40th ANNIVERSARY 1979–2019
SCIENCE AND TECHNOLOGY CORPORATION
STC NEWS
... An Innovative Advanced Technology Company
VOL. 26, NO. 1 | HAMPTON, VIRGINIA | SUMMER ISSUE 2020

STC Awarded ETSS Contract

Science and Technology Corporation (STC), as a subcontractor to New Horizons Aeronautics, was awarded the Engineering Technical Support Services (ETSS) contract in January 2019. The ETSS contract encompasses engineering expertise for research, flight, and mission operations, engineering support for facilities and safety/mission assurance, support for various technical functions including project planning and control, range support, lab support, and special studies, and most recently, CAD drawing control engineering.

Ms. Kim Bestul

As part of our series on employee spotlights, we would like to highlight the efforts of three STC engineers on this contract: **Ms. Kimberly Bestul, Ms. Tegan French**, and **Mr. Rocky Garcia.**

Kim Bestul has served as lead meteorologist for various field and flight research projects including Unmanned Aircraft Systems (UAS) integration in the National Airspace System and Aircraft Acoustic Research. As the Lead Contract Meteorologist, Ms. Bestul largely oversees project support across the team. She is the primary meteorologist behind:

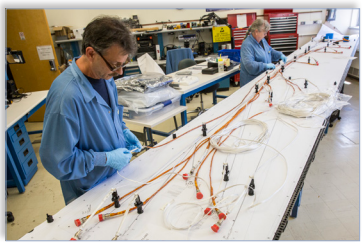
Renovation/Overhaul of SoDAR 2000. Organizing and overseeing enclosure renovations, acoustic foam replacement, speaker replacement, and pioneering NASA Armstrong Flight Research Center (AFRC) ability to remotely access data from the SoDAR. An operational SoDAR allows for three-dimensional wind measurements from the surface of the Earth to nearly 2,000 ft above ground level (AGL) highlighting wind shear and turbulence features near the surface.

Construction of a permanent Automated Surface Observing System (ASOS) similar weather tower for NASA AFRC. Market research and recommendation of suite purchase based on compatibility with existing outdated sensors.

– Continued on page 4 (see **ETSS CONTRACT**)

On To Mars, MEDLI2

NASA's goal is to eventually get humans to Mars and STC is once again in the thick of helping achieve that goal. Hardware installed onto NASA's Mars 2020 entry vehicle in August 2019 helped to increase the safety of future Mars landings. The Mars Science Laboratory (MSL) Entry, Descent, and Landing (EDL) Instrumentation 2 (MEDLI2) project developed a suite of sensors that will measure aerothermal environments and the performance of thermal protection system (TPS) material during the entry phase on the Mars 2020 mission. MEDLI2 recently completed environmental testing on flight hardware at NASA's Langley Research Center, Hampton, VA. The testing included vibration and thermal vacuum testing, demonstrated the ability of the hardware to survive the large vibratory loads experienced during the launch, and the extreme cold during the cruise to Mars.


Mr. Rick Thomas and Mrs. Cathy Kern

MEDLI2 includes three types of sensors (thermocouples, heat flux sensors, and pressure transducers), a data acquisition and signal conditioning unit (the Sensor Support Electronics Unit) to record the heating and atmospheric pressure experienced during entry and through parachute deployment, and the harnessing between the sensors and the Sensor Support Electronics (SSE) unit. STC technicians **Mrs. Cathy Kern, Mr. Rick Thomas,** and **Mrs. Jeri Carter** worked diligently on MEDLI2 and in particular the harnessing between the sensors and the SSE. These flight cable harnesses are 30-feet-long groups of electrical wires that will transmit signals for some MEDLI2 sensors. It takes about 8 weeks to build and test all of the harnesses. After completion, they were shipped to Lockheed Martin for integration onto the Mars 2020 heat shield.

MEDLI2 will measure pressure, temperature, heat flux, and radiation on the capsule that encloses the Mars 2020 rover during Mars atmospheric entry. The data collected will extend the groundbreaking entry data collected by the first MEDLI instrument suite flown aboard the Mars Science Laboratory mission in 2012 and improve designs of entry systems for future robotic and human missions to Mars.

The Mars 2020 spacecraft entered Mars' atmosphere traveling about 12,500 miles per hour (mph). MEDLI2 started collecting data about 5 hours prior to the entry and continued to collect data throughout the entry and part of the descent phases. It took about 6 minutes

– Continued on page 4 (see **MARS, MEDL12**)

In This Issue...

