Welcome to the November 15th, 2017, Edition of THE REVENGE HUMP DAY!

This has been a very quiet week around Casa Bolgeo for a change. About the biggest thing that has happened around the house was that last Saturday Evening we replaced a the microwave oven in the kitchen. It was really kind of humorous because we had the whole crew over here working on it. Jeremy Cook lead the effort with his wife Elena, Will Darwin and Brandy helping out. Their son Chance added to the pandemonium along with Tristan, Bubba Bear, screaming through the house. I had bought the new microwave about 7 months ago at Sear Sale because we are thinking about having a small renovation done on the kitchen. The bear is that we are staying with the same color for the cabinets and appliances which is Bisque (Tan) and it is a bear finding appliances in that color now. Well, the new Bisqued Colored Whirlpool Microvave is now installed and working like a champ. About the only thing different is that it is a lot bigger on the inside that the old one.

The high point of the week also happened last Saturday during the day. LibertyCon presented a check to the Austin Hatcher Foundation for $17,000 from money raised at LibertyCon 30. This children's foundations help children who have cancer and their families. I have added the Facebook posting about the event and a picture of the check as the first article for this week's missive.

On another note and can release that LibertyCon 31 will be held June 29-July 1, 2018 at the Downtown Marriott Hotel and Convention center. Brandy and the gang will be releasing more information in the coming weeks on our website and online convention registration will be opening shortly. Also, registration for the hotel will be opening soon through the LibertyCon Website.

So on that "happy note", why don't y'all sit back and relax because here's the best in gossip, jokes and science for your reading pleasure!

Uncle Timmy

<G>~<O>~<S>~<S>~<I>~<P>~~~<S>~<T>~<A>~<R>~<T>~<S>~~~<H>~<E>~<R>~<E>~<!>

LIBERTYCON DONATES $17,000 TO THE AUSTIN HATCHER FOUNDATION

From: Fritz Ling shared LibertyCon's post on Facebook — Saturday November 11, 2017

I had a GREAT morning! Helped to hand over a $17,000 check to the Austin Hatcher Foundation with the LibertyCon Board of Directors on behalf of the entire LibertyCon Family!

Today, the LibertyCon Board of Directors had the amazing pleasure of presenting a donation to the Austin Hatcher Foundation on behalf of all the Staff, Pros, Guests, and Attendees of LibertyCon.

Due to the HUGE HEARTS and deep pockets of the LibertyCon Family, we were able to present a check to the total of (drumroll please...):

SEVENTEEN THOUSAND DOLLARS!!!! Yes... $17,000.00!!!!

Brandy (Bolgeo Spraker), Donald (Puckett), Ann (Robards, Fritz (Kevin Fotovich), and Beth (Destroyer of Worlds) were able able to meet up at the AHF Headquarters to present this gift.

Yes, tears flowed.

<U><T><'><s><*><C><O><M><M><E><N><T>

All of you who attended LibertyCon last year should be proud. We took about $1.50 of each of your registration fees and added to the charity fund this year to allow us to reach a combined total of $17,000 for our children's charity. This make the heart of this old many brim over with love and appreciation to all of you. Even though I have retired from the Board of Directors of LibertyCon, we are still making a great impact on the needy children in the Chattanooga Area. Thank you for your support. Uncle Timmy.

<L>~<I>~<B>~<E>~<R>~<T>~<Y>~<C>~<O>~<N>

Re: 1I/'Oumuamua (fka A/2017 U1) & Project Lyra in the news

From: "Robert Kennedy" robot@ultimax.com

As you may have heard, a rock the size of a stadium emanating from somewhere in the the southern skies underneath the solar system zipped up past us at one helluva clip. Perihelion was on my birthday (though I didn't know it at the time--nice present from Nature all the same). It was only observed on 19 October going past Earth on the way out, northbound back to the depths of space with +26 km/sec excess velocity.

The astronomy community had to make up nomenclature for this interstellar interloper (eccentricity ~1.2, therefore definitely hyperbolic, therefore definitely not of this solar system). First we called it A/2017 U1. It has been renamed to 1I/'Oumuamua, a Hawaiian common name suggesting "messenger" since the asset that found it (Pan-STARRS) is stop the Hawaiian volcano Haleakala on Maui. We've never seen it before (or anything of its class, ever, hence the number 1 at the beginning of its name), and we'll never see this one again.

11 days ago (31 October), my colleagues and I came up a potential mission to see the object, which we called Project Lyra after its apparent origin. Wouldn't be easy--it'd be a stern chase.

Yesterday (10 November), we published an article on arXiv: https://arxiv.org/abs/1711.03155

which Paul Gilster picked up and extended on Centauri Dreams:
https://www.centauri-dreams.org/?p=38728

Kudos to Paul for publishing this article so quickly!

Also, there's some social media, if you're into that:

https://www.facebook.com/InterstellarInstitute/

Regards, RGK3

<L>~<I>~<B>~<E>~<R>~<T>~<Y>~<C>~<O>~<N>

Re: Jewish Humor

From: "Eric Jamborsky" mrsolo1@comcast.net

Uncle Timmy,

Loved the Jewish jokes. They made me realize that we grew up with humor the younger generations will never experience. Our humor, no matter our background, was greatly influenced by Jews who grew up in Yiddish speaking homes. Just think of our influences: Mack Sennett, Charlie Chaplin, Jack Benny, George Burns and Gracie Allen, Milton Berle, the Three Stooges, Henny Youngman, Myron Cohen, Max Davidson, and many more. Burlesque and Vaudeville were their training grounds. Then they broke into radio, movies, and finally TV. It was wonderful humor, very human, and very representative of everyday,

down to earth people. Today, too many "comics" feel the need to preach at us and to instruct us from on high. Sigh. They were good times.

Eric Jamborsky

<U><T><'><s><*><C><O><M><M><E><N><T>

Eric, Truer words have never been said. We grew up with ethnic humor and it was a great portion of our lives. A wonderful portion of our lives because the present generation has forgotten to laugh and looks for slights and putdowns in all discourse. Ethinic jokes made us laugh at the differences in people, races or genders. But not to hate or dislike them. I feel sorry for the modern generation because of what they have lost. UT

<T>~<H>~<E>~~~<J>~<O>~<K>~<E>~<S>~~~<S>~<T>~<A>~<R>~<T>~~~<H>~<E>~<R>~<E>

From: "Bob Bolgeo" bbolgeo@aol.com

DOG FOR SALE

Whether you own a dog or not, you must appreciate the efforts of this owner trying to sell her dog. Look at the picture of this lovable Chinese Mastiff and then read the sales pitch below.

Dog For Sale. Excellent guard dog.

Owner cannot afford to feed Jethro any more, as there are no more drug pushers,
thieves, murderers, or molesters left in the neighborhood for him to eat.
Most of them knew Jethro only by his Chinese street name, Ho Lee Schitt.

<J>~<O>~<K>~<E>~<S>

GREAT TRUTHS THAT LITTLE CHILDREN HAVE LEARNED:

1) No matter how hard you try, you can't baptize cats..

2) When your Mom is mad at your Dad, don't let her brush your hair..

3) If your sister hits you, don't hit her back. They always Catch the second person.

4) Never ask your 3-year old brother to hold a tomato.

5) You can't trust dogs to watch your food..

6) Don't sneeze when someone is cutting your hair..

7) Never hold a Dust-Buster and a cat at the same time.

8) You can't hide a piece of broccoli in a glass of milk.

9) Don't wear polka-dot underwear under white shorts.

10) The best place to be when you're sad is Grandma's lap.

<J>~<O>~<K>~<E>~<S>

GREAT TRUTHS THAT ADULTS HAVE LEARNED:

1) Raising teenagers is like nailing Jell-O to a tree.

2) Wrinkles don't hurt.

3) Families are like fudge....mostly sweet, with a few nuts.

4) Today's mighty oak is just yesterday's nut that held its ground..

5) Laughing is good exercise. It's like jogging on the inside.

6) Middle age is when you choose your cereal for the fiber, not the toy.

<J>~<O>~<K>~<E>~<S>

GREAT TRUTHS ABOUT GROWING OLD

1) Growing old is mandatory; growing up is optional.

2) Forget the health food. I need all the preservatives I can get.

3) When you fall down, you wonder what else you can do while you're down there.

4) You're getting old when you get the same sensation from a rocking chair that you once got from a roller coaster.

