Orbiter
December 2014

FAA Uses Aerospace Study to Decide Launch Danger Area

December 29, 2014

Aerospace analyzed radar data of a launch vehicle first stage break-up to help the Federal Aviation Administration (FAA) determine how big an area should remain clear around a commercial launch or spacecraft re-entry.

The FAA is responsible for ensuring public safety and national security during commercial launch and re-entry activities. To do this, the FAA restricts the areas that the public can use in the airspace, on land, and in water around launch and re-entry events.

If the identified area is too small, falling debris potentially could cause harm to the public. Conversely, if the area is too large, unnecessary disruptions to maritime, aviation, and land activities could occur.

The government relies on break-up characteristics and risk models to determine these aircraft and maritime hazard areas. To benchmark and improve the risk models, the FAA asked Aerospace to analyze radar data to determine the break-up characteristics of a commercial launch vehicle's first stage that broke apart into many fragments prior to ocean splashdown. The goal was to identify the number of fragments generated.

In order to determine the keep-out areas during future launches, the FAA would have used the number of hardware pieces in the first stage to estimate the number of fragments — an estimate that ranged from 200 to 1,400 (accounting for the likelihood that some of the parts may or may not separate from one another).

Aerospace has developed radar analysis expertise through supporting Air Force and civil and commercial launches for years, yet this particular break-up analysis posed a unique problem. The radar detection of the first stage break-up revealed hundreds of crisscrossing fragment paths with a variety of shapes, sizes, and velocities.

The challenge was similar to estimating the number of people that have walked on a beach by looking at the footprint tracks in the sand from above, after waves have erased some of the tracks.

Aerospace developed a technique to analyze subsections of the image and generate fragment track segments. The Aerospace team then applied an algorithm to connect the segments along the boundaries of the subsections to produce complete tracks. The analysis concluded that the total fragment count was in the range of 365 to 549 pieces.

This more accurate estimate allowed the FAA to benchmark their prediction and risk models with actual break-up data, instead of using the broad and unverified range of 200 to 1,400 fragments.

The FAA recommended to the Range Safety Group's Risk Committee that the Aerospace analysis be the benchmark for aerodynamic break-up modeling, and that range tracking radars should be equipped to capture data during break-up events. The FAA cited Aerospace's Radar Data Acquisition System and its long history of supporting U.S. launches as one potential tool that could provide this capability.

Through better characterization of actual break-up events, the FAA will be able to more accurately predict the risks associated with launch vehicle break-up and re-entry, and therefore define a more accurate keep-out area.

This article is based on a Value Vignette by Bruce Janousek.

General Managers Take New Leadership Roles

by Kimberly Locke
December 17, 2014

A succession of leadership changes in three of the corporation's business units at the general manager level were recently announced.

Kevin Bell

Kevin Bell has been appointed general manager, Imagery Programs Division, National Systems Group; Todd Nygren has been appointed general manager, Systems Engineering Division, Engineering and Technology Group (ETG); and Andrew Dawdy was promoted to general manager, Developmental Planning and Architectures Division, Systems Planning, Engineering, and Quality (SPE&Q).

Bell succeeds Glenn Davis, who was promoted to vice president, Strategic Space Operations, SPEQ. In his new role, Bell is providing technical leadership for the Aerospace Imagery Programs Division and managing its resources in support of a national security customer.

Bell joined The Aerospace Corporation in 1992 as a member of the technical staff (MTS) in ETG's Vehicle Systems Division. In his most recent assignment, Bell was the general manager of the Systems Engineering Division (SED) of ETG.

Bell has bachelor of science degrees in mechanical engineering and aerospace engineering from the University of California, Davis, and a master of science degree in aerospace engineering from Stanford University.

Todd Nygren

Nygren succeeds Bell and is leading SED's bicoastal efforts to support Aerospace customers in space systems architecture and design, acquisition and planning, mission assurance, and system analysis and simulation.

Nygren joined Aerospace as a summer hire in 1985 and became an MTS in 1987, in which capacity he supported mission planning for military missions on the Space Transportation System for the Space Test Program.

