

HAPPENINGS AT NORTHROP GRUMMAN

Northrop says Air Force Design Changes Drove Higher Sentinel ICBM Cost

A Northrop Grumman official attributed the explosive project cost growth of the U.S. Air Force's next intercontinental ballistic missile (ICBM) to the service's design changes, including to the nuclear missile's silo and connecting cables.

The Air Force's original plan for modernizing its ICBM enterprise included keeping nearly all its existing copper cabling in place to be reused for the upcoming LGM-35A Sentinel. That's roughly 7,500 miles of copper cabling, connecting 450 half-century-old Minuteman III ICBM silos scattered through the Great Plains region with launch control centers and other facilities.

But the company official, who spoke with reporters on the condition that he be identified only as an official familiar with the Sentinel program, said the Air Force concluded it is necessary to upgrade the copper cables with a higher-performing fiber-optic network. That decision apparently came after the service awarded the engineering and manufacturing development contract to Northrop Grumman in 2020, and during the company's work on the program's early design phase.

The Air Force also realized that the original designs for Sentinel's launch facilities, the massive concrete-encased silos from which the missiles would launch, would not work and had to be changed, the Northrop official said. Those original concepts were drawn up during the technology maturation and risk-reduction phase, as well as the early engineering and manufacturing development step.

With hundreds of launch facilities dotting the Great Plains region, often in 1-acre plots, and thousands of miles of cable stretching across farmland and other privately held property that now must be dug up, the cost of these changes swiftly added up, the Northrop official said.

"As we've worked through those changes, that's led to a design that's different than the one that they [the Air Force] started with," the official explained. "When you multiply that by 450, if every silo is a little bit bigger or has an extra component, that actually drives a lot of cost because of the sheer number of them that are being updated."

The Air Force said the Pentagon is still studying what exactly caused the severe cost overruns, which triggered a review process known as a critical Nunn-McCurdy breach.

"In accordance with statute, [the Office of the Secretary of Defense] will determine what factors caused the cost growth that led to a critical breach via the Nunn-McCurdy process, which is

currently underway," an Air Force spokesperson said. "Early estimates indicate that a large portion of the Sentinel program's cost growth is in the command and launch segment, which is the most complex segment of the Sentinel program."

The program was expected to run about \$96 billion, with the total per-unit cost amounting to \$118 million when its most recent cost, schedule and performance goals were set in 2020. But the price tag has skyrocketed at least 37%, and the per-unit cost is now about \$162 million.

That triggered the Nunn-McCurdy breach, and the Pentagon is now reviewing Sentinel to figure out how to get it back on track as well as where to find funds to keep it going. Top Air Force officials have publicly said that with Minuteman III well past its originally expected life span, the service has no choice but to replace it with a new, more reliable model - and will find money to pay for it.

Sentinel, which was originally supposed to reach initial operational capability in 2029, is now expected to fall two years behind schedule. The nuclear missile's first flight test, which had been expected to take place in 2024, is now likely to come in February 2026, according to the Air Force's budget documents.

The Northrop Grumman official told reporters that the company's work on Sentinel continues, despite the Nunn-McCurdy breach and ensuing review process.

"We don't have a pause on our EMD [engineering and manufacturing development] work," the official said. "We're continuing to make progress on developing the missile and iterating the designs for all the facilities."

In a discussion last fall, Air Force Secretary Frank Kendall said given it's been so long since the service created an ICBM, early cost estimates for Sentinel were based on "a huge uncertainty."

"There are unknown unknowns that are surfacing, that are affecting the program," Kendall said during a November 2023 event with Center for a New American Security think tank. Kendall also said the Sentinel program was "struggling."

The Northrop Grumman official highlighted such comments, including Kendall's about the uncertainty that went into the program's cost estimates, and said some estimates that went into the 2020 baseline review turned out to be incorrect.

Before it received the Sentinel contract in September 2020, the firm started building a full-scale mock-up of a Minuteman III silo in Promontory, Utah, which it completed in early 2021. The project was a major undertaking, and on Northrop Grumman's dime. But the company saw it as a worthwhile investment in its bid to win the lucrative Ground Based Strategic Deterrent contract, as the program was then known.

