 2021, the Transport Canada RPAS task force engaged NRC to conduct wind tunnel experiments to measure the extreme magnitude of urban airflow fluctuations - for each flow type - for Canadian cities.

The objective of these experiments is to support Transport Canada in the development of...
regulations for safe operation of remotely piloted aircraft systems within urban environments by providing knowledge on extreme airflows within Canadian cities and the flight response of commonly used RPAS to these airflows. The team accomplished simulating and measuring urban airflow utilizing four city models representing Canadian cities (Vancouver, Toronto, Halifax, and an Artificial city).

Models of four Canadian cities

The impacts to regulatory agencies and benefits to the RPAS industry include -

Improving RPAS operational safety in cities by:
- Providing aerodynamic knowledge of RPAS operational limits within typical Canadian urban airflows for development of regulations for higher-risk operations.
- Preparing technologies to inform future amendments to Part IX of the Canadian Aviation Regulations (CARs) for RPAS.
- Developing methods for assessing RPAS response to representative urban flow features.

Supporting the Canadian RPAS industry by:
- Improving knowledge of urban flows with RPAS manufacturers to ensure products are safely designed.
- Enabling Canadian subject matter experts (SMEs) to develop a Canadian competency in verti-pad assessments for robust Canadian urban infrastructure.

The next phase of the wind tunnel experiments is scheduled for Fall of 2021 and will focus on examining the effects of wind speed and turbulence on RPAS flight tests. These tests will include RPAS and operators at hobbyist and professional levels.

AEDC’s Propulsion Wind Tunnel 16S Returns to Service After 24 Years

Submitted by: Rebecca Rought, Arnold Engineering Development Complex

The Arnold Engineering Development Complex’s (AEDC) Propulsion Wind Tunnel 16S conducted a successful test of an Advisory Group for Aerospace Research and Development (AGARD) B standard model in January 2021. This test was a demonstration of tunnel operability after a multi-year reactivation effort. The supersonic wind tunnel has a 16 ft x 16 ft test section that has been operated from Mach numbers 1.5 to Mach 4.75. The tunnel last conducted a
customer test in 1997 and has been inactive since that time. The January test verified the integrated functionality of key systems, including test article control and data acquisition systems.

The AGARD B is standard model with planar symmetry, well understood and internationally used. This symmetry, along with high fidelity CFD results and the analysis of standard tunnel instrumentation, allowed for the validation of tunnel flow quality and the tunnel calibration. As a result of this test, it was determined that Tunnel 16S is currently capable of meeting the needs of customers who wish to test up to Mach number 2.0. Continuing tunnel upgrades are under way to restore the capability to the full Mach number range of 4.75.

Additional programmed investment includes extending the Mach number capability into the hypersonic regime as well as to reinstate the tunnel’s propulsion testing capability that provides altitude matched conditions up to Mach 3.0. As part of these efforts, a scavenging scoop used for propulsion testing was refurbished and recently used to calibrate large mass flow plug assemblies required for propulsion integration testing in Propulsion Wind Tunnel 16T. The ability to perform these calibrations in Tunnel 16S represents a new capability for AEDC.

The AGARD B model shown in the 16S Test Section

NASA-Ames Unitary Plan Wind Tunnel Continues Operations During Pandemic

Submitted by: Jon VanHorn and Eric Paciano

The NASA Ames Unitary Plan Wind Tunnels (UPWT) successfully supported multiple test programs, accumulating almost 1500 User Occupancy Hours from July to December 2020. This proved to be very challenging due to the COVID-19 pandemic. Special protocols were put in place to ensure the safety of both the operational crew and customers. The facility was able to complete these programs without a single recorded case of sickness at the facility. One notable test program was the Sierra Nevada Dream Chaser, which tested in both the 11-ft Transonic and 9x7-ft Supersonic Test Sections.