His most recent previous assignment was general manager, Development Planning and Architectures Division, SPE&Q, where he supported the Space and Missile Systems Center (SMC) in the design, development, and analysis of future space, ground, and launch system concepts.

Nygren has a bachelor of arts in mathematics from Bethel College and a master's of science in system architecting and engineering from the University of Southern California.

Andrew Dawdy

In his new position, Dawdy, who replaces Nygren, is leading and supporting SMC in the design, development, and analysis of future space, ground, and launch system concepts to support the warfighter. In addition, he is working to expand these efforts across the national security space enterprise. His organization is also responsible for identifying and assessing technology improvements needed to realize the proposed architectures on the customer's roadmaps.

Dawdy joined the corporation in 1992 as an MTS intern in the SED in ETG. His most recent previous position was principal director for the Engineering and Integration Division for the Space Systems Group. In this position he helped lead Aerospace support to SMC's staff directorates for Engineering, Program Integration, and Financial Management.

Dawdy holds a bachelor of science degree in aeronautical and astronautical engineering and an master of science degree in aeronautics and astronautics, both from the University of Washington.

Austin Reports Out on Merit Raises, Exec Promotions, and Launches

by Matthew Kivel
December 16, 2014

The audience paid close attention to Dr. Wanda Austin's first CEO's Report to Employees of fiscal year 2015. (Photo: Elisa Haber)

In her December CEO's Report to Employees, Dr. Wanda Austin reported that Aerospace supported two successful launches during the quarter, that there will be a merit pool for fiscal year 2015, and she announced the winner of the annual corporate Team of the Year Award.

In addition, Austin announced that Dr. Charles Gustafson, general manager, Launch Systems Division, will be promoted to senior vice president, Engineering and Technology Group, effective April 1, 2015 – the day of Dr. Rami Razouk's retirement.

Dr. Jeffery Emdee, general manager, Vehicle Systems Division, will take over as general manager of Launch Systems Division and Dr. Eric Hall, principal director, Atlas V Directorate, will be promoted to general manager, Vehicle Systems Division. Due to his increasing responsibilities and impact across the entire corporation, Dr. Willie Krenz will now report to Executive Vice President Dr. Dave Gorney, starting April 1.

In board of trustees news, board members the Hon. John McLaughlin and the Hon. Robert Walker have retired.

At the beginning of her report, Austin delivered a series of thoughtful remarks about two recent space mission failures – Orbital Sciences' Antares launch vehicle and Virgin Galactic's suborbital spaceplane, SpaceShipTwo – that affected the aerospace community in October. Reflecting on the impact of the mission failures, Austin said, "These mission failures are sobering reminders that space systems are unforgiving and achieving mission success is very hard. They remind us that a single anomaly can lead to the loss of an entire spacecraft, an entire payload, and most significantly, a human life." She went on to encourage everyone at the Aerospace Corporation to learn from these recent events as the company continues to assure mission success for all of its customers.

Austin reported that during the quarter, Aerospace supported two successful launches, one of which, the GPS IIF-8 spacecraft, was launched on Oct. 29 aboard an Atlas V from Cape Canaveral. The GPS IIF-8 is set to replace older satellites, some having provided GPS service for more than 20 years.

Looking to the future, Austin reported that during 2015 there are nine scheduled launches that Aerospace will fully support and three launches on which it will provide partial support.

In the Civil and Commercial Operations area, Austin detailed Aerospace's extensive work with NASA, including a fascinating project exploring the use of military technologies for potential missions to penetrate the surface of Jupiter's moon Europa. The goal of such missions would be to search for an ocean of liquid water beneath Europa's surface with the eventual hope of discovering extraterrestrial life.

Aerospace is also ramping up its efforts with non-traditional customers, which includes new work on FBI data centers, the Department of Energy's National Nuclear Security Administration, and the pursuit of a potential proposal to the Canadian government on the future Polar Communications Satellite project.

Austin went on to discuss the opening of three new Aerospace facilities in the past quarter; the Chantilly Campus, the Mt. Wilson Aerospace Facility for Integrated Optical Tests (MAFIOT), and the Propulsion Research Facility, which all add tremendous new capabilities and depth to the corporation.