5) It's frustrating when you know all the answers but nobody bothers to ask you the questions.

6) Time may be a great healer, but it's a lousy beautician.

7) Wisdom comes with age, but sometimes age comes alone.

<J>~<O>~<K>~<E>~<S>

THE FOUR STAGES OF LIFE:

1) You believe in Santa Claus.

2) You don't believe in Santa Claus.

3) You are Santa Claus.

4) You look like Santa Claus.

<J>~<O>~<K>~<E>~<S>

SUCCESS:

At age 4 success is . . . . Not piddling in your pants.

At age 12 success is . . . Having friends.

At age 17 success is . . Having a driver's license.

At age 35 success is . . . . Having money.

At age 50 success is . . . Having money.

At age 70 success is . .. . Having a driver's license.

At age 75 success is . ... . Having friends.

At age 80 success is . . .. Not piddling in your pants.

<J>~<O>~<K>~<E>~<S>

$2.99 SPECIAL

If you are a Senior you will understand this one. If you deal with Seniors, this should help you understand them a little better. And if you are not a Senior yet.....God willing, someday you will be.

The 2.99 Special

We went to breakfast at a restaurant where the 'Seniors Special' was two eggs, bacon, hash browns and toast for $2.99.

'Sounds good,' my wife said, 'But I don't want the eggs.'

'Then, I'll have to charge you $3.49 because you're ordering a la carte', the waitress warned her.

'You mean I'd have to pay for not taking the eggs?' my wife asked incredulously.

'Yes!' stated the waitress.

'I'll take the special then,' my wife said.

'How do you want your eggs?' the waitress asked.

'Raw and in the shell,' my wife replied.

She took the two eggs home and baked a cake.

DON'T MESS WITH SENIORS!!! We've been around the block more than once!

<J>~<O>~<K>~<E>~<S>~~~<of>~<the>~~~<W>~<E>~<E>~<K>

From: "Mike Waldrip" waldripk@gmail.com

HOW MANY PEOPLE DOES IT TAKE TO CHANGE A LIGHT-BULB?

1 to change the light bulb and to post that the light bulb has been changed

14 to share similar experiences of changing light bulbs and how the light bulb could have been changed differently

7 to caution about the dangers of changing light bulbs

27 to point out spelling/grammar errors in posts about changing light bulbs

53 to flame the spell checkers

41 to correct spelling/grammar flames

6 to argue over whether it's "lightbulb" or "light bulb" ... another

6 to condemn those 6 as anal-retentive

2 industry professionals to inform the group that the proper term is "lamp"

15 know-it-alls who claim *they* were in the industry, and that "lightbulb" is perfectly correct

156 to email the participant's ISPs complaining that they are in violation of their "acceptable use policy"

109 to post that this forum is not about light bulbs and to please take this discussion to a lightbulb forum

203 to demand that cross posting to hardware forum, off-topic forum, and lightbulb forum about changing light bulbs be stopped

111 to defend the posting to this forum saying that we all use light bulbs and therefore the posts *are* relevant to this forum

306 to debate which method of changing light bulbs is superior, where to buy the best light bulbs, what brand of light bulbs work best for this technique and what brands are faulty

27 to post URL's where one can see examples of different light bulbs

14 to post that the URL's were posted incorrectly and then post the corrected URL's

3 to post about links they found from the URL's that are relevant to this group which makes light bulbs relevant to this group

33 to link all posts to date, quote them in their entirety including all headers and signatures, and add "Me too"

12 to post to the group that they will no longer post because they cannot handle the light bulb controversy

19 to quote the "Me too's" to say "Me three"

4 to suggest that posters request the light bulb FAQ

44 to ask what is a "FAQ"

4 to say "didn't we go through this already a short time ago?"

143 to say "do a Google search on light bulbs before posting questions about light bulbs"

1 forum lurker to respond to the original post 6 months from now and start it all over again.

1 to state that a light bulb does not emit light, it sucks dark. After it is full, it stays dark.

<J>~<O>~<K>~<E>~<S>

WOMEN ARE EVIL BY NATURE...

A woman went up to the bar in a quiet rural pub. She gestured alluringly to the bartender who approached her immediately. She seductively signaled that he should bring his face closer to hers. As he did, she gently caressed his full beard. 'Are you the manager?' she asked, softly stroking his face with both hands.

'Actually, no,' he replied.

'Can you get him for me? I need to speak to him,' she said, running her hands beyond his beard and into his hair.

'I'm afraid I can't,' breathed the bartender.. 'Is there anything I can do?'

'Yes. I need you to give him a message,' she continued, running her forefinger across the bartender's lip and slyly popping a couple of her fingers into his mouth and allowing him to suck them gently.

'What should I tell him?' the bartender managed to say.

'Tell him,' she whispered, 'There's no toilet paper, hand soap , or paper towels in the ladies room.'

<J>~<O>~<K>~<E>~<S>~~<of>~<the>~~<W>~<E>~<E>~<K>

From: "Jim Hollis" jhollis@northsidesales.com

LIFE EXPLAINED TO YOU

ON THE FIRST day, God created the dog and said, sit all day by the door of your house and bark at anyone who comes in or walks past.... For this I will give you a life span of twenty years.

The dog said, "That's a long time to be barking. How about only ten years and I'll give you back the other ten?"

And God said that it was good.

On the second day, God created the monkey and said, "Entertain people, do tricks, and make them laugh. For this, I'll give you a twenty-year life span."

The monkey said, "Monkey tricks for twenty years? That's a pretty long time to perform. How about I give you back ten like the dog did?"

And God again said that it was good.

On the third day, God created the cow and said, "You must go into the field with the farmer all day long and suffer under the sun, have calves and give milk to support the farmer's family. For this, I will give you a life span of sixty years."
The cow said, "That's kind of a tough life you want me to live for sixty years. How about twenty and I'll give back the other forty?"

And God agreed it was good.

On the fourth day, God created humans and said, "Eat, sleep, play, marry and enjoy your life. For this, I'll give you twenty years."

But the human said, "Only twenty years? Could you possibly give me my twenty, the forty the cow gave back, the ten the monkey gave back, and the ten the dog gave back; that makes eighty, okay?"

"Okay," said God, "You asked for it."

So that is why for our first twenty years, we eat, sleep, play and enjoy ourselves... For the next forty years, we slave in the sun to support our family. For the next ten years, we do monkey tricks to entertain the grandchildren. And for the last ten years, we sit on the front porch and bark at everyone.

Life has now been explained to you.

<J>~<O>~<K>~<E>~<S>~~<of>~<the>~~<W>~<E>~<E>~<K>

From: "Chris Cowan" cowanc1028@earthlink.net

A DARK AND STORMY NIGHT

This will Make Your Day

Bob Hill and his new wife Betty were vacationing in Europe...as it happens, near Transylvania. They were driving in a rental car along a rather deserted highway. It was late at night and raining very hard with thunder and lightning.

Bob could barely see the road in front of the car.

Suddenly, the car skids out of control! Bob attempts to control the car, but to no avail! The car swerves and smashes into a tree.

Moments later, Bob shakes his head to clear the fog.

Dazed, he looks over at the passenger seat and sees his wife unconscious, with her head bleeding! Despite the rain and unfamiliar countryside, Bob knows he has to get her medical assistance. Bob carefully picks his wife up and begins trudging down the road. After a short while, he sees a light. He heads towards the light, which is coming from a large, old house.

He approaches the door and knocks.

A minute passes and a small, hunched old man opens the door. Bob immediately blurts, "Hello, my name is Bob Hill, and this is my wife Betty. We've been in a terrible accident, and my wife has been seriously hurt. Can I please use your phone?"

"I'm sorry," replied the hunchback, "but we don't have a phone. But my master is a doctor; come in, and I will get him!"

Bob brings his wife in. An older man comes down the stairs. "I'm afraid my assistant may have misled you. I am not a medical doctor; I am a scientist. However, it is many miles to the nearest clinic, and I have had a basic medical training. I will see what I can do. Igor, bring them down to the laboratory." With that, Igor picks up Betty and carries her downstairs, with Bob following closely. Igor places Betty on a table in the lab. Bob collapses from exhaustion and his own injuries, so Igor places Bob on an adjoining table.

After a brief examination, Igor's master looks worried.

"Things are serious, Igor. Prepare a transfusion."

Igor and his master work feverishly, but to no avail, and Bob and Betty Hill both passed away.