Northrop didn't have direct access to the Minuteman III silos, and likely won't until the government hands them over for conversion into Sentinel silos, since the missiles must remain ready for launch at all times. And so the company considered its construction project the best way to understand how the massive ret-

TRA for Northrop Grumman Retirees

The Retirees Association (TRA) welcomes the retirees and the spouses of retirees of Northrop Grumman and TRW.

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Contacting TRA

By Email:

TRA@tra-spacepark.org - Your email questions will be routed to the appropriate source. Also, if we have your e-mail address, we can notify you of information of interest to our TRA members. Send us an email to get added to the TRA email list.

By Web:

Our website is at www.tra-spacepark.org. It is an excellent source for the latest news, lists of the new retirees, travel details, party photos (more than get into the NNG), forms of all sorts, personal photographs, and much more.

By Mail:

TRA, P.O. Box 1276, Redondo Beach, CA 90278

By Phone:

If you need to phone, call 310-813-7745 to reach our voice mail. Our office hours are 10 AM to 2 PM on each non-board meeting Wednesday.

For Membership:

TRA Membership is open to Northrop Grumman and TRW-legacy retirees at \$10 per calendar year. New members receive two years membership for their first dues payment.

The application is available on the website.

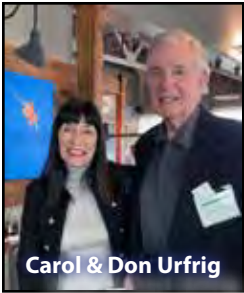
TRW/NG Retirees Meetings Around the U.S.

E-mail or call the contact to make sure the event is occurring before you go. Changes from last issue are marked in **bold**.
If you have a group that you would like to have listed here, please contact us by email at tra@tra-spacepark.org.

GROUP	MEETING LOCATION	DATE & TIME	OTHER INFO	CONTACT
TRA Board Meeting	Zoom	3rd Wednesday, 9:30 AM, Monthly except December	Decisions, planning and actions on archives, events, NNG, coordination with NG	All members welcome. Contact TRA to receive meeting link
ATD Friends & Colleagues	Lido di Manhattan, 1550 Rosecrans Ave, MB, CA	TBD November 2024, 11:00 AM - 1:00 PM	Social, Nostalgia, Lunch	Jack Trost, Dena Bouskos, Cindy McCully 310-377-2194 cschamp@aol.com
Beach Cities Get-together	Grunions Restaurant, 1501 N Sepulveda Blvd, MB, CA	Last Monday, Even months, 11 AM to 2 PM	Social	Allen Parker 310-780-0712 777allendsp@gmail.com
Central Coast Chapter	Various Locations in the Central Coast Area	Various days: contact Zaiser for details	Social	George Zaiser 805-473-2105 gzais34@icloud.com
Controls Systems (& Friends) Breakfast	Mimi's Cafe, 25343 Crenshaw Blvd, Torrance, CA	1st Wednesday, 8:50AM	Social	Michael Narigon 424-200-2971 mnarigon@gmail.com
Houston Chapter	Baybrook Denny's, 19212 Gulf Fwy, Friendswood, TX	3rd Tuesday, 8:30 AM	Social	Gary Dinsmore 281-461-6270 samngary@att.net
Huntsville Chapter	Various Locations	2nd Tuesday, 11:30 AM	Lunch and Social	Jim Troy 850-797-0044 jtroy28x@gmail.com
Northern Virginia	Zoom	2nd Friday, 11:30AM	Social	Jim Miller 703-483-5448 jmiller158@gmail.com
Utah	Layton Cracker Barrel	1st Thursday, 8:30 AM	Breakfast Social	Charles Vono 801-745-5879 charlesvono@comcast.net
Temecula Valley	Various Locations	2nd Wednesday, 11:30 AM	Social	Judy Lebovitz 951-461-0065 judylebovitz@gmail.com
The Mountain Folks	On hold due to COVID-19		"We do have fun!"	Carl Winkelman 303-693-0034 winkelman@att.net
TRIN	Zoom	2nd Thursday, 1:00 PM	Investment info based on monthly newsletter reviews	Bob Eshbaugh 310-376-5880 eshonnet@yahoo.com

TRA Spring Fling, May 2, 2024

We met at the Lido Di Manhattan for our annual Spring Fling. These photos are by Stephanie Sundius. To see all of her photos, go to www.tra-spacepark.org.