At last week's board of trustees meeting, the board approved a merit pool for fiscal year 2015, Austin said. The merit adjustment will take place in mid-February and it will be handled by using both salary increases and/or lump-sum payments to recognize employees.

The Aerospace Team of the Year Award for 2014 went to the 23-member Chantilly Campus team, which was honored for “the development of the Chantilly Corporate Campus, which lays the foundation for Aerospace’s support to Intelligence Community customers for many years to come.”

Austin explained that “between 2007 and 2014, The Chantilly Campus team worked to accomplish a number of significant goals, which required expertise in a variety of subject areas. Team members from Facilities, EIS, Security, CorpComm, Finance and Business Operations, NSG, and ETG consistently worked together to see this ambitious project through to its completion.”

Austin also announced that nominations are now being accepted for a new corporate award – The Innovation Award. The Innovation Award will recognize employees who discovered, fashioned, or developed a new or novel creation that has a noteworthy impact on the company, our customers, or society at large. The nomination period for the 2015 Innovation Award ends on Friday, Jan. 9.

As has become her much beloved tradition, the CEO closed with a selection of holiday jokes that brought a bit of levity and holiday cheer to the report.

Joke highlight: Why does everyone like Frosty the Snowman? Because he is so cool.

Answers to questions submitted before the CEO’s Report, edited somewhat for space and concision, follow.

Question: What current actions are being taken in regard to the employee survey taken in 2011?

Answer: A number of actions were taken in response to the surveys. First, managers were asked to take appropriate actions in their groups based on the results. Three corporate teams were also formed to look at a few of the major items and make recommendations for further actions. Those recommendations included addressing concerns about retaliation, employee development, and pay for performance. Some of the actions taken based on these recommendations were the job structure evaluation project, which has given us a clearer picture of job levels; initiation of the early career development network, and communication to managers on topics such as compensation, employee satisfaction, and employee development.

Question: Is there any expectation that the PPO plan at Aerospace will be subject to the so-called Cadillac tax on employer health plans when that tax takes effect? Can you comment on what type of changes in coverage or cost would occur were the tax to be applicable?

Answer: At this time, we’re anticipating that in 2018 the PPO plan will be subject to the excise, or “Cadillac,” tax that is part of the Affordable Care Act, due to the level of the premiums. The company moved from a fully insured to a self-insured model for funding the PPO plan: this resulted in a significant savings and a positive impact on the expected excise tax without significant changes in benefits to our employees. Employees can help us maintain our current levels of premiums in several ways:

Using generics whenever possible,
Maintaining a healthy lifestyle, and
Using the plan benefits in a cost-effective manner (for example, using an urgent care facility instead of the emergency room, when appropriate).

As we get closer to 2018, we will be evaluating the changes to our health plans that might be necessary. This could include increasing deductibles, increasing copays, implementing a high-deductible plan, or limiting benefits. We will be watching our claims very closely over the next few years to determine the appropriate actions necessary to maintain the best possible benefits for our employees.

View a video of the entire CEO’s Report to Employees below.

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Atlas V With Four Solid Motors Lights Up California Coast

December 15, 2014

An Atlas V with four solid rocket motors lifts off at Vandenberg Air Force Base on Friday, Dec. 12. (Photo: United Launch Alliance, LLC)

An Atlas V rocket launched successfully from Vandenberg Air Force Base on Friday evening.

Ray Johnson, Vice President, Space Launch Operations, reported: “An Atlas V with its [national security] satellite successfully launched from Vandenberg Air Force Base on Friday evening. After delaying one day because of severe weather, the vehicle lifted off of SLC-3E at 7:19 p.m. PST.

“This was the first Atlas V from Vandenberg to use four strap-on solid motors, which made it particularly bright as it flew down the California coast. After spacecraft separation, this mission also performed a third burn of the Centaur upper stage to reenter the upper stage for breakup and disposal. All phases of the mission were successfully completed, and there were no flight anomalies. Congratulations to the entire Atlas and NSG team for successfully completing this very challenging mission.”