The Hills' deaths upset Igor's master greatly. Wearily, he climbs the steps to his conservatory, which houses his grand piano. For it is here that he has always found solace. He begins to play, and a stirring, almost haunting melody fills the

house. Meanwhile, Igor is still in the lab tidying up. His eyes catch movement, and he notices the fingers on Betty's hand twitch, keeping time to the haunting piano music. Stunned, he watches as Bob's arm begins to rise, marking the beat! He is further amazed as Betty and Bob both sit up straight! Unable to contain himself, he dashes up the stairs to the conservatory.

He Bursts in and Shouts to his Master, "Master, Master"

"The Hills are Alive with the Sound of Music!"

I am Soooooo Sorry.....But You Really Should've Seen That Coming!!

<YOU>~<>~<JUST>~<>~<CAN'T>~<>~<MAKE>~<>~<THIS>~<>~<STUFF>~<>~<UP!>

YOU JUST CAN'T MAKE THIS STUFF UP!

From: "Tim Bolgeo" tbolgeo@epbfi.com

JOE BIDEN: AR-15 USED TO STOP TEXAS CHURCH MASSACRE SHOULD NOT BE ALLOWED

by AWR HAWKINS13 Nov 20178,427 http://www.breitbart.com/big-government/2017/11/13/joe-biden-hero-shouldnt-allowed-use-ar-15-stop-texas-church-attack/

AP Photo/Brennan Linsley

During a November 13 appearance on NBC's Today, former Vice President Joe Biden answered a question on Texas church attack hero Stephen Willeford by saying, "Well, first of all, the kind of gun being carried he shouldn't be carrying."

His response came in response to an audience member who was asking how Democrats can justify pushing gun control when it was clearly the presence of a gun in the hands of Willeford that ended the attack.

On November 6 Texas officials credited Willeford with ending the attack.

Willeford, who is a former NRA instructor and current NRA member, ran out of his house barefoot with an AR-15 in hand, took cover behind a vehicle and shot killer Devin Kelley when he walked out of the church. Kelley then fled the scene, only to crash and die roughly 15 minutes later. Breitbart News reported that Senate Democrats responded by introducing a ban on the type of gun Willeford used to end the attack.

On Today, audience member Brianna asked, "How do you justify the Democrat view on gun control when the shooter was stopped by a man who was legally licensed to carry a gun?"

Biden replied, "Well, first of all, the kind of gun being carried he shouldn't be carrying." He then specifically mentioned "assault weapons" and said, "I wrote the last serious gun control law that was written, it was law for 10 years. And it outlawed assault weapons and it outlawed weapons with magazines that had a whole lot of bullets, as you can kill a whole lot of people more quickly."

He added, "Number two, it's just rational to say certain people shouldn't have guns. Now the fact that some people with guns are legally able to acquire a gun and they turn out to be crazy after the fact, that's life. There's nothing you can do about that."

Again, Brianna was asking how Democrats can justify pushing more gun control in light of the fact that an armed citizen used a gun, an AR-15 in this case, to stop the Texas church attack.

<YOU>~<>~<JUST>~<>~<CAN'T>~<>~<MAKE>~<>~<THIS>~<>~<STUFF>~<>~<UP!>

YOU JUST CAN'T MAKE THIS STUFF UP!

From: "Chris Cowan" cowanc1028@earthlink.net

HOW A HERD OF SHEEP PUT THE FAROE ISLANDS ON THE MAP

Sarah Buder 11.7.2017
https://www.afar.com/magazine/how-a-herd-of-sheep-put-the-faroe-islands-on-the-map?inspiration=tips-and-news&sub_inspiration=tech&email=cowanc1028%40earthlink.net&utm_source=Sailthru&utm_medium=email&utm_campaign=faroe%20islands&utm_content=Final&utm_term=Daily%20Wander%20Newsletter

Courtesy of Visit Faroe Islands

Thanks to a wandering team of camera-equipped quadrupeds, you can now navigate these remote Scandinavian isles on Google Street View.

It seems too good to be true that the Faroe Islands—a

destination with a greater population of sheep than humans and a name that translates to the "Sheep Islands"—would be put on the map (both literally and figuratively) by the woolly beasts. But it's not too good to be true. The Faroe Islands are now officially on Google Street View, and the islands' local sheep population is to thank.

For years, the 18-island archipelago, located between Iceland and Norway, didn't exist on Google Street View (it's that remote). So Faroe Islanders took matters upon themselves. In 2016, Visit Faroe Islands rep Durita Andreasson launched "Sheep View 360"—an innovative project that could be described as a Faroese spin on Google's digital mapping service.

With the help of a local shepherd, Andreasson strapped specially built harnesses equipped with 360-degree, solar-powered cameras to a handful of sheep across the islands and sent them off to collect imagery of the remote surrounding landscapes. But because these sheep continued to freely roam the islands, "Sheep View 360" still needed Google's assistance in formally documenting the archipelago's roads and town centers.

Following the launch of "Sheep View 360," thousands of people around the world urged Google to make the Faroe Islands part of Google Street View. In response, Google sent camera equipment to the islands so that locals could assist the sheep in accurately capturing the jaw-dropping area.

"When we herd about the Sheep View project, we thought it was shear brilliance," writes David Castro González de Vega, Google Maps program manager, in a statement. "So we decided to help the Faroese by supplying them with a Street View Trekker and 360-degree cameras via our Street View camera loan program."

With Google's equipment, Faroe locals set out to capture on- and off-road imagery of the archipelago—on foot, by bike, in cars, via kayaks, and even by wheelbarrow. Thanks to that data, various locations in the Faroe Islands can officially be found—and explored—on Google Street View. And now, it's up to locals and visitors to continue adding highlights to the map.

"The Visit Faroe Islands office in Tórshavn and Atlantic Airways at the Vágar Airport will be lending out Google cameras, and anyone is welcome to lend a hand in the exciting project," says Guðrið Højgaard, director at Visit Faroe Islands. "We are delighted to continue to develop our own unique version of Google Street View."

Watch the adorable project come to life AT THE WEBSITE.

<S>~<C>~<I>~<E>~<N>~<C>~<E>~~~<S>~<T>~<A>~<R>~<T>~<S>~~~<H>~<E>~<R>~<E>

From: "Tim Bolgeo" tbolgeo@epbfi.com

SPACEX ROCKET ENGINE SUFFERS FAILURE DURING TEST (UPDATED)

By Mike Wall, Space.com Senior Writer | November 8, 2017 08:12pm ET
https://www.space.com/38712-spacex-rocket-engine-test-explosion.html?utm_source=sdc-newsletter&utm_medium=email&utm_campaign=20171108-sdc

An explosion occurred during a test of a SpaceX Merlin engine on Saturday (Nov. 4) at the company's test facility in McGregor, Texas, according to a statement obtained by Space.com.

Two SpaceX Merlin 1D engines sit on a test stand at the company's rocket-development facility in McGregor, Texas. Credit: SpaceX

"No one was injured and all safety protocols were followed during the time of this incident," according to the statement. "We are now conducting a thorough and fully transparent investigation of the root cause."

The explosion occurred during a test of a "Block 5" Merlin engine, which will be used in a future generation of the company's Falcon 9 rockets, a source told Space.com. Falcon 9 rockets that are currently in operation utilize the "Block 4" Merlin engine, so the incident will not require the company to halt any of its scheduled launches.

"SpaceX is committed to our current manifest and we do not expect this to have any impact on our launch cadence," the statement said.

The incident occurred during a "LOX drop" test, in which an engine is filled with liquid oxygen fuel and tested for leaks, according to the source. The engine did not fire during this test. At some point during the test, the liquid oxygen ignited; the company does not know if the engine itself exploded, the source said. The test bay where the explosion took place may take two to four weeks to repair.

SpaceX anticipates that a full investigation into the incident will take several weeks. The explosion was first reported by The Washington Post.

SpaceX's launch schedule has been pretty packed this year. SpaceX has already launched 16 missions, all of them successful, in 2017 — twice as many as its previous high in a calendar year. And all but three of these missions also involved landings of the Falcon 9 first stage, for eventual refurbishment and reuse. (During the other three launches, no landing was attempted.)

The reuse of rockets and spacecraft will slash the cost of spaceflight, leading to greater exploration opportunities, SpaceX founder and CEO Elon Musk has said.