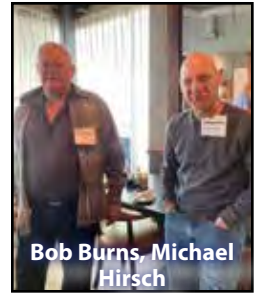
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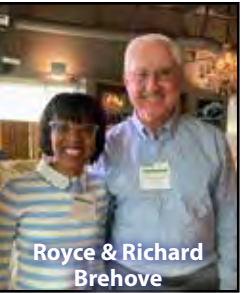
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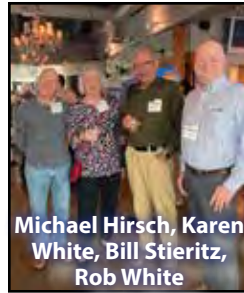
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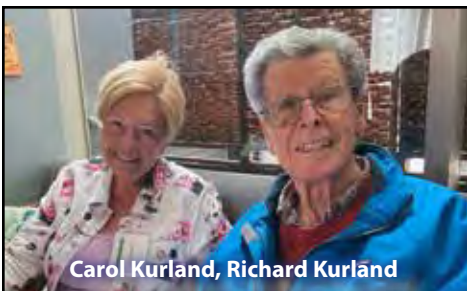
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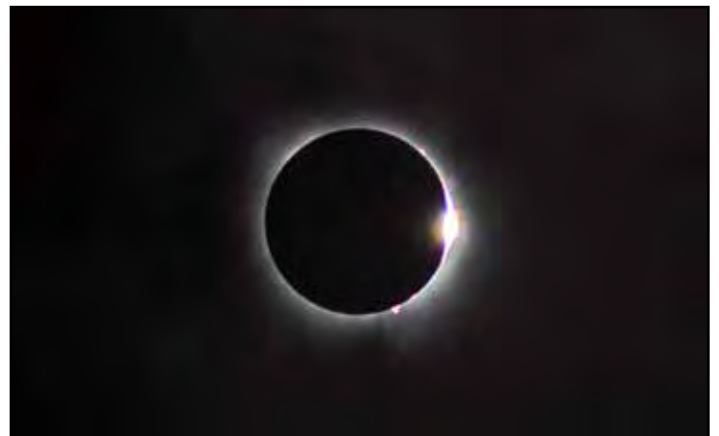
Attendees at our March Control Systems Breakfast. Clockwise from lower left: Michael Narigon, Bob Cash, Brooks Vogt, Al Frew, Carol Schamp, Fred Koehler, Bob King, Emery Reeves, Ralph Iwens, Tom Coffey, Dave Wise, and John Wider.



Charlie Vono writes: If you are in the neighborhood on a First Thursday, stop by the Layton Cracker Barrel at 0830 to join the Utah TRW retirees. L-R: Leo Seeber, Bob Luzitano, Dan Zemke, Harry Amalfitano, Gene Poncelet, Merlin Mitchell, Tony Spehar, Toni Martinez, Mark Parsons, Roger Fanetti, Marty Stampick, and Charlie Vono.



Mike Leung writes: Last September we traveled to Iceland (with another NG retiree, Andy Smith) and were lucky enough to see the Aurora Borealis. This photo was taken with an iPhone with no special settings. The auroras do not look so brilliant and colorful with the eye, because in dim light conditions, our eyes are not sensitive to color. With a DSLR and a several second time exposure, we could see more colors, including red. Of the 10 nights we were in Iceland, we saw the aurora only 2 of those nights, so luck is important!



Several TRA members reported they traveled across the US to observe the total eclipse. This photo is from Carol Segal.

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rofitting process might work, and to find where the biggest risks might lie.

Top Air Force official Kristyn Jones compared the Sentinel project to five major acquisition programs rolled into one. But the nuclear missile itself “is not an area of concern,” said Jones, who is performing the duties of undersecretary of the Air Force.