Orion AA-2 Launch

On July 2, 2019, years of hard work and effort culminated in the Ascent Abort test flight called AA-2. The years of effort were on display for just over 3 minutes, but what a 3 minutes it was! Launch is always an exciting time. The roar of the engines, the ground lighting up, and the ever increasing speed of the rocket, is both invigorating and beautiful. A handful of STC personnel, who worked intimately with different aspects of the AA-2 effort, were on hand at Cape Canaveral, FL to witness the fruits of their labor. Those attending the launch included **Mr. Mike Barney, Mr. Tony Daley, Mr. Eric May, Mr. Matt Stearman, Mr. Bill Weigel**, and **Mr. Aaron Wright**. The primary areas of STC's contribution included platform modifications for Space Launch Complex (SLC) 46 and the crew module and separation ring flight test articles.

The platform modifications were required for SLC 46 to accommodate the modified aero-shell for the Peacekeeper rocket used for the flight test. This larger diameter aero-shell required modified platforms that matched up with it properly. Three such platforms were required. The new platforms were required to refit the Mobile Access Structure (MAS) to accommodate a modified Peacekeeper booster. The AA-2 article used a single stage Peacekeeper missile first stage motor [SR118] inside an aero-shell to replicate the Orion Service Module 5.5-meter diameter. The existing MAS had to be modified with platforms designed and built at NASA Langley Research Center, by STC, to surround the Orion Abort

– Continued on page 4 (see **ORION AA-2**)

STC Boulder, CO Employee Recognized


Ms. Sydnee Masias

Hispanic Heritage Month is observed annually from September 15–October 15. The month serves to recognize and celebrate the achievements and contributions of American citizens whose ancestors came from Spain, Mexico, the Caribbean, and Central and South America.

Each year the National Council of Hispanic Employment Program Managers (NCHEPM) receives thousands of submissions for their Hispanic Heritage Month Poster contest. STC employee, **Ms. Sydnee Masias**, located in Boulder, CO, was the artist chosen in 2019 to be featured on their poster! Ms. Masias described her entry with the following words, "The range in ways that Hispanic Americans serve our country is as diverse as the people themselves; from the sciences to the arts and everything in between Hispanic Americans have a long history of serving our nation through the individual communities and organizations. I wanted to represent this, as well as, unity, service, and diversity in my poster. My poster illustrated colorful hands to symbolize the diversity amongst Hispanic Americans. The diversity is also represented by the patterns located throughout the image and I based the illustrated pattern on traditional Latino art motifs. I then showcased the idea of service through the symbol of hands positioned in fists. Fists are a symbol of strength and support and is often used to express unity. Next, the hands lead into a silhouette of the United States to reinforce the idea of unity, service, and diversity within our nation."

Ms. Masias is a graphic designer and scientific illustrator at the National Oceanic and Atmospheric Administration (NOAA). For the past two years she has worked on a variety of projects, including creating visuals for national conferences and designing posters for NOAA's public spaces. Outside of her work at NOAA, she is active in the Denver art community and participates yearly in the One Club of Denver Paper Fashion Show fundraiser. □

NASA Ames Contractor of the Year Award

Mr. Geoffrey Ament, an STC employee who works on the AEMMS contract at NASA Ames in Mountain View, CA, was recently awarded the NASA Ames Contractor of the Year Award. Mr. Ament is a Research Associate in the field of Mechatronics Engineering. The award citation reads, "Mr. Ament's desire to explore, design, and innovate embodies the true spirit of what a NASA Engineer should be. He is articulate, meticulous with his work, and strives for excellence." In their nomination letter the nominators cited that, "Since the start of his employment as a Science and Technology Corporation (STC) research associate in August of 2015, Mr. Ament has made substantial contributions to NASA's RLVT mission with respect to both terrestrial and Martian flight. In 2017, he was part of the Multicopter Unmanned Aerial Systems (UAS) performance test team, during which he designed and manufactured quadcopter mounting hardware for mounting to the 7-by-10 ft wind tunnel sting mount. He was the test director for the first-ever wind tunnel test of a simulated rotorcraft in forward flight at Mars atmospheric conditions, which led to a data report that he presented at the 2018 AHS conference in San Francisco, CA, and subsequently led to a NASA Contractor Report (NASA/CR-2018-219736). Furthermore, as part of the Mars Helicopter risk reduction effort, he designed and assembled the test hardware for the rotor blade spin-up in the JPL Space Simulator, a requirement for Mars Helicopter testing; moreover, he led efforts to build a dust chamber and coaxial rotor control system to perform dust studies in order to study saltation and the effects of dust on the helicopter's onboard sensors. Currently, Mr. Ament is the lead for all rotorcraft testing performed at Martian atmospheric densities in the Planetary Aeolian Laboratory (PAL), and he designed (and is currently assembling) a 2-by-2 meter wind tunnel for rotor testing at Martian atmospheric conditions as well as terrestrial UAV testing."