SNC Dream Chaser Model Tested in the Ames 11-ft TWT in August 2020

In December 2020, the Ames UPWT began a multi-month maintenance period. Many systems were upgraded during this time. One notable upgrade was the installation of the large optical windows in the 11-ft test section. These windows will allow for a greater, unobstructed view of the model while using optical test techniques (such as shadowgraph).
Ames Check Standard Model seen through the new large optical windows at the 11-ft TWT

An Integrated Systems Test was successfully completed in May 2021, ensuring the tunnel and all supporting subsystems performed safely and the facility was ready to resume customer operations. Immediately following the Integrated Systems Test, the Ames Check Standard Model was tested to document flow field changes that might impact the wall interference correction scheme.

NASA-Langley Research Center

Highlighted Achievements

Submitted by: David Chan, NASA Langley Research Center

The NASA Engineering & Safety Center (NESC) and Space Launch System (SLS) High Reynolds Number Test in the National Transonic Facility (NTF) was successfully completed on April 2, 2021, after a one year delay due to the COVID-19 pandemic.

The objective of the test was to assess and characterize Reynolds number effects on the ascent aerodynamics of the SLS launch vehicle. A total of 420 data runs were acquired which consumed nearly 1900 MW-hrs of power and nearly 27,000 tons of liquid nitrogen during the test. The results from the test will be used to inform and update the SLS Ascent Aerodynamics Force & Moment Database and the SLS Ascent Aerodynamics Partial Derivatives Database.

Force & moment and surface pressure data were acquired for Mach numbers between 0.5 and 0.95 at Reynolds numbers up to 40 million corresponding to about 30% - 40% of flight Reynolds number. Additionally, flow visualization data from Pressure Sensitive Paint (PSP) were acquired focused on the area around the Solid Rocket Booster (SRB) forward attach hardware, which is an area known to exhibit unsteady flow at transonic speeds. The data from the test will also be used to compare to Computational Fluid Dynamics (CFD) simulations and help understand the reason for any discrepancies between experimental and computational results.

The cryogenic test article (Figure 1) was a 1.75%-scale representation of the SLS Block 1 Cargo configuration fabricated mostly out of stainless steel to withstand test temperatures as low as -250 °F and dynamic pressures as high as 3500 psf.

Several parts including the SRB attach brackets and SRB aft skirt & nozzles were additive manufactured out of Inconel 718 using Direct Metal Laser Sintering, in order to pass internal pressure flowpaths through the SRB parts while also maintaining geometric fidelity. This was the first use of additive manufacturing on structural components of a cryogenic model in the NTF, and thus required post-fabrication coupon strength testing and x-ray computed tomography scans (Figure 2) to satisfy safety requirements.
Figure 1 – (upper) SLS cryogenic wind tunnel model in the NTF test section; (lower) application of PSP.

Figure 2 - Sample computed tomography (CT) scan showing the internal pressure flowpaths in the SRB attach brackets.
Historical Photos of the Walter H. Beech Wind Tunnel

Submitted by: John Laffen, NIAR, Wichita State U.

This July, the 7 x 10 foot low speed (subsonic) wind tunnel on the campus of Wichita State University and a landmark laboratory of the National Institute for Aviation Research (NIAR) will celebrate 70 years of continuous operation dedicated after one of the greats in aviation and a local legend – Walter H. Beech.

Enjoy some photos from the past and present!

Figure 3: Artist’s Rendering of WSU Wind Tunnel (circa 1947)

Figure 4: Construction of the WSU Wind Tunnel (circa 1948)

Figure 5: Completed and Operational WSU Wind Tunnel (circa 1949)

Figure 6: Dedication to the late Walter H. Beech, July 15, 1951

Figure 7: Aerial View of WSU campus and Walter H. Beech Wind Tunnel (circa 1951)
Figure 8: WSU Campus today. Can you find the Beech Wind Tunnel?