The Northrop official said the Sentinel missile will not just be a new iteration of the Minuteman series of ICBMs. “It’s not a Minuteman IV,” the official said, but a brand-new weapon top to bottom. Its solid-rocket motors will be made of composite materials instead of the steel used on the Minuteman III, and it will have a more advanced guidance system. Sentinel will be slightly larger and lighter than the Minuteman III, which will allow it to carry more propellant and payload. And, it is being designed to last until at least 2075, far longer than the decade Minuteman III was originally supposed to last.

The infrastructure for Sentinel, including the silos themselves, the launch control centers where airmen control the ICBMs, and supporting infrastructure, will also be refurbished.

That portion, which Jones called “essentially a civil works program,” is especially challenging, particularly with issues such as inflation, the supply chain and labor force shortages.

The service and Northrop Grumman plan to reuse the existing Minuteman III silos as much as possible. But that will require a great deal of new construction and equipment updates to ensure the Sentinel silos can keep operating. With the nation’s roughly 400 Minuteman IIIs spread out across nearly 32,000 square miles in Wyoming, Montana, North Dakota, Colorado and Nebraska, that makes the Sentinel program a massive real estate project, requiring the government to negotiate easements and, in some cases, property purchases with numerous landowners.

All of that adds up to “one of the most large, complex programs I’ve ever seen,” Kendall said of Sentinel. “It’s probably the biggest thing, in some ways, that the Air Force has ever taken on.”

Minuteman III silos have concrete liners as well as mechanical launch tubes and missile suspension systems that hold the current ICBMs. The tubes and suspension systems will be replaced, and the concrete liners underneath will undergo inspection to determine if repairs need to be done and what is reusable. The government has contingency plans if the silos’ foundations prove to be seriously cracked or damaged. That could include remediation work such as patching cracks or replacing portions of the concrete.

“There’s currently no plan to dig new holes,” the official said. “But given the site conditions of the land, [there is] certainly the potential that when they get to investigating more of the silos, they may find that [reusing] some of them might not be possible.”

Though the Nunn-McCurdy review process is still underway, the Northrop official said the company is talking to the Air Force about ways to bring down costs. One idea under discussion, he noted, is potentially changing the way mechanical rooms are constructed to build them in a more modular way, which could lower expenses.

But no matter how difficult or expensive Sentinel becomes, or what trade-offs are made to pay for it, the Air Force is adamant it must happen. Lt. Gen. Richard Moore, the service’s deputy chief of staff for plans and programs, said at the January appearance alongside Jones that extending the Minuteman III missile significantly longer is “not a viable option.”

“We will find the money,” Moore said. “Sentinel is going to be funded. We’ll make the trades to make that happen.”

IN MEMORIAM

Phil Allen, 84, March 2024. Phil worked for TRW/Northrop Grumman for over 30 years, where he ran countless proposals and served as lead systems engineer on many programs. After “retiring”, Phil went on to work part time for Cal Tech, teaching Systems Engineering to numerous aerospace companies.

Cornelia Edwards, 91, February 26, 2024. Cornelia retired from TRW in 1993, where she was a Quality Assurance Assistant Project Manager. Cornelia was very active in TRW corporate and private community service organizations.

Gen. Howell Estes, 82, March 18, 2024. After a distinguished career in the Air Force, Gen. Estes retired in 1998. He then started a new phase of his life as president of Howell Estes Associates, where he served on the boards of multiple aerospace-related companies. He was also a consultant to Northrop Grumman (16 years) and ITT (8 years).

Timothy Galvin, December 6, 2023. Timothy was hired by STL, where his career started with the OGO satellite and ended with the Cassini program. In between he worked on DSP, EHF, TT&C, and ASCM and LEM projects.

Beatriz “Betty Boop” Gomez, 88, 26 March 2024. Betty worked for 24 years supporting engineering organizations on various TRW space programs as an executive secretary, retiring in the early 2000s. She is survived by 4 children and 6 grandchildren.

Hal Hart, March 5, 2024. Hal and his wife Ruth joined a field group in Dayton, Ohio, in 1974 and moved to Space Park in 1976, working on software projects in what eventually became Mission Systems until their retirement in 2005. Hal was a technologist at heart, participated in computer working groups and advocated for CMMI Level 5 certification. He spent the last decade of his career in Dominguez Hills.