STC would like to congratulate Mr. Ament on this award and to thank him for the years of exceptional service that he has provided to NASA Ames through STC. □

The STC NEWSLETTER is published by
Science & Technology Corporation,
21 Enterprise Parkway, Suite 150,
Hampton, Virginia 23666.
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DCSA Awards STC the Cogswell Award

The Defense Counterintelligence and Security Agency (DCSA) has awarded STC's Corporate Office in Hampton, VA the 2020 James S. Cogswell Outstanding Industrial Security Achievement Award. The announcement said: Your facility has demonstrated you are among the "best of the best" in implementing an industrial security program of excellence. Only 61 out of the approximately 12,500 cleared facilities in the U.S., and 2 out of 500 from the Hampton Roads area, were chosen this year. This prestigious award was established in 1966 in honor of the late Air Force Col. James S. Cogswell, the first chief of industrial security within the DoD. Congratulations to STC's Security Team of **Mrs. Carol Lightner** (Security Officer), **Mr. Jeff Manning** and **Mrs. Jennifer McCauley** in the Hampton Office and **Ms. Glenda Lissimore** in Belcamp, MD Office. □

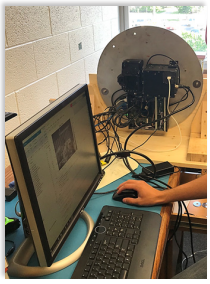
Aberdeen Test Center – Welding, Fabrication, Machining and Painting Project

Since January 2017, STC has been supporting the mission of the Aberdeen Test Center (ATC) at the Aberdeen Proving Ground (APG), MD. APG is the oldest of five military weapons proving grounds dating back to 1918. ATC's mission is to test all forms of weapons and systems in order to ensure they provide the maximum safety for our U.S. war fighter against constantly evolving enemy threats, and also, that our weapons are highly effective against our enemies and the threats they pose against the U.S. STC supports the testing efforts at ATC with manufacturing that includes fabrication, welding, machining, and painting. The items manufactured support the testing performed on the many test ranges at ATC. Vehicles, ships, aircraft, structures, body armor, weapons, etc., are tested for all branches of the U.S. military, Homeland Security, State Department, and U.S. allies. Because of APG's proximity to Washington, DC, the testing being performed can be easily witnessed by members of Congress and the Pentagon.

Within an environment of proving and experimenting, STC's support must be highly adept and agile in order to perform workscopes that are dynamic and often ad hoc. Work instructions can be highly detailed and specific, such as, adherence to tech manuals or ad hoc sketches that change daily over the life of the project. STC management must ensure its work force of craftsmen are skilled and capable to perform the challenging work put before them. Because of the excellent support provided by STC's corporate shared services, the on-site management can focus its efforts on directing the craftsmen in their execution of the ATC mission support requirements. □

STC Methane Detection Instrument

by Mark Schoeberl



FINIS mounted to look out a window. The actual instrument is the black box with the white cord. Below that is the flight computer and to the left is the context camera.

Methane is one of the most powerful greenhouse gases, about 30 times more effective at trapping infrared (IR) radiation than CO^2. Burning methane as a substitute for coal or oil also reduces CO^2 emissions. The improvements in CO^2 emissions are cancelled out if methane leakage approaches about 5–10% of the methane production. Regulators have focused on leakage from methane wells, transmission lines, compressors, and the distribution system. Currently, methane leaks are monitored using in situ sensors, but a remote measurement flying in low orbit or on an aircraft would be a more efficient way to spot leaks.