SpaceX has experience investigating accidents. In September 2016, a Falcon 9 exploded on the launch pad during a routine preflight test, destroying the rocket and its payload, the Amos-6 communications satellite. The company traced the problem to a design flaw in one of the helium canisters inside the rocket's second-stage liquid-oxygen tank.

In June 2015, a Falcon 9 broke apart less than 3 minutes after liftoff, scuttling an uncrewed cargo run to the International Space Station by SpaceX's Dragon capsule. That accident was caused by the failure of a single steel strut inside the second stage, the company determined.

Nobody was hurt in either of these incidents.

SpaceX has several more Falcon 9 missions on tap for 2017, and the company also aims to launch its huge new Falcon Heavy booster for the first time before the end of the year.

Correction: This story was updated at 6:48 p.m. EST to correct the date of the SpaceX Merlin rocket engine mishap. It occurred Saturday, Nov. 4, not Sunday, Nov. 5, according to a SpaceX statement.

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BOEING TAPPED TO BUILD PHANTOM EXPRESS SPACEPLANE FOR DARPA

David Szondy, May 24th, 2017
https://newatlas.com/boeing-darpa-spaceplane-phantom-express/49691/

DARPA's ambitious launch-a-day spaceplane is a step closer to lift off after Boeing announced that it's been assigned the contract to work with the agency to design, build and test a technology demonstration vehicle for the Experimental Spaceplane (XS-1) program. Called the Phantom Express, the goal is to create an unmanned, autonomous, hypersonic, reusable spaceplane that can deliver small payloads of 3,000 lb (1,361 kg) to low Earth orbit.

Currently, space launches are special events that take months or years in preparation, but as the world becomes more dependent on orbital assets, stepping up the pace is becoming a major priority. This is especially the case for the military, which often requires new satellites put in place on very short notice to fulfill missions in a fast-changing world.

Phantom Express shown preparing to launch its expendable second stage on the top of the vehicle in this artist's concept(Credit: boeing-spaceplane)

The Phantom Express is DARPA's idea for a craft that can deliver small payloads into orbit for about US$5 million each. Unlike the US Air Force's X-37B, the Phantom is a self-contained vertical launch vehicle about the size of a business jet and uses cryogenic liquid oxygen and hydrogen propellants to power an updated version of the Space Shuttle's Aerojet Rocketdyne AR-22 engine.

The idea is that the Phantom Express would lift off from a launch pad and go into a suborbital trajectory at hypersonic speeds while shielded by third-generation thermal protection. After it reaches the edge of space, it would launch a small, expendable second stage, which would deliver the payload to orbit. Meanwhile, the Phantom would bank and return to the spaceport, where it would land like a conventional aircraft.

Because the Phantom would be built and operated more like a military aircraft than a space vehicle, and even uses off-shelf military components, DARPA says that it has a potential turnaround time for the next launch of hours instead of weeks. According to the agency, this first of a new class of spaceplanes would allow the US to quickly recover even if faced with the catastrophic loss of military or commercial satellites.

Boeing's task is to develop a technology demonstrator capable of carrying out 10 flights in 10 days by using easily accessible subsystem components that can be quickly ordered and replaced.

As the XS-1 project enters Phase 2 and 3, the vehicle will incorporate advanced, lightweight composite cryogenic propellant tanks, hybrid composite-metallic wings and control surfaces capable of withstanding hypersonic temperatures and stresses, and automated

flight-termination and other technologies, including those from DARPA's Airborne Launch Assist Space Access (ALASA) program.

If all goes to schedule, Phase 2 will see static engine tests by 2019, followed by Phase 3 that will include 12 to 15 flight tests by 2020, the 10 in 10 days flight demonstration, and hypersonic test flights at Mach 5 (3,800 mph, 6,125 km/h). This will be followed by flights at Mach 10 (7,600 mph, 12,250 km/h) and delivering payloads of up to 3,000 lb (1,361 kg) to low Earth orbit.
DARPA says that in addition to the Phantom Express helping meet military needs, it hopes it will attract interest in the XS-1 technology from private firms.
"The XS-1 would be neither a traditional airplane nor a conventional launch vehicle but rather a combination of the two, with the goal of lowering launch costs by a factor of ten and replacing today's frustratingly long wait time with launch on demand," says Jess Sponable, DARPA program manager. "We're very pleased with Boeing's progress on the XS-1 through Phase 1 of the program and look forward to continuing our close collaboration in this newly funded progression to Phases 2 and 3 — fabrication and flight."

The animation below shows the Phantom Express in action.

Sources: Boeing, DARPA

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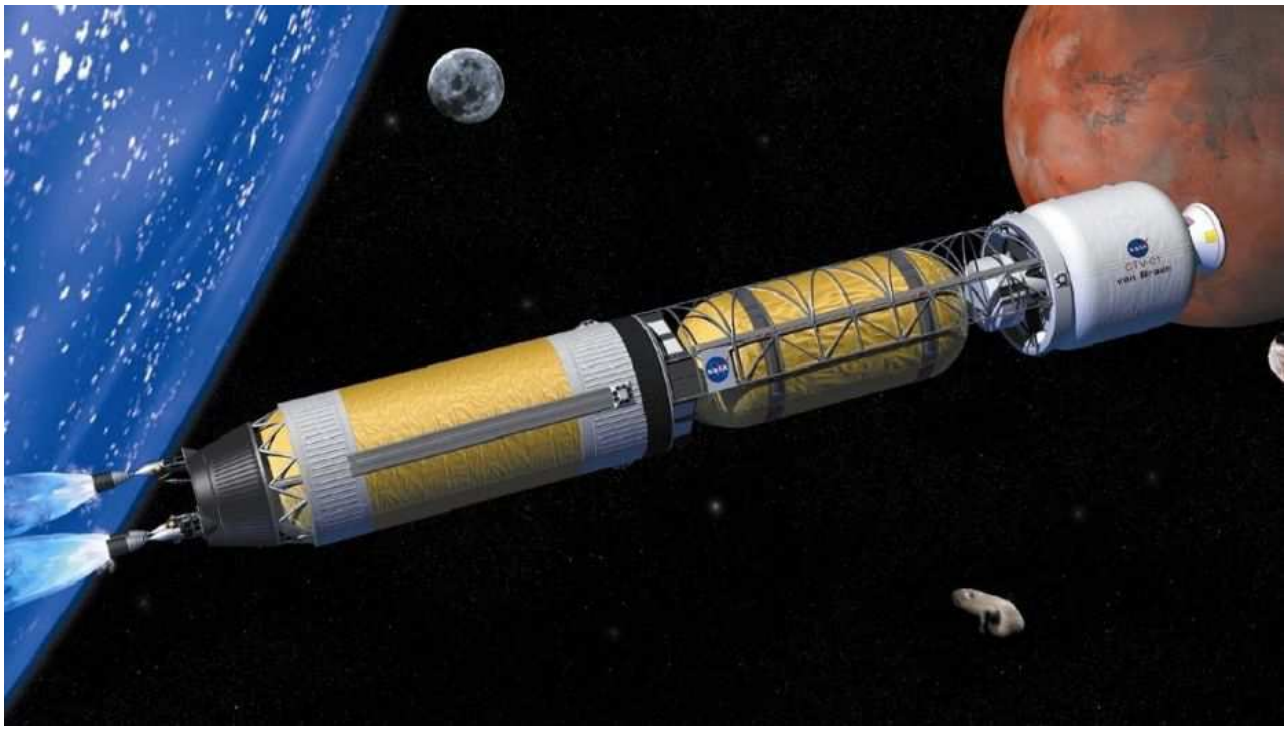
HOW VINTAGE ROCKET TECH COULD BE NASA'S TICKET TO MARS AND BEYOND

By Charlie Wood, Space.com Contributor
http://www.foxnews.com/science/2017/11/10/how-vintage-rocket-tech-could-be-nasas-ticket-to-mars-and-beyond.html



Nuclear thermal rockets like the one in this artistic rendering could halve the time needed for a Mars mission. (Pat Rawlings/NASA)

Dangerous radiation. Overstuffed pantries. Cabin fever. NASA could sidestep many of the impediments to a Mars mission if they could just get there faster. But sluggish chemical rockets aren't cutting it — and to find what comes next, one group of engineers is rebooting research into an engine last fired in 1972.