Aerospace Beats Odds to Deliver New REBR in Record Time

by Heather Golden
December 08, 2014

Geoff Maul sands excess sealing compound from the REBR-W heat shield on Nov. 11. At left is Nathan Harnagel from the Aerospace Houston office. (Photo: Dave Hinkley)

When the unmanned Antares rocket exploded Oct. 28, along with an Aerospace-built Reentry Breakup Recorder-Wireless (REBR-W), it took only three minutes before NASA was on the phone with Aerospace asking for a replacement REBR-W.

The REBR-Ws are used to collect and transfer reentry data from vehicles returning to Earth from space. They measure hull temperatures, tumble and breakup dynamics and speed changes. NASA originally ordered two of these devices from Aerospace in July 2013 to be used as part of its safety verification process for the future reentry of the ISS. The first REBR-W was delivered one year later in July of this year, with the second one stored away in pieces for an undetermined future launch.

The REBR-W had been outfitted with custom wireless external sensors specifically designed to attach to the hull of an ATV-5 cargo carrier. The plan was for the REBR-W to arrive at the ISS and into the hands of the astronauts stationed there, who would later attach it to an ATV-5 that would then plummet back to Earth with a load of trash from the space station. The REBR-W would record the vessel’s breakup data. The second ordered REBR-W was

built simultaneously, but without any customization, as it was not yet scheduled for any particular launch.

It took the Aerospace team a year to create, test, troubleshoot and deliver the first REBR-W. Troubleshooting alone can eat up months of time because of the nature of the comprehensive testing and retesting that has to be completed. Just one of the errors discovered while building the first REBR-W required six weeks to troubleshoot and correct.

When NASA called requesting a second REBR-W, Aerospace got back to them that same day with an optimistic prediction that the second REBR-W could definitely be ready in four weeks, and possibly in three weeks, if no errors occurred during testing, said Mike Weaver, section manager in the Fluid Mechanics Department and project manager for REBR-W.

A small team consisting primarily of Geoff Maul, Dave Hinkley, Brian Hardy, and Petras Karuza got to work immediately, before any logistics could be worked out. To make this happen, the funding needed to be turned on; the customized parts manufactured; the stored parts readied, assembled, and tested; troubleshooting completed; and a ride on another launch and delivery date negotiated. Thankfully, a complete set of parts, including heat shield, were in storage, and the funding was arranged within two days instead of the weeks or months it could normally take.

“We were assuming we’d have a ride, and assuming three weeks would be enough,” Weaver said.

NASA and the Department of Defense Space Test Program (DOD STP) negotiated a delivery date and space on a fast-approaching December Falcon 9 launch. The ISS Program agreed, but their delivery date required the REBR-W to be ready in two weeks, not the hoped-for three.

“Once we found out three weeks was too much, Dave Hinkley found an expediency in the parts-manufacturing process. He cut the time down to one week when it would originally have taken two,” Weaver said.

Luckily, there were no negative results during the testing and troubleshooting stage, and the DOD STP helped by sorting out what needed to be retested since the REBR-W was built a year ago and which of the original tests were acceptable to recycle.

“They (DOD STP) handle our safety verification,” Weaver said. “They very efficiently defined what we needed to test and how it needed to be documented for the Payload Safety Review Panel. They really are part of our team.

“Within one week, we saw we could deliver within the requested two-week time period,” Weaver added.

What started as a frantic and hopeful “maybe” ended as a rousing success story. The second REBR-W is complete, customized, and delivered, and awaiting its trip to the ISS in mid-December.

“It turned out flawlessly; none of us expected this when we got that call,” Weaver said. “It is very rare to have a chance to re-fly, and to have everything ready in time to make the second flight opportunity; this is unprecedented.”

SMC Looking at Next-Generation All-Electric Satellite Fleet

by Heather Golden
December 02, 2014

Aerospace and the Space and Missiles Systems Center are working to introduce the next generation of solar electric propulsion technology into SMC’s satellite fleet.

