ASSOCIATES

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January 2021

MARS STAR

MARS STAR has gone digital!!
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MARS Activities This Quarter:

- **OLDP Virtual Presentation. See pg. 3 – February 3**
- **Virtual Annual Meeting. See pg. 22 – March 3**

MARS Associates: A Social Club for Retirees of Lockheed Martin & United Launch Alliance

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President-Elect	TBD	
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CLUB CONTACTS

Bridge	Dave & Kathy Martz	303-683-9524
Car Club	Roger Rieger	303-912-6217
Dinner	Becky & Gary Englebright	303-973-4062
	Anita Kannady	303-794-9210
Golf	Bo Rodriguez	303-798-9157
Hiking	Sue Janssen	303-936-8339
Photography	John Chapter (Pres)	303-986-8277

REMINDER:

If you move, please give the membership VP a change of address. Also, if you are a snowbird, let us know when you are leaving and when you plan to return so your MARS STAR can be sent to you. It costs us 70 cents for each STAR package returned.

(Published quarterly by MARS Associates, Retirees of Lockheed Martin Corporation and United Launch Alliance, Denver, CO)

IMPORTANT PHONE NUMBERS

LM Employee Service Center	1-866-562-2363

MARS Important Phone Numbers
(Be sure to have your MARS ID available)

MARS Delta Dental of CO	
Individual Team (representatives)	1-877-516-6512
Ron Rueger (Account Mgr)	303-889-8616
Assured Partners of CO	
MARS Delta Dental "Vision" (EyeMed)	
MARS Vision Service Plan (VSP)	
Jon Elmore	303-228-2206
Hudson Howard	720-510-9505
Sharla Leary	720-510-9507
Aetna/Medicare Plus	1-888-562-8111
Kaiser Advantage Plus	303-338-3800

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MARS Website: https://www.marsretirees.org

Cover:

L: The Christmas STAR – the great conjunction of Jupiter and Saturn Credit: Monte Kopke

R: This file illustration provided by NASA depicts the Osiris-Rex spacecraft at the asteroid Bennu. The Osiris-Rex spacecraft entered orbit Monday, Dec. 31, 2018, around the asteroid Bennu, 70 million miles from Earth. It's the smallest celestial body ever to be orbited by a spacecraft. Bennu is just 1,600 feet (500 meters) across. (Conceptual Image Lab/Goddard Space Flight Center/NASA via AP, File) (See LM News, pg. 21)

From the Editor's Desk

Tom Pighetti (tjpighetti@q.com)
Linda Stearns (linda80120@comcast.net)

For comments or corrections, contact Tom (issue editor) or Mike Carroll, V.P. of Communications.

MARS welcomes your submissions. Submissions must be relevant **to the MARS organization**, informative, and **appropriate for this newsletter**. No **personal dialogues or opinion pieces** will be accepted.

Please submit your article for approval **in advance** to the V. P. of Communications. Articles will be included as time / space allows.

President's Corner

By Dick Sosnay
(richardsosnay@gmail.com)

I hope you all had a wonderful holiday season, with a Merry Christmas and a Happy New Year. The most important thing for all of us this New Year is to have a healthy new year. There is light at the end of the tunnel, we all hope. With any luck at all, we will all have had our vaccinations hopefully by springtime, we can again plan to have our MARS events, get out, see our friends and do things as before the pandemic. But we have to take it slowly, at least for now. Therefore, we will not meet together for our March Annual Meeting and spring luncheon. Instead, we will hold our annual business meeting via ZOOM on Wednesday, March 3 from 1:00 – 3:00 PM. We have been using ZOOM for our officer and director meetings since April last year, and it works very well. In addition, we have held several events using ZOOM, including the Titan Panel Discussion in October, and a presentation in November by the Lockheed Martin Engineering Leadership Development Program (ELDP), which consists of a group of young leaders at the company.

The Titan Panel Discussion, led by our MARS historian Barb Sande, was a fantastic look back over the Titan program. About 40 people participated and it was fun to reminisce about that extremely successful and important program in our corporation's history. There would not be a Lockheed Martin facility here in the Denver area if not for the Titan program. Many of us worked on the Titan program at some time in our career, many of us also worked on programs that flew on Titans, and all of us followed the launches. It was great fun to look back over those times, and to see old friends again on ZOOM. You can find a further discussion of the Titan Panel Discussion in Barb Sande's Historian Corner section in this MARS STAR.

The ELDP ZOOM presentation was set up by Bill Wise, MARS director. The purpose of ELDP program is to provide opportunities for up-and-coming engineers to connect with one another and with management. The ELDP group volunteered to make a ZOOM presentation to MARS members to provide insight into the program and the company. The interactive ZOOM meeting was held November 4 with four ELDP members and well attended by about 40 MARS members. The Agenda included:

- Panelist introductions (brief background information: when they worked on their program and what their responsibilities were)
- Panelist roundtable/large group discussion – discussion topics:
  * Pandemic
    - What are the effects of the Pandemic in the workplace?
  * Digital Transformation
    - What are some of the changes made for embracing the digital age?
    - A glimpse of future projects and technology
  * Millennial & Baby Boomer
    - What changes have been made to facilitate Boomers born from 1946 – 1964 and Millennials born from 1981 – 1996 to improve work product in a workplace that has become much more Millennial-age centric?