STC is developing the algorithm and supporting the calibration approach working with Utah State University (USU) to develop a remote methane sensing instrument using commercial off the shelf (COTS) equipment. The prototype instrument, called FINIS, has been calibrated in the lab, tested in an outdoor environment, and on an airplane. The instrument can measure > 2 cm of column methane. The atmospheric abundance of methane is about 1 cm. This means it can detect moderate to small methane leaks from a pipeline. STC is evaluating the calibration processes and working with the students. The project is being headed by Dr. Charles Swensen at USU.

During the aircraft flights, the instrument flew over scheduled releases of methane, landfills, oil processing facilities, and agricultural centers. The data is currently being processed. □

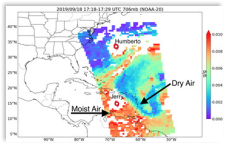
FINIS mounted in the aircraft on top of a mount to reduce vibration

STC Researchers Investigating How to Improve Hurricane Forecasting

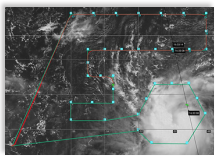
by Rebekah Esmaili, Research Scientist

The STC-developed NOAA-Unique Combined Atmospheric Processing System (NUCAPS) is the NOAA operational product system for four polar-orbiting satellite platforms—MetOp-A, MetOp-B, Suomi-NPP, and NOAA-20. NUCAPS retrieves satellite soundings, or profiles of atmospheric temperatures, moisture and other trace gases, from infrared and microwave radiance measurements. After more than 50 years of research in satellite sounding technology, NUCAPS is the first such product to become operational at the National Weather Service (NWS) with support from STC.

On September 18, 2019, Tropical Storm Jerry was anticipated to become a hurricane overnight. To evaluate NUCAPS potential, STC coordinated with NOAA's National Hurricane Center (NHC) in Miami, FL, for a joint NESDIS-NHC science research mission. While hurricane forecast models have become increasingly accurate, aircraft measurements and satellite observations are critical for interrogating model performance. Tropical Storm Jerry was a tricky storm to forecast because Jerry was on the leading edge of a phenomenon called the Saharan Air Layer, a warm dry layer that originates from Africa. The dry air can suppress hurricane development by forming an atmospheric inversion, which prevents air from rising and forming convection. However, to the south, there was a moist tropical marine air mass that fed the system there by making Jerry stronger. These types of competing environments create model uncertainty as some model runs will favor one process over another. Hurricane reconnaissance flights provide measurements that can "correct" the model, but these missions are costly to fly and only provide point observations. Fortunately, satellites can see the surrounding environment outside of the aircraft path. In particular, NUCAPS sounding data is valuable because it can estimate atmospheric moisture at different heights (figure below); in the case of Tropical Storm Jerry, this was useful for corroborating the model output.



So on September 18, 2019, a Gulfstream-IV (GIV) airplane took off from Barbados at 9 a.m. (14Z) for a 7.5-hour research mission that released over 30 dropsondes into Tropical Storm Jerry. The flight was coordinated with the Joint Polar Satellite System (JPSS) satellite overpasses, which had an overpass at 16:33Z. The aircraft dropsondes were used to make comparisons between the satellite observations (such as NUCAPS), forecast models, and aircraft dropsondes. The goal of the campaign was to assess when and where satellites could strengthen decision making regarding hurricanes. The flight took a "lawnmower" back and forth pattern to sample the environment and then later circumnavigated the storm itself (figure below). The coordination between NHC and STC provided valuable information to hurricane forecast models and for evaluating the NUCAPS satellite product, research which can ultimately help increase confidence in warnings about hurricane hazards. □



NEW CONTRACTS

- **June 2020 – STC** was awarded a GSA Small Business (SB) Pool 4 OASIS contract.
- **June 2020 – STC** was awarded a MAC IDIQ contract for U.S. Army Evaluation Center (AEC) Support Services (AECSS) from the U.S. Army.
- **May 2020 – STC** was awarded a subcontract from ASTRA for the EWS Project OT-1A Prototype Rapid Revisit Optical Cloud Imager (RROCI).
- **January 2020 – STC** was awarded a contract for the PROTECH Weather Domain from NOAA.
- **December 2019 – STC** was awarded the Mechanical and Composite Hardware Fabrication Support Services (MCHFSS) contract from NASA Langley for the 4th time.
- **September 2019 – STC** was awarded the follow-on task order for OFCM under the PROTECH Satellite Contract.
- **March 2019 – STC** was awarded a subcontract from Jackson and Tull for a Lockheed Martin Technical Services IDIQ Contract.
- **December 2018 – STC** was one of the awardees of the Seaport Next Generation Contract with the Naval Warfare Systems Command. □