All-electric satellites can be considerably less expensive to launch than traditional spacecraft because they are lighter. They have lower overall launch mass because they use power generated by solar arrays to accelerate satellites with electric propulsion thrusters instead of heavier chemical engines. These newly introduced vehicles are already an in-demand item in the commercial sector and some are already being used for challenging interplanetary missions, said Dr. Chris Ranieri, engineering specialist, Flight Mechanics Department.

However, the benefits of all-electric propulsion have not yet been fully realized. The commercial sector, with the help of NASA, Defense Advanced Research Projects Agency, and Air Force investments, is exploring next-generation solar array technologies as a means to lower launch mass and associated acquisition costs.

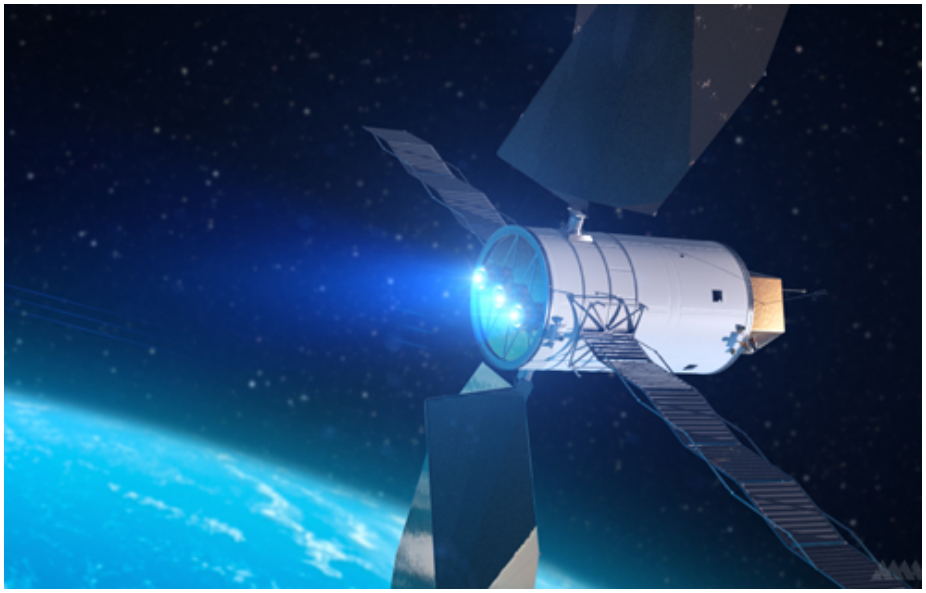
Reduced launch mass and lower energy injection orbits could provide a big payoff for SMC by significantly cutting launch costs. A single launch vehicle could feasibly carry two all-electric satellites at once, instead of a single satellite with chemical propulsion that has been the standard to date. Other benefits of a lighter payload include potentially downsizing launch vehicles, lowering fleet-wide architecture costs due to smaller boosters and fewer launches, and increased maneuverability of spacecraft.

All-electric propulsion replaces chemical propellants, such as hydrazine and the combination of liquid hydrogen fuel with liquid oxygen oxidizer (LH2/LOX), with energy gathered from the sun, using lightweight, high-power arrays that feed into electric propulsion thrusters. Electric propulsion systems, depending on the application, may need up to 10 times less fuel to perform

the same orbit transfer as a chemical propulsion system.

“The preliminary cost analysis indicated we would see a 15 percent lifecycle cost savings over one block buy of four SMC enterprise spacecraft (GPS, AEHF, WGS and SBIRs), including paying off development costs,” said Jay Penn, Distinguished Engineer, Launch Systems Division.

Other potential benefits include increased resiliency; more effective constellation management; extra power that could enhance payload capabilities; enhanced end-of-life options, like the possibility of hyperbolic escape or on-orbit spares; reduced orbital debris; enabling larger launch windows; and enabling previously impractical missions that maintain unstable orbits or exercise dynamic orbit change flexibility.



Solar Electric Propulsion (SEP) technologies are an essential part of future missions into deep space with larger payloads. (Image: NASA)

“This technology has wide application,” Penn said. “It is the equivalent of switching from a gas guzzler to a super-efficient electric car, but without the need for a battery, as we collect the energy as we need it from the sun.”