The energy liberated by burning chemical fuel brought astronauts to the moon, but that rocket science makes for a long trip to Mars. And although search for a fission-based shortcut dates back to the 1950s, such engines have never flown. In August, NASA boosted those efforts when the agency announced an $18.8-million-dollar contract with nuclear company BWXT to design fuel and a reactor suitable for nuclear thermal propulsion (NTP), a rocket technology that could jumpstart a new era of space exploration.

Here are eight things you should know about this serious condition.

"The strengths with NTP are the ability to do the very fast round trip [to Mars], the ability to abort even if you're 2 to 3 months into the missions, the overall architectural robustness, and also the growth potential to even more advanced systems," Michael Houts, principal

investigator for the NTP project at NASA's Marshall Space Flight Center, told Space.com. [Superfast Space Propulsion Concepts (Images)]

SUPERIOR GAS MILEAGE

NTP rockets would pull all that off by offering about twice the bang for the buck that chemical rockets do. Rather than burning fuel with oxygen, a nuclear fission reactor would serve as a powerful furnace, heating liquid hydrogen and expelling the resulting gas for thrust. How much oomph a rocket gets from its fuel depends largely on how fast it can hurl particles out the back, which in turn hinges on their mass. And NTP's single or double hydrogen atoms would be up to a dozen times lighter than chemical rocket outputs.
That atomic bean counting could add up to significant time savings. "Nuclear thermal propulsion can enable you to get to Mars faster, on the order of twice as fast," said Vishal Patel, a researcher involved in subcontract work for BWXT at the Ultra Safe Nuclear Corp. in Los Alamos, New Mexico. "We're looking at nice 3- to 4-month transit times."

NEW TRICKS WITH AN OLD TECHNOLOGY

Unlike truly exotic propulsion proposals using antimatter or nuclear fusion, researchers have long considered nuclear fission rockets technologically feasible. Concrete development began with the Atomic Energy Commission's Project Rover in 1955 — three years before NASA's founding — and continued with the NERVA rocket prototype, which fired for nearly 2 hours straight during ground tests before budget cuts ended development in 1972.

By then, NASA had already canceled Apollo 18 through 20, as well as Saturn V rocket production. When Mars plans followed suit, the multibillion-dollar NERVA project lost its main purpose, Houts said. The technology saw a brief revival in the late '80s and early '90s with the Space Nuclear Thermal Propulsion (SNTP) program, which also ran out of funding before flight testing.

But now, with interest turning back toward Mars, past research is finding new life in current projects.

"The key thing is, [the NERVA rocket] was extremely well documented," said John Helmey, project manager for BWXT's NTP project. "We aren't starting from scratch. We're building upon really good work that was done back in that time frame," he told Space.com. Over the course of the contract, which extends through 2019, BWXT will develop conceptual designs focusing on fuel elements and the reactor core.

Three main challenges distinguish modern efforts from the legacy research.

Nuclear-testing rules have changed, said Jonathon Witter, BWXT NTP project chief engineer. The potential for trace levels of radioactivity in the engine exhaust means that engineers can no longer let clouds of hydrogen gas billow into the atmosphere. Instead, BWXT plans to test a trick developed at NASA's Stennis Space Center and combust the hydrogen gas with oxygen to make easy-to-catch water. Early, small-scale demonstrations will use non-nuclear hydrogen gas to test this exhaust-capturing method, but water from future nuclear tests could be decontaminated with off-the-shelf technology.

Engineers are also redesigning the fuel elements with new materials surrounding the uranium fuel particles, according to Witter. Rocket efficiency depends on temperature too, and BWXT expects that a ceramic and tungsten composite will allow for better operation at higher temperatures.

What's more, NERVA ran on 90 percent highly enriched uranium that would today qualify as weapons-grade. But because the fission process throws off more than enough heat, those levels are overkill, Patel said. BWXT's designs will harness material enriched to just below 20 percent, putting it in the less-tightly regulated low enriched uranium (LEU) category. On top of allowing safer reactors, the modest levels of fissionable material could open the door to more public-private partnerships.

"The LEU thing really enables the idea that non-governmental entities can get in on this," Patel said. "It's potentially game changing."

A DARK HORSE FOR THE RED PLANET

But extensive design and many years of testing separate NTP's on-paper potential from single-season jaunts to the Red Planet, and nuclear space technology's history of false starts makes it a long shot for NASA's early Mars missions, currently scheduled for the 2030s. "It's one of several advanced propulsion options, Houts said. "There're a lot of good options that use chemical systems, and options that use electric propulsion ."

Scott Hall, a developer of one such electric propulsion prototype that recently broke records at the University of Michigan, says he'd love to see any of these technologies get into space, but doesn't think it'll happen soon.

"Optimistically, it will be 15 years," Hall said of his high-powered ion thruster, "and realistically it's probably more like 50… The process is just moving so slowly, and I imagine the nuclear guys are in a similar boat."

But whether it takes one decade or 10, Houts thinks nuclear technology could transform space exploration. He cites Martian power plants and the possibility of spacecraft that refuel from naturally occurring resources like water or methane as examples of far-off possibilities.

"What we're talking about is a first generation system. The systems beyond that could have extremely advanced capabilities," he said.

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NASA'S NEW PLANE DESIGN IS A SIMPLE, BRILLIANT FUEL-SAVER

The design of STARC-ABL might seem like a simple change, but the fuel savings are significant.

By Avery Thompson, Nov 8, 2017
http://www.popularmechanics.com/flight/news/a28947/nasa-new-plane-design/

NASA

NASA is best known for building rockets and spacecraft, but don't forget that "space" represents only one of the letters in the acronym. NASA also focuses on aeronautics, which means it's continually trying to improve the planes we travel in every day.

The most recent idea is called STARC-ABL, which stands for "Single-aisle Turboelectric Aircraft with an Aft Boundary-Layer propulsor." It's a terrible acronym, and for such a long-winded phrase you might expect something fancier than what it really is: an engine on the back of the plane.

NASA's idea is pretty straightforward: place a large turbofan engine on the rear of a plane, where it will collect the slow-moving air traveling along the plane's body. This lets the wing-mounted turbofans be built smaller, which means less drag and a higher fuel efficiency.

That by itself would mean a minor improvement to fuel use, but NASA decided to go a step further. The engineers also added generators to the wing-mounted turbofans, and the electricity generated by these engines is used to power the tail-mounted one. This means that the rear turbofan that provides much of the plane's thrust doesn't require any fuel to operate.

According to NASA, this means that the plane's engines use 10 percent less fuel using these improvements, which will translate to longer ranges for aircraft like Boeing's already long-range 787 Dreamliner.

NASA is starting to work with industry and academic leaders to turn this dream into reality. The agency issued grants to Boeing, the University of Georgia, and Liberty Works with ES Aero to develop working designs with the STARC-ABL concept. The long-term goal is to have a plane using this tech in the air within the next two decades, so you won't be seeing STARC-ABL on a working aircraft anytime soon. But this is an interesting glimpse into the future of commercial aviation, and NASA is appropriately leading the way.

Source: NASA

THERE IS A VERY GOOD VIDEO EXPLAINING THE CONCEPT AT THE WEBSITE.

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NASA DISCOVERS MANTLE PLUME ALMOST AS HOT AS YELLOWSTONE SUPERVOLCANO THAT'S MELTING ANTARCTICA FROM BELOW

BY HANNAH OSBORNE ON 11/8/17 AT 8:30 AM
http://www.newsweek.com/antarctica-melting-below-mantle-plume-almost-hot-yellowstone-supervolcano-705086

A mantle plume producing almost as much heat as Yellowstone supervolcano appears to be melting part of West Antarctica from beneath.

Researchers at NASA have discovered a huge upwelling of hot rock under Marie Byrd Land, which lies between the Ross Ice Shelf and the Ross Sea, is creating vast lakes and rivers under the ice sheet. The presence of a huge mantle plume could explain why the region is so unstable today, and why it collapsed so quickly at the end of the last Ice Age, 11,000 years ago.

Mantle plumes are thought to be part of the plumbing systems that brings hot material up from Earth's interior. Once it gets through the mantle, it spreads out under the crust, providing magma for volcanic eruptions. The area above a plume is known as a hotspot.

Marie Byrd Land.NASA/MICHAEL STUDINGER

For 30 years, scientists have suggested that a mantle plume may exist under Marie Byrd Land. Its presence would explain the regional volcanic activity seen in the area, as well as a dome feature that exists there. However, there was no evidence to support this idea.