Karl Poehlmann, Jr., 86, February 3, 2024. Karl joined TRW/DSSG in 1962. He retired in 1992. Karl was the Systems Architect for many projects, supervising proposals, systems design, development, analysis, and integration and test. His career spanned key programs at TRW, including the Orbiting Geophysical Observatory spacecraft, Pioneer 1, EROS Digital Image Processing System, the Lunar Excursion Module Descent Engine, and high-performance ADPE/EGSE systems.

Jacqueline Johnson Walker, 103, October 2023. Jackie started at TRW Instruments and retired from TRW Space Park. She worked various positions - among them accounting and pricing. Jackie and her first husband, Bill (aka Beeeell), were active members of the SEA Travel Club.

The first step in notifying Northrop Grumman of a retiree’s death is to call the Northrop Grumman Benefits Center. If the deceased was a member of TRA, please notify TRA whether you want the NNG continued or you want to be removed from future mailings.

If you know of a person that should be included in the “In Memoriam” column, please inform us by either email or mail to the TRA office. As a minimum, we request the name of the deceased, date of death, and the name of the person submitting the information. If more information is available and desired, include age, position and years at NG/TRW, any notable programs, and special skills.



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The next NNG will be
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THE MAIL POUCH

By Pam Overton

◆◆◆ From **Marshall Huang** - After I retired in 2001, we moved from Palos Verdes to Glendale to be closer to our church. I enjoy singing with my local community choir, Pasadena Pro Musica (just sang Vivaldi's Gloria). We celebrated our 56th wedding anniversary last December. ◆◆◆ From **Garry Parriott**, Henderson, NV - Enclosed is my check for renewing my TRA membership for 4 years. Was tempted to renew for just 3 years but decided that was a pessimistic statement on my longevity so made it 4 years, ha. I'm still active in many organizations such as The American Legion, Sons of the American Revolution, Sons of the Union Veterans, and National Society of the Sons and Daughters of the Pilgrims, and still looking for those Jamestown and Mayflower ancestors. Starting to feel my age having worked on an early development computer that used a drum memory (equivalent to a hard disk drive), ferrite bead memory (for random access memory) and Fairchild, solid state, discrete logic functions (and, or, nor and JK flip flops). Last year I attended the inaugural Formula 1 race. Seeing the race was a great experience and just getting to the venue was an adventure. Got as close as possible to the gate for the Koval Straight and hailed a Pedicab for the last half mile. Good to see some familiar names in The Mail Pouch. ◆◆◆ From **Judy Lebovitz**, Murrieta, CA - Greetings from Murrieta, California, where I have been living for the past 23 years in The Colony 55 & over community. Not playing too much golf due to some health issues but I do play 9 holes with the women's golf club and I'm on the board of that club

too. I play the monthly fun tournaments. I have a wonderful family and just had my first great-grandson! So exciting. Also, I am blessed to have wonderful friends here and we get together a lot enjoying lots of great activities that the clubhouse offers. I also play bridge and canasta. So life is good at 83. I enjoy reading the No Name Gazette and hope everyone is keeping well and safe. ◆◆◆ From **Gerrit Legrand**, Newport Beach, CA. Since retiring from Mission Systems in 2017, we have moved to Newport Beach near the water! I am now a Skipper for the Oasis Sailing Club, and teach sailing and racing to our 200+ membership. We have two Catalina 34 Mark 2 sailboats which go out to sea almost every day! **Nancy**, my wife, is in charge of our insignia apparel and very active in the club, too! We are also members of the Balboa Yacht Club, and actively participate in the many programs the club offers. We have 4 children and 10 grandchildren that are all nearby and keep us very busy! ◆◆◆

Mail Pouch Items

People always mention how much they love hearing from other retirees in the Mail Pouch. It is easy to send in a brief note about what you are up to. Contact us by e-mailing the Mail Pouch at mailpouch@tra-spacepark.org or by mail to Mail Pouch, P.O. Box 1276, Redondo Beach, CA 90278.