AA-2 Awards

On September 25, 2019, NASA Langley Research Center (LaRC) had an awards ceremony to celebrate the AA-2 Flight Test with special guests Don Reed, Griff Corpening, and Jenny Devolites at the Reid Center and to recognize the various contributions. As Head of the Orion Flight Test Management Office (FTMO), Don Reed led the AA-2 Flight Test Mission with support of his Deputy, Griff Corpening, while Jenny Devolites led the CM/SR (CSR) Project Team that included the CSR structures Hardware delivered by NASA LaRC. STC personnel were recognized for their contributions with specific recognition going to **Mr. Bill Weigel**, **Mr. Aaron Wright,** and **Mr. Eric May.** The awards and appreciation can best be summed up by Mr. Kurt Detweiller, Project Manager, AA-2 Flight Test Article Project, who said, "I wish to personally thank you and all of your employees for all efforts over the last three and a half years in the building of the Orion Ascent Abort 2 Crew Module, Separation Ring, Mechanical Ground Support Equipment, and Mobile Access Structure Platforms. From my vantage point, Science and Technology Corporation truly stepped up to the job and worked well with the government in manufacturing, delivering, and integrating this hardware. Proof in this quality was demonstrated in the actual successful flight test." □

– ETSS CONTRACT *(Continued from page 1)*

Upon assembly, the tower will allow for standard atmospheric measurements in addition to present weather and lightning detection on-site. Tower data will pump directly into NASA network/public weather website—a first of this capability on-site.

She is also a forecaster for Stratospheric Observatory for Infrared Astronomy [SOFIA] project—global flying 747SP with telescope on board for space research. Forecasts include takeoff and landing conditions at the surface, cloud coverage and heights, turbulence, icing, and any other significant weather

She was recently awarded NASA Center Innovation Funds for her proposed idea for development of an advanced instrumentation suite, SonicSonde. When completed, the SonicSonde will serve as a lightweight, comprehensive, tethered instrument that can be used for high-resolution boundary-layer measurements capturing three-dimensional wind, temperature, pressure, relative humidity and air quality data, displaying data via in-house developed software in near real time.

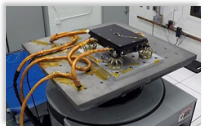

Ms. Tegan French

Ms. Tegan French is a lead meteorological engineer on several NASA ETSS initiatives. She provides weather forecast briefings for NASA flight tests using observations, models, and pattern recognition. She also provides field support by deploying meteorological instrumentation to test sites. Ms. French is the lead on projects including:

Lead Meteorologist for recent supersonic-flight field campaign, CarpetDIEM. CarpetDIEM aims to research the feasibility of vast area instrumentation deployment necessary for upcoming Low Boom research. Upcoming Low Boom research aims to demonstrate sonic-signature flight in a means nondisruptive to the public with the intent to prove supersonic commercial travel can be the way of the future.

Air data calibration analysis involves hand analysis of the entire atmospheric profile at 12Z and 00Z per flight day, producing insight on accuracy error—used as the means for aircraft instrumentation calibration.

– MARS MEDLI2 *(Continued from page 1)*



to slow the spacecraft from 12,500 mph to just under 2 mph. MEDLI2 measured crucial entry and descent performance data on the Mars 2020 heat shield and back shell. The key objectives of MEDLI2 were to reduce design margin and prediction uncertainties for the aerothermal environments and aerodynamic database. Close analysis of MEDLI2 flight data is vital to future NASA exploration of the Red Planet.

This dovetails into the AEMMS contract at NASA Ames where they perform modeling and simulation of EDL, and will be able to leverage the data obtained by MEDLI2 to improve models providing more information for safer landings on Mars. □

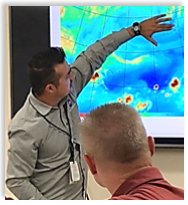
Ms. French forecasted for, prepared, and deployed multiple weather instrumentation suites and handled data collection for this project. She also coordinated with United States Air Force (USAF) for weather balloon launches and data collection and conducted/led air data calibration analysis post flight.