Figure 9: Beech Wind Tunnel Test Section (circa 1950s)

Figure 10: Beech Wind Tunnel test section today – Boom Supersonic XB-1 model

Figure 11: Dedication placard
AIAA SciTech Virtual Forum Aviation 2021

Ground Test Committee Meetings

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<td>Steering, Standards, &amp; Publications Committees</td>
<td>Tuesday July 27, 2021</td>
<td>10:30am – 12:30pm (EDT)</td>
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<tr>
<td>Awards, Conferences, &amp; Education Committees</td>
<td>Wednesday July 28, 2021</td>
<td>10:30am – 12:30pm (EDT)</td>
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<tr>
<td>Meet the TC and New Members Briefing</td>
<td>Friday July 30, 2021</td>
<td>10:30am – 12:30pm (EDT)</td>
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<tr>
<td>GTTC Closeout Meeting</td>
<td>Thursday August 12, 2021</td>
<td>10:30am – 1:00pm (EDT)</td>
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Working Group Meetings

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<tr>
<td>Uncertainty Working Group</td>
<td>Tuesday August 10, 2021</td>
<td>2:00pm – 4:00pm (EDT)</td>
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<td>GTTC Defining an AIAA Initiative on Integrating Experimental and Computational Methods</td>
<td>Wednesday August 11, 2021</td>
<td>10am – 11:30am (EDT)</td>
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<tr>
<td>GTTC Wind Tunnel Model Design Working Group</td>
<td>Wednesday August 11, 2021</td>
<td>10:30am-12:30pm (EDT)</td>
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Ground Test Technical Sessions Schedule

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<th>Session</th>
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<td>GT-01</td>
<td>Evaluation of CFD as a Surrogate for Wind-Tunnel Testing for Mach 2.4-4.6 I (Steve Helland, Pat Goulding)</td>
<td>Monday, August 2</td>
<td>11:15am – 12:30pm EDT</td>
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<tr>
<td>GT-02</td>
<td>Evaluation of CFD as a Surrogate for Wind-Tunnel Testing for Mach 2.4-4.6 II (Roman Paryz, Tom Wayman)</td>
<td>Monday, August 2</td>
<td>2:30pm – 3:45pm EDT</td>
</tr>
<tr>
<td>GT-04</td>
<td>Introduction to Ground Test Facilities (George Moraru)</td>
<td>Tuesday, August 3</td>
<td>1:00pm – 3:00pm EDT</td>
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GTTC Newsletter No. 51 August 2, 2021

<table>
<thead>
<tr>
<th>Session Code</th>
<th>Title</th>
<th>Date</th>
<th>Time</th>
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<tbody>
<tr>
<td>GT-05</td>
<td>Recent Advances in Development and Use of Strain-Gage Balances</td>
<td>Tuesday, August 3</td>
<td>2:30pm – 3:45pm EDT</td>
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<td></td>
<td>(Norbert Ulbrich, Ryan Kew)</td>
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<tr>
<td>GT-06</td>
<td>Wind Tunnel Facility Upgrades and Improvements</td>
<td>Wednesday, August 4</td>
<td>11:15am – 12:30pm EDT</td>
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<td>(Chynoweth, Simerly)</td>
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<tr>
<td>GT-07</td>
<td>Electric Motor Powered Aero-Engine Simulator (EMPAS) Project</td>
<td>Wednesday, August 4</td>
<td>1:00pm – 2:15pm EDT</td>
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<td>(Chris Jorgens, John Doherty)</td>
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<tr>
<td>GT-08</td>
<td>Topics in Wind Tunnel Testing (Matt Rhode, Rebecca Rought)</td>
<td>Thursday, August 5</td>
<td>11:15am – 12:30pm EDT</td>
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<td>1:00pm – 2:15pm EDT</td>
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<tr>
<td>GT-09</td>
<td>Wind Tunnel Measurement Technology and Techniques</td>
<td>Thursday, August 5</td>
<td>11:15am – 12:30pm EDT</td>
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<td>(Harald Quix, Melissa Rivers)</td>
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<td>1:00pm – 2:15pm EDT</td>
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**For more information contact:**
GTTC Chair: Stephanie Simerly
Phone: (216) 433-6772
email: stephanie.simerly@nasa.gov

**Connect with the GTTC**

Use a QR code reader on your smart phone to quickly find us on the web or clicking this link.

https://engage.aiaa.org/aerospace-sciences/communities/all-asg-communities

All session briefings with audio to be available on-demand at least one week prior to conference. Live Q&A with authors to take place at slotted times. Working and Focus Group meetings to be coordinated at the discretion of group chairs. Look for email announcements.