Now, scientists from NASA's Jet Propulsion Laboratory have created advanced numerical models to show how much heat would need to exist beneath the ice to account for their observations—including the dome and the giant subsurface rivers and lakes we know are present on Antarctica's bedrock. As lakes fill and drain, the ice thousands of feet above rises and falls, sometimes by as much as 20 feet.

Study author Hélène Seroussi, from JPL, said when she first heard that a mantle plume might be heating Marie Byrd Land she thought the idea was "crazy."

"I didn't see how we could have that amount of heat and still have ice on top of it," she said in a statement.

View of the Grand Prismatic hot spring in Yellowstone National Park.MARK RALSTON/AFP/GETTY IMAGES

However, in a study published in the Journal of Geophysical Research: Solid Earth, Seroussi and colleagues looked at one of the most well studied magma plumes on Earth—the Yellowstone hotspot. The team developed a mantle plume model to look at how much geothermal heat would be needed to explain what is seen at Marie Byrd Land. They then used the Ice Sheet System Model (ISSM), which shows the physics of ice sheets, to look at the natural sources of heating and heat transport.

This model enabled researchers to place "powerful constraint" on how much melt rate was allowable, meaning they could test out different scenarios of how much heat was being produced deep beneath the ice.

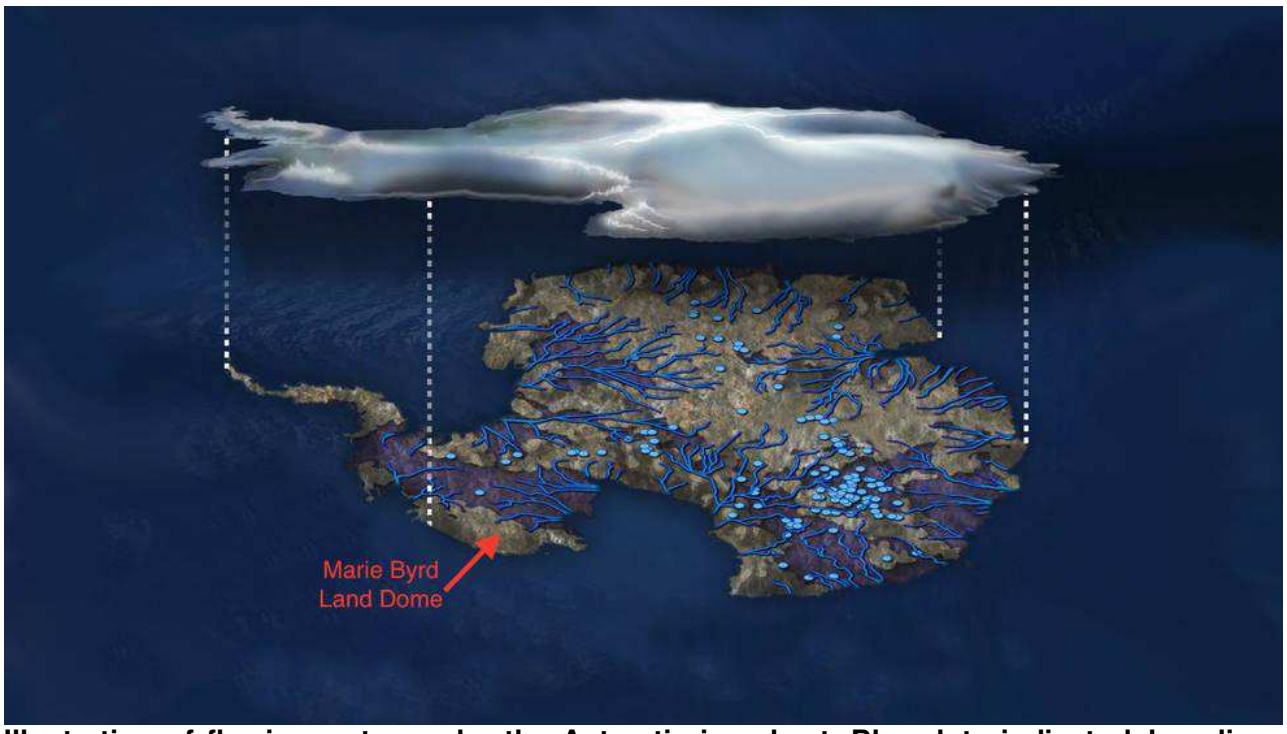

Illustration of flowing water under the Antarctic ice sheet. Blue dots indicate lakes, lines show rivers. Marie Byrd Land is part of the bulging "elbow" leading to the Antarctic Peninsula.NSF/ZINA DERETSKY

Their findings showed that generally, the energy being generated by the mantle plume is no more than 150 milliwatts per square meter—any more would result in too much melting. The heat generated under Yellowstone National Park, on average, is 200 milliwatts per square meter.

Scientists also found one area where the heat flow must be at least 150-180 milliwatts per square meter—but data suggests mantle heat at this location comes from a rift—a fracture in the Earth's crust where heat can rise up.

Concluding, the team say the Marie Byrd Land mantle plume formed 50-110 million years ago—long before the land above was hidden by ice. Heat from it, they say, has an "important local impact" on the ice sheet—and understanding these processes will allow researchers to work out what will happen to it in the future.

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FUTURISTIC BIONIC ARMS NOW AVAILABLE FOR THE NATION'S BRAVEST

By Allison Barrie | Fox News
http://www.foxnews.com/tech/2017/11/10/futuristic-bionic-arms-now-available-for-nations-bravest.html

Veterans get new hope with prosthetic advancements

New breakthroughs in prosthetic limb technology are offering better options for America's wounded veterans. Firepower's Allison Barrie shares the exciting news and advancements.

American military members make many sacrifices serving the United States. In fact, more than 1,600 have suffered the loss of a limb in Iraq and Afghanistan.

Until now, options for those who have endured an arm amputation have been limited. The quality of prosthetics has been entirely unworthy of the men and women who selflessly serve the country.

ETFs 101

The what, why, and how of ETFs. Learn about the potential cost and tax benefits of ETFs
DARPA has been doggedly determined to find a way to restore limbs. For more than 10 years, this military bastion of innovation has paved the way and funded the best advances to deliver limbs that would far better restore capabilities.

The aim doesn't stop there. In the Revolutionizing Prosthetics DARPA program, their vision is to also restore intuitive use of the new limbs with near natural control– even through thought control.

The hope is that these limbs will be so good that a service member's options will be limitless – and that they may even return to duty if they so wish.

LUKE

One of the exciting advances for those who have lost an arm is the LUKE (Life Under Kinetic Evolution) available through Mobius Bionics.

NORTH KOREA: WILL MINI NUKES BECOME AN OPTION FOR TRUMP?
With far better capabilities, LUKE allow users to do many things again for the first time since they lost the arm. It can translate muscle signals into complex arm motions.

The bionic arm (Mobius Bionics).

Developed by DEKA Research & Development Corp., and funded by DARPA, it is the very first arm cleared by the U.S. Food and Drug Administration.

About 100 wounded veterans played a vital role in this

breakthrough. During development, they assisted by testing the LUKE and providing feedback. More than 10,000 hours went into honing it into the arm.

And it is now commercially available for everyone and available by prescription.

LUKE is compatible with a range of amputation levels including shoulder, above the elbow and below the elbow. And an amazing breakthrough for wounded warriors as well as those with amputations from other causes such as diabetes, trauma and cancer.

The bionic arm (Mobius Bionics).

THE NEED

Since 9/11, it is believed more than 1,600 American warfighters have lost hands, arms, feet or legs.

In war zones, enemies of the U.S. have deployed vicious means of attack, like hidden IEDs, that have caused horrific wounds requiring amputations.

The impact of limb loss can be devastating. In addition to physical challenges, it can have profound psychological, social and economic, social and psychological consequences.

HOW IS LUKE DIFFERENT?

The LUKE arm will give wounded warriors the chance to do more complex movements with precision.

This enhanced precision, greater strength and better range will make daily activities much easier. LUKE provides a shoulder with better range, a hand that can manage both fragile and heavy items, a wrist with more dexterity and an elbow with far more strength.

With this prosthetic advance, users will have the strength to take a heavy grocery bag out of the trunk, carry it into the house from the car and heave it onto a high countertop.