Ms. French has also been a primary weather tower instrumentation consultant—led the inventory, calibration, computer programming, and assembly of each of the numerous weather tower suites owned by NASA AFRC, which included soldering and thorough understanding of datalogging wire diagrams.

In addition, Ms. French has been the lead developer behind a current heat stress condition system—heat stress conditions are critical to track during the summer months in the desert. Ms. French has not only led the assembly of the tower used to measure these conditions, but she has worked closely with NASA IT and SharePoint personnel to display the current flag condition on the Armstrong Xnet site for all personnel across the center to have easy access.

Ms. French stands beside a research-quality weather sensor suite. Multiple suites are typically deployed in support of field research projects.

Mr. Rocky Garcia is the current lead forecaster for daily operations briefs. He is responsible for briefing the operations branch/various other branch chiefs that attend weather conditions for the day. This allows planning for protection of people and assets outdoors (i.e., heat stress conditions and timing, inclement weather timing—wind or precipitation—move people and susceptible instrumentation/aircraft indoors).


Mr. Rocky Garcia

Additionally, Mr. Garcia is now in the lead forecaster position for UAS integration in the National Airspace [UAS-NAS] Flight Test 6 Series. Forecasts include takeoff and landing conditions for both the UAS and Intruder aircraft, weather conditions enroute (wind conditions aloft, turbulence, icing, cloud coverage and heights, in addition to timing of inclement weather or crosswind issues). The FT6 series aims to test the detect and avoid system on Group 3 (500 lbs) UAS. To do so, manned T-34, TG14, and King Air aircraft are used as intruder aircraft. The goal of the research is to help the Federal Aviation Administration (FAA) develop standards for UAS in the NAS.

Mr. Garcia also assists in weather instrumentation deployments writing procedural manuals, contributing to team synoptic map analysis, and general construction. □

– ORION AA-2 *(Continued from page 1)*

Test Booster (ATB) and Launch Abort Vehicle [comprising a Separation Ring, Boilerplate Crew Module (also built at NASA Langley Research Center), and Launch Abort System] outer mold line. Three platforms were built, each slightly different from the other, but the overall dimensions of each were 24 feet x 24 feet. To ensure the platforms would fit seamlessly once at Canaveral Air Force Station, STC built a test platform that had the same dimensions as the MAS. The test platform was laser tracked to confirm that the dimensions of the completed structure matched the dimensions of the MAS. As each MAS platform was completed, it was transported to the test platform for fit up and load testing. The platforms were then trucked, one at a time over three nights, to Fort Eustis, VA where they were loaded on a barge and shipped down to Florida for installation. Bill Weigel, STC's lead fabricator for the platforms, went down to Florida on multiple occasions to assist with the installation of the platforms. Due to the fit up with the test platform, the platforms went in smoothly, with only minor adjustments were needed. The MAS was now prepared for accepting the Orion ATB.

In addition to the MAS platforms, STC was instrumental in the fabrication of the crew module (CM) and separation ring (SR) flight test articles. Aaron Wright, STC's lead fabricator for the flight test articles, went to Houston's Johnson Space Center (JSC) to help with the mating and integration of the CM and SR once they were completed and the CM had passed vibration testing at Plum Brook, OH. The CM built for the AA-2 flight test reused the CM initially started for AA-1 as part of the Constellation program. It was then repurposed for AA-2. When work began on the modifications to the CM for AA-2, it had to be moved from the surface table it was sitting on to another surface table that would provide better access. Once moved and positioned, the real work could begin. Changes to the CM included a modification to the angle of the profile of the outer mold line. This was required to accommodate the new profile while trying to maintain the integrity of the work already completed as part of AA-1. The STC team was instrumental in ensuring the quality and schedule were maintained to meet the launch date as set by NASA. The team worked in shifts and on weekends to ensure schedule. They adapted when engineering changes were made or issues encountered. Once the CM was completed and shipped to JSC, the team immediately started on the SR. The SR served as the connection between the CM and the rocket and again had to meet exacting tolerances. The team performed laser tracking to ensure specifications were met and provided a model in which to perform virtual fit ups prior to performing the actual mating and integration of the CM and SR.

In addition to the platforms, CM and SR, STC fabricated the transportation fixture called the KAMAG, for transporting the launch abort system to the pad for integration at the MAS with the aero-shell and rocket. Again, Bill Weigel lead this effort with Mike Barney. □