All in the Family: Three Generations of Aerospace Engineering

Wednesday, March 8, 2023

Discover engineering passion across three generations from the 1950s to 2030 and beyond. Engineers Bill, Greg and Chip Bollendonk talk about achieving engineering balance to create new aerospace products, from early Titan rockets to manned spaceflight and deep space exploration programs. Learn how they apply technology and imagination to create new products and capabilities in the face of cost, schedule and resource constraints. Plus, see how their engineering day jobs overlap with automotive passion, and how they apply expertise to maintain and operate vintage sports cars.

Part 1: Titan I Testing and Lowry Site Activation

Bill Bollendonk

Bill is a New York City native glad to relocate to Colorado and study Electrical Engineering at CU Boulder. Bill joined the Glenn L. Martin Company in 1956 to work on the Titan I program. In addition to Titan I, Bill had a long aerospace career working Titan II, Viking, Skylab EREP, Shuttle Caution & Warning and PIC, Peacekeeper, Manned Maneuvering Unit, and Tethered Satellite. Bill retired as a program director in 1990. Bill has enjoyed a second career actively restoring and enjoying pre-war MG's.

Recommended Reading

Bollendonk, Bill, "Titan I ICBM Activation at Lowry Air Force Base – Remembrances by Bill Bollendonk, Martin Marietta Activation Team", December 2022, 21 pages.

It was the heart of the Cold War, and the Pentagon was racing to counter the rapidly expanding Soviet nuclear weapons threat. A young engineer named Bill Bollendonk was part of Titan I Intercontinental Ballistic Missile testing at the Waterton facility near Littleton, Colorado. The two-stage missiles were designed to reach their targets within 30 minutes after launch. Bill participated in ground test firings of missiles to ensure the missile was qualified before they were deployed to flight tests and missile sites at several locations in the U.S. Once the missiles were delivered to the Air Force, Bill and his team provided engineering integration support to missile squadrons in the ground operations and maintenance of 18 missiles in six Colorado launch locations. It was during this time that Bill provided a technical solution that diffused a near catastrophic incident in which a Titan I ICBM, complete with an operational warhead, might have exploded on site.

See attached file: "Titan I ICBM Activation at Lowry AFB.pdf"

HGM-25A Titan I
https://en.wikipedia.org/wiki/HGM-25A_Titan_I

Part 2: Engineering Spacecraft Software

Greg Bollendonk

Greg is a Colorado native with mathematics and computer science degrees from Fort Lewis College and CU Boulder. Greg has been a key part of building reliable software systems for more than twenty flight missions, including Mars Odyssey, MRO, Phoenix, Juno, MAVEN, OSIRIS-REx, InSight and Lucy. Greg is an Engineering Fellow at Lockheed Martin Space.

References

Ceruzzi, Paul E., "Computers and Space Exploration", Smithsonian's National Air and Space Museum, Washington, 2008, 11 pages.
https://www.bbvaopenmind.com/en/articles/computers-and-space-exploration/

Fishman, Charles, "They Write the Right Stuff", Fast Company, December 1996.
https://www.fastcompany.com/28121/they-write-right-stuff

Part 3: Engineering Space Science Instruments

Chip Bollendonk

Chip received his bachelor's and master's degrees in Mechanical Engineering from CU Boulder, and was named the college's Outstanding Graduate in 2017. His internship and professional roles have allowed him to contribute towards Sierra Space's Dream Chaser, ULA's Vulcan, Blue Origin's New Glenn, and several NASA programs. Chip is currently working at the Laboratory for Atmospheric and Space Physics (LASP) at CU Boulder, where he is the lead mechanical engineer for the Interstellar Dust Experiment (IDEX) on the Interstellar Mapping and Acceleration Probe (IMAP) mission. Chip enjoys classic cars, 14er hiking, and running marathons.

References

Interstellar Dust Experiment (IDEX)
https://lasp.colorado.edu/home/instruments/idex/

Interstellar Mapping and Acceleration Probe (IMAP)
https://en.wikipedia.org/wiki/Interstellar_Mapping_and_Acceleration_Probe
https://imap.princeton.edu/

Cosmic dust
https://en.wikipedia.org/wiki/Cosmic_dust

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Additional Reading

Glenn L. Martin Company
https://en.wikipedia.org/wiki/Glenn_L._Martin_Company

Historic American Engineering Record, Creator, "Titan One Missile Complex 2A, .3 miles west of 129 Road and 1.5 miles north of County Line Road, Aurora, Adams County, CO", Historic American Engineering Record (HAER) CO-89.
https://www.loc.gov/item/co0919/

Historic American Engineering Record, Creator, "Glenn L. Martin Company, Titan Missile Test Facilities, Waterton Canyon Road & Colorado Highway 121, Lakewood, Jefferson County, CO", Historic American Engineering Record (HAER) CO-75.
https://www.loc.gov/item/co0348/

The Transistor at 75 - The past, present, and future of the modern world's most important invention
https://spectrum.ieee.org/special-reports/the-transistor-at-75/

Mindell, David, "Digital Apollo: Human and Machine in Spaceflight", Cambridge, Massachusetts: MIT Press, 2000, 376 pages.
https://www.amazon.com/Digital-Apollo-Human-Machine-Spaceflight/dp/0262516101

Three NASA deep space missions:

Mars Reconnaissance Orbiter (MRO)
https://mars.nasa.gov/mro/
https://www.jpl.nasa.gov/missions/mars-reconnaissance-orbiter-mro
https://en.wikipedia.org/wiki/Mars_Reconnaissance_Orbiter

Juno Mission
https://www.nasa.gov/mission_pages/juno/main/index.html
https://www.jpl.nasa.gov/missions/juno
https://www.missionjuno.swri.edu/
https://en.wikipedia.org/wiki/Juno_(spacecraft)

Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx)
https://www.nasa.gov/osiris-rex
https://solarsystem.nasa.gov/missions/osiris-rex/in-depth/
https://www.asteroidmission.org/
https://en.wikipedia.org/wiki/OSIRIS-REx

Laboratory for Atmospheric and Space Physics
https://lasp.colorado.edu/

"How to Build a Spacecraft", Arizona State University
https://news.asu.edu/20151123-discoveries-how-build-spacecraft-beginning

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