Some of the technology challenges are how to integrate the high-power solar array with the electric propulsion system and how to handle low-thrust orbital maneuvering and spacecraft control in a space environment. While those challenges do require answers, the only major cons of switching to an all-electric satellite fleet are the increased times needed to reach the proper orbit and increased radiation doses from prolonged exposure to the Van Allen Belts. All-electric designs need four-to-eight month transfers compared to all-chemical satellites that need less than two weeks.

“However, some of SMC’s current vehicles already employ hybrid chemical/electric propulsion systems that need three-to-four month transfers, so the four-to-eight month transfers for all-electric transfers from LEO are not significantly longer,” Ranieri said. “Plenty of mass margin exists to allow extra local shielding to combat the higher radiation dosages seen by all-electric spacecraft transferring from LEO.”

SMC and Aerospace recently held an industry day to gather together potential suppliers and industry experts to discuss options.

“One major lesson learned from the event was that industry representatives did not indicate any significant concerns associated with either the long transfer times or the harsher radiation environments,” Penn said.

This is not to suggest the radiation environment and its effect on spacecraft does not require evaluation. Aerospace is currently updating trajectory radiation modeling and has initiated an effort to work with the respective program offices to assess all system-level impacts.

Penn suggested the way forward is to examine possible weather and commercial satellite opportunities, spacecraft-level impacts of larger solar arrays in more detail, to further research and qualify solar arrays to expected radiation dosages, and determine required array and spacecraft component radiation shielding.

Studies are ongoing with NASA, the Air Force and DARPA on the key performance parameters and on exploration of a possible demonstration mission.

December 2014 Obituaries

by Carolyn Weyant
December 01, 2014

Sincere sympathy is extended to the families of:

Sidney Cohen, member of the technical staff, hired June 8, 1970, retired Jan. 1, 1988, died Nov. 10.
Clola Ferris, member of the administrative staff, hired May 18, 1962, retired Oct. 1, 1993, died Oct. 30.
Edward Kraly, member of the technical staff, hired March 17, 1980, retired Dec. 1, 1994, died Nov. 20.
George McGhee, member of the technical staff, hired Sept. 18, 1961, retired Sept. 1, 1990, died Nov. 12.
Clifford Scott, member of the technical staff, hired June 23, 1962, retired Nov. 1, 1991, died Nov. 15.
Joseph Van Horn, member of the technical staff, hired Feb. 3, 1964, retired Feb. 1, 1977, died Nov. 15.

To notify Aerospace of a death and have it included in the Orbiter, please contact Cynthia Johnson in Human Resources at 310-336-5806.

December 2014 Notes

by Carolyn Weyant
December 01, 2014

Notes of appreciation to fellow employees and Aerospace for thoughtfulness and sympathy have been received from:

Judy Kerner, for the recent passing of her mother, Honey Weiss.

To submit a note of appreciation to Aerospace, please contact Valerie Jackson in Human Resources at 310-336-0891.

December 2014 Anniversaries

by Carolyn Weyant
December 01, 2014

35 YEARS

Engineering and Technology Group: Hang-Kam Lee

National Systems Group: Richard Fleming

Space Systems Group: Forrest Sinsheimer

30 YEARS

Engineering and Technology Group: Steven Moss

National Systems Group: James Gin

25 YEARS

Space Systems Group: John Campbell

20 YEARS

Civil and Commercial Operations: Harold Huslage

Engineering and Technology Group: Peter Eggan

Operations and Support Group: George Valenzuela

Systems Planning, Engineering, and Quality: Jack Witz

15 YEARS

Engineering and Technology Group: Felicia Bagby, Betty Baker, Gregory Dees, Tina Gober, William Neel, Lyle Nojima

Operations and Support Group: Dana Honeycutt, Alyssa Risher

Space Systems Group: Lavada Martin, Richard Mortimer

10 YEARS

Engineering and Technology Group: Sang Bae, Sandra Suzuki

Space Systems Group: Gus Bacoyanis

5 YEARS

Engineering and Technology Group: Anna-Britt Mahler, Dolan Highsmith, Stephen Reed, John Schilling

Operations and Support Group: Robert Vongerichten