Users can take advantage of the enhanced precision for tasks that require dexterity and a gentle touch such as taking something delicate like an egg out of the fridge and delivering it to the stove to make an omelet – and without the egg breaking on the way.

The LUKE arm can also do things like pour a glass of orange juice in the morning and hold a glass without spilling.

U.S. Army Colonel Michael Heimall, Director, Walter Reed National Military Medical Center (WRNMMC); U.S. Air Force Colonel Jeffrey Bailey, MD, Director for Surgery, WRNMMC; Colonel (Ret.) Paul Pasquina, MD, Chief of Orthopaedics and Rehabilitation, WRNMMC; Justin Sanchez, Ph.D., Director, Biological Technologies Office, Defense Advanced Research Projects Agency; Lieutenant Colonel Keith Myers, MD, Director, Amputee Clinic, WRNMMC (DARPA)

HOW DOES IT WORK?

The central control tech harnesses signals. Electromyogram (EMG) electrodes detect electrical signals from the user's muscles. Pattern recognition tech then interprets these nerve signals and translates them into the intended arm movement.

This approach is definitely not new. The breakthrough has been just how much this tech can translate from the nerve signals and communicate to the LUKE, giving the user much better control, strength and movement.

The design incorporates multiple motors, which are key delivering the technology's capabilities. LUKE can deliver 10 powered degrees of freedom.

To control the limb, LUKE users have a number of different input devices and approaches they can choose to use. Surface EMG electrodes and pressure switches is one option.

Another option is the foot control device, which is generally worn on top of shoes. This was the choice of the first two veterans to receive the LUKE through prescription. The IMU (Inertial Measurement Unit) foot controls enable the users to intuitively control the LUKE movements.

There are a number of grasp patterns available and the user can turn them on and off depending on what is needed for the activities ahead.

It was also designed with other practical daily challenges in mind like weather and terrain. The LUKE can be worn outside and will be fine in conditions like light rain.

WHAT'S NEXT?

Now bomb robots are benefiting from the extraordinary advances made by the LUKE project too. These robots are using the LUKE hand capabilities to do their job better.

With bomb robots more capable of stopping dangerous explosive threats, this means that humans do not have to be put in harm's way to complete the task. Not only can this save lives, it will also help prevent suffering and amputations in the future.

Thanks to DARPA and Mobius Bionics this breakthrough is now commercially available. Mobius is now finally able to accept requests from veterans. For more information, you can contact Mobius Bionics at info@mobiusbionics.com.

SCALED COMPOSITES NEW X-PLANE TAKES TO THE SKIES

David Szondy, October 13th, 2017
https://newatlas.com/scaled-composites-experimental-plane-model-401/51733/

Scaled Composites Model 401 experimental plane has completed its maiden flight. The aircraft, which was developed in secret by the wholly owned Northrop Grumman subsidiary for an unnamed client, took to the air on Wednesday as part of a program to demonstrate the company's advanced, low-cost manufacturing techniques.

Details of the first flight are sketchy, though Scaled posted a video on Facebook showing the takeoff of Vehicle Number 1. The Model 401 prototypes have an identical outer design with a 38-ft (11.6 m) wingspan and identical performance characteristics. Lightweight construction allows for an empty weight of 4,000 lb (1,814 kg) and a takeoff weight of 8,000 lb (3,628 kg).

The Model 401 on its maiden flight(Credit: Scaled Composites)

The Model 401 uses a single Pratt & Whitney JTD-15D-5D engine punching 3,045 lb of thrust. This provides for a speed of Mach 0.6 (456 mph, 735 km/h) and a service ceiling of 30,000 ft (10,000 m) with a flight endurance of three hours.

Two of the aircraft have been constructed. Vehicle Number 1 will continue its flight test program and expand the performance envelope before the second prototype's first flight.

Source: Scaled Composites

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STUDY FINDS SPACEX INVESTMENT SAVED NASA HUNDREDS OF MILLIONS

The private spaceflight company saved NASA the trouble of building their own cargo spacecraft.

By David Grossman, Nov 10, 2017
http://www.popularmechanics.com/space/rockets/a28995/study-finds-spacex-a-bargain-for-nasa/

When a SpaceX Dragon spacecraft connected with the International Space Station on May 25, 2012, it made history as the first privately-built spacecraft to reach the ISS. The Dragon was the result of a decision 6 years prior—in 2006, NASA made an "unprecedented" investment in SpaceX technology. A new financial analysis shows that the investment has paid off, and the government found one of the true bargains of the 21st century when it invested in SpaceX.

GETTY

A new research paper by Edgar Zapata, who works at Kennedy Space Center, looks closely at the finances of SpaceX and NASA. "There were indications that commercial space transportation would be a viable option from as far back as the 1980s," Zapata writes. "When the first components of the ISS were sent into orbit 1998, NASA was focused on "ambitious, large single stage-to-orbit launchers with large price tags to match."

Then in 2003 the Space Shuttle Columbia, a pricey orbiter that had made several trips to space, exploded upon reentry, killing the seven astronauts aboard. The Space Shuttle program was suspended and the expanded construction of the ISS was halted. The next year, President George W. Bush delivered his administration's "Vision for US Space Exploration," which called for NASA to "acquire cargo transportation as soon as practical and affordable to support missions to and from the International Space Station." This led to the creation of the NASA Commercial Orbital Transportation Services (COTS), which led to the investment in SpaceX.

Zapata estimates that SpaceX launches cost NASA around $89,000 per kilogram of cargo delivered to the space station. There's no telling what precisely would have come from a cargo spacecraft developed by NASA, but Zapata estimates that it would be $272,000 per kg.

For future commercial crew missions sending astronauts into space, Zapata estimates that it will cost $405 million for a SpaceX Dragon crew deployment of 4 and $654 million for a Boeing Starliner, which is scheduled for its first flight in 2019. That sounds like a lot, and it is, but Zapata estimates that its only 37 to 39 percent of what it would have cost the government.

NASA's initial 2006 investment, as well as further investments in the company in 2011 and 2014, have had profound benefits beyond the ISS. They have allowed SpaceX to become a global company, working with nations across the globe. "Considering NASA invested only about $140M attributable to the Falcon 9 portion of the COTS program, it is arguable that the US Treasury has already made that initial investment back and then some merely from

the taxation of jobs at SpaceX and its suppliers only from non-government economic activity," Zapata says.

All this positive financial ground can only be good news for SpaceX, which has set its bar extremely high as a company. Founder Elon Musk wants to use the company to get to Mars, a vision he's detailed in a speech titled Making Humans a Multiplanetary Species. "Right now we are estimating about $140,000 per ton for the trips to Mars," Musk said in that speech. "If a person plus their luggage is less than that, taking into account food consumption and life support, the cost of moving to Mars could ultimately drop below $100,000."

Only a couple hundred thousand per person to Mars is quite the ambitious estimate, but the company has proven it can significantly reduce the cost of spaceflight.

Source: NASA via Ars Technica

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NASA CUBESAT MISSIONS ARE PUSHING THE BOUNDARIES OF MICROSATS

by Staff Writers, Washington DC (SPX) Nov 14, 2017
http://www.spacedaily.com/reports/NASA_CubeSat_Missions_Pushing_the_Boundaries_of_Technology_999.html

NASA's Small Spacecraft Technology Program is on the countdown clock to advance communications and proximity maneuvering capabilities for CubeSats with two separate technology demonstration missions.

The Optical Communications and Sensor Demonstration (OCSD) mission will showcase the first-ever high-speed data downlink from a CubeSat to a ground station using lasers, in addition to maneuvering the pair of diminutive spacecraft to up-close proximity.

Also set for demonstration is the Integrated Solar Array and Reflectarray Antenna (ISARA) mission. A reflectarray is a relatively new type of antenna fabricated from standard printed circuit boards with an array of square copper patches etched on them.

These innovative satellites were carried onboard Orbital ATK's Cygnus advanced maneuvering spacecraft, a commercial resupply vehicle that will berth to the International Space Station (ISS). Atop the Orbital ATK's Antares booster, the Cygnus commercial resupply mission launched from NASA's Wallops Flight Facility in Virginia on Nov.12.

Once the Cygnus craft has completed its ISS servicing mission, it will detach from the ISS and move to a higher orbit. From there, the OCSD and ISARA CubeSats will be deployed to begin their respective missions.

The Small Spacecraft Technology Program expands U.S. capability to execute unique missions through rapid development and in-space demonstration of capabilities for small spacecraft applicable to exploration, science, and the commercial space sector.

The program enables new mission architectures through the use of small spacecraft, with goals of expanding their reach to new destinations and challenging new environments.

illustration only

PRECISION POINTING

"Our primary mission for OCSD is demonstrating laser communications, by using a laser on the spacecraft to downlink data to our optical ground stations on Mt. Wilson in California. The laser communication data rates are orders of magnitude higher than what we can do in radio frequency," explains Richard Welle, one of the principal investigators for OCSD at The Aerospace Corporation in El Segundo, California, that manages the project.

"Laser communication offers data rates competitive with current high-end CubeSat communications systems, in a compact package, and with the potential to go to much higher rates yet," Welle notes.

With each spacecraft carrying ultra-small star trackers, critical for precision pointing of the laser communications hardware, the laser is hard-mounted to the individual CubeSat body with the beam pointed by controlling the orientation of the entire spacecraft.

"Building a laser that would work in this environment meant solving a number of technical challenges," Welle advises. But having solved those challenges, he continues, the result was having a laser system much more compact than anything previously flown in space.

Applications for high data rate communications include providing download capability for data-intensive missions in low-Earth orbit such as those engaged in Earth imaging.

CLOSE COUSINS

Following laser communication testing, another OCSD objective is proximity operations where the two CubeSats will fly relatively close together in Earth orbit. To do so, the satellites use a combination of variable drag and bursts of propulsion from the spacecraft - using water exhausted as steam - to bring the two within 650 feet (200 meters) of one another.

Both CubeSats have miniature cameras, laser rangefinders, and are dotted by light-emitting diodes (LEDs) to aide in a step-wise reduction of distance between them, Welle explains. "The plan is to essentially have one of the satellites orbit the other at smaller and smaller distances," Welle adds.

Each OCSD CubeSat is about 4 inches x 4 inches x 6.7 inches (10 centimeters x 10 centimeters x 17 centimeters) and weighs approximately 5 pounds (2.5 kilograms).

As for the benefit of CubeSats, Welle is confident on what's already been learned in the OCSD project. "The technology development aspect of this mission is proving worthwhile for follow-on missions. Also, the commercial sector is very interested in the technologies that come out of this work," he concludes.

Capabilities in proximity operations will enable multiple small spacecraft to operate cooperatively during science or exploration missions, to approach another spacecraft or object for in-space observation or servicing, or to connect small spacecraft together to form larger systems or networks in space.

DATA-DOWNLINK

The technology benefit of the ISARA mission is to enhance CubeSats with a blend of antenna and solar cells, to allow for higher data-downlink communications. ISARA will use radio frequency Ka-band - the first time Ka-band uses a reflectarray antenna- that will surpass the existing baseline CubeSat transmission rate of 9.6 kilobits per second to more than 100 megabits per second.

"We have a lot of mission firsts with ISARA," says Richard Hodges, principal investigator of this CubeSat mission at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California. As a devoted "antenna guy" with decades of experience, he sees a bright future for the integrated solar array and reflectarray antenna that was perfected by JPL technologists.

"This is a flat antenna style, effectively replacing an antenna such as the curved surface parabolic style. Thanks to a photolithographic etching process, the reflectarray is relatively inexpensive to produce and they are lightweight. Furthermore, this type of antenna makes very efficient use of CubeSat volume. And that means lots of added room for payloads, such as science instruments or imaging systems," Hodges observes.

To the best of his knowledge, ISARA will be the first in-space demonstration of a reflectarray antenna as well as that of an integrated antenna and solar array. "As far as we know, no reflectarray has ever flown in space. It has been discussed over the years, but now we're going to demonstrate it does work in the space environment," says Hodges.

SWEET SPOT SENDOFF

Distinct from a parabolic dish antenna, the flat reflectarray panels are folded down flush against the CubeSat. Once the three antenna panels are deployed - electrically tied together through hinges - they narrowly focus the CubeSat's radio transmission beam to a "sweet spot" in much the same way a parabolic dish reflector would, Hodges explains.

"ISARA's solar array and reflectarray antenna is a very attractive package that enables high-speed data rates of more than 100 megabits per second. That's our primary goal for this mission."

Signals from the reflectarray antenna are to be transmitted to a ground station located at NASA's JPL. Experts there will reconstruct the antenna signal pattern, contrasting that pattern against pre-launch ground tests to appraise overall quality of ISARA's downlink transmission over months of mission duration.

The ISARA mission is being carried out in partnership with The Aerospace Corporation (Aerospace). Aerospace built the CubeSat and also supports a ground station network that's spread out across the United States that can be used to support the CubeSat demonstration flight.

STOWAGE EFFICIENCY

Hodges highlights other ISARA flight firsts, including antenna gain measurement actually done in space. "There's quite a significant list of technology advancements, like use of off-the-shelf camera sensors for weather and environmental monitoring," he says.

Indeed, due to efficiencies in the ISARA design that provide extra stowage volume, along with spacecraft power provided by ISARA technology, a secondary payload known as the CubeSat Multispectral Observation System (CUMULOS) is onboard - an experimental remote sensing payload from Aerospace.

"We're very excited about what ISARA can enable, both in science data transmitted down from Earth orbit, and for deep space exploration missions too," Hodges forecasts.

Infusion into the future

The path forward for CubeSats is underscored by Elwood Agasid, deputy program manager of the Small Spacecraft Technology Program at NASA's Ames Research Center in Silicon Valley, California.

"These two missions are pushing technology forward, for infusion in future missions. Getting data down to the ground from space is always essential. Laser communication and improvements in CubeSat radio frequency communication will be key components of that future. Similarly, flying smallsat constellations are important as well," says Agasid, as is new antenna technology.

ISARA and OCSD reflect how essential small satellites have become. "The short period of development time, the frequency of flight opportunities, and the ability to fly hardware in space to see how it performs in a relevant environment - these small satellites give us a low-cost avenue for in-space validation, verification and improvement of technology in an incremental fashion," Agasid concludes.

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FIRST VISITOR FROM OUTSIDE OUR SOLAR SYSTEM HAS A NAME AND AN ORIGIN

Meghan Bartels, Newsweek•November 10, 2017
https://www.yahoo.com/news/first-visitor-outside-solar-system-101002321.html

11_09_asteroid, An artist's representation of an asteroid (not ‘Oumuamua). NASA

Less than a month after spotting the first ever confirmed object from another solar system visiting Earth, astronomers haven't just given it a name, 1I/'Oumuamua—they even think they know where it came from. That's according to a new article posted on the physics pre-print server arxiv and submitted for publication to the journal Research Notes of the American Astronomical Society.

Astronomers were first struck early in their observations of the object, which at the time they thought was a comet, by its extraordinarily weird path. Most comets travel more or less in the plane of space that contains Earth, our sun, and our neighboring planets. Not this one: It swooped in from above that plane, then twirled around the sun and flew up again, tracing out a dramatic arc that will never bring it back to our solar system.

And as they got a better look at the mystery visitor, the plot thickened: They realized it wasn't a comet at all, since it lacks a comet's trademark fuzzy bubble surrounding its core. That meant it must actually be an asteroid, a hunk of space rock from a distant solar system.

Since then, the astronomical community has come together to give it a name—and that alone required some thinking on their feet, since no one had ever bothered to design a naming scheme for a phenomenon we'd never seen. They settled on 1I/'Oumuamua, representing the first (1) interstellar (I) object. 'Oumuamua was chosen by the team that first spotted it, based at the Pan-STARRS telescope in Hawaii. The name memorializes its status and is inspired by the Hawaiian words for being first to reach out.

And now there's even more exciting news: Astronomers think they know where 'Oumuamua came from. They figured that out by tracing its path backward along the observations that have been made so far and accounting for the wiggles that would have been caused by the gravitational tug of the large objects it flew past.

That led a trio of scientists to consider a neighborhood near the Carina and Columba constellations in the southern sky. There, somewhere in a cluster of stars, 'Oumuamua was born in a disk of pre-planetary dust, close enough to its star to be more rock than ice—until 40 million years ago. Then, something dramatic (they think a nearby planet had something to do with it) abruptly booted it out of the area, sending it on its odyssey to Earth.

'Oumuamua may be the first, but it won't be the last, and the authors of the new paper know it. They conclude the article: "We predict that future interlopers could radiants similar to ['Oumuamua]: Watch this space."