The presentation was very interactive, well received and gave great insight into some things going on at Lockheed Martin. As a result of the success of that presentation, a similar meeting with the Operations Leadership Development Program (OLDP) is planned for February 3 at 6:00 PM. We will send out a mass email with more details for the OLDP ZOOM presentation prior to that meeting.

All participants in these ZOOM discussions thoroughly enjoyed the ZOOM meetings and they were a great way to replace in-person meetings. I hope all of you will take the opportunity to join us at our March Annual meeting. The Annual meeting flyer in this MARS STAR, provides more about how to set-up and use ZOOM, and how to participate in our meeting using ZOOM. It is quite easy to use, even for those among us who may not be as computer savvy as some of our members.

After our annual spring meeting, we are hoping to start phasing in some real events. We have already reserved a time for our annual Rockies Baseball game get together on August 18 for an afternoon game with the Seattle Mariners. We have reserved a room for our 2021 Holiday Celebration on Weds, Dec 1, at the Wellshire Country Club. We will continue to monitor the coronavirus status and hope to also have our Senior Recognition luncheon and, of course, our annual picnic at Clement Park. If things turn out as we all are hoping for, we plan to start up our Happy Hours again. We may even set up some more informational seminars that we provided in the last few years. We would all like to get back to normal.

At the same time, our clubs are also looking forward to starting up their activities when it is safe to do so. You can read more about each club's plan for the coming year in their sections later in the STAR.

As we begin the New Year, it is time for all of us to renew our MARS Association membership. As we started doing last year, we are giving members the option to renew on-line, or via a paper copy and check. Please make sure your email address is correct when you fill out the renewal form. It becomes even more important during the pandemic and as the world evolves more and more to an on-line world. You can read more about that in Carl Kaminski's Membership section in this MARS STAR.

For the first time in 2 years, we almost did not have a volunteer article in this edition of the MARS STAR. Previously we have been successful in finding a MARS member to write an article describing the volunteer work

they do, and to provide information about that organization. As thanks for doing that, the MARS Association provides that volunteer organization a check for $50. However, this time, we did not find someone willing to write that article until right before we went to press. If you, or someone you know, is a volunteer and would like to prepare a short article for future MARS STARs, please contact me, or any officer or director, and let us know. We appreciate the volunteer work of our members do and appreciate even more the article that you could write for MARS.

As we head into the New Year, I am about to complete my first year as MARS president. It has been a real pleasure to serve in this role, although there have two disappointments for me, both of which you – Our MARS members can help fix. The first is that within weeks of my taking over the reins from Dan Ellerhorst last year, the coronavirus hit, and we have had to: cancel all of our major events, move all our officer/director's meetings onto ZOOM, cancel many of our club activities, and have had a general disruption of how MARS operated over its entire 35 years of existence. You can help fix that by continuing what you have already been doing, including wearing masks, washing your hands and social distancing, and by getting your vaccinations when they become available. With any luck, we hope to gradually begin getting MARS back to the way it was. My second disappointment was that we have gone this entire time period without a President-Elect. We have gotten through this period by all the officers picking up assignments of the President-Elect, but the major concern is not finding a volunteer to begin the training to take over the President's slot in 2022. Our organization is 100% run by volunteers, and only if we continue to get great volunteers to fulfill the roles of officers, directors, and other volunteer positions (like MARS STAR editors, Webmaster, Volunteer coordinator, Historian, In Memoriam coordinator, and club leaders) will MARS be able to continue to function in the future. Only somebody out there now reading this MARS STAR can fulfill the role of President-Elect by volunteering. I can guarantee you will have fun doing it!

This last year has been a strange one, for the entire world. I would like to thank everybody again for bearing with us as we transition through the pandemic and hope to transition back to normal as the year progresses. Please let me or any of the officers or directors know if you have any questions and concerns that we can help you with, or any suggestions for future activities. In closing, I would like to refer back to that great picture on the cover, taken by Monte Kopke, a MARS director. It shows a fantastic and inspiring close-up of the "Christmas Star", the conjunction of Jupiter and Saturn that occurred just prior to Christmas this year. While it has significance to many of our MARS members for reminding us of programs that some of us worked on (Voyager, Galileo, Cassini, Juno, and Titan launches for some of those missions), it also showed a shining beacon of hope for the coming next year and better times.

Activities Updates

By Linda Duby
(lindaduby@comcast.net)

I am very glad to see the year 2020 come to an end and am looking forward to 2021 and, hopefully, getting back to normal! So, Happy New Year and here's to 2021 being a much better year for everyone!

Due to COVID-19, MARS cancelled all activities that were scheduled after March, 2020. So, 2020 has been a very quiet year for those members who normally attend those functions. We are hoping to have more events in 2021 and I am proceeding with the plans for events later in the year.

In the meantime, since there are still restrictions in place for social events, the officers and directors made the decision to have a virtual Annual Meeting this year. The meeting is scheduled for March 3, 2021 on ZOOM at 1:00 p.m. See the "flyer" included in this STAR with more details about the meeting, -- please check it out and let me know, by email, if you would like to participate in this virtual meeting. My email is lindaduby@comcast.net.

The other event that is planned for this year, is the Rockies game and picnic. This event is scheduled for August 18, 2021. The Rockies will play the Seattle Mariners. More information and a flyer for this event will be in a later edition of the STAR.

I will have more information on other 2021 events in subsequent editions of the STAR.

Business

By William Schrott
(wmschrott@msn.com)

This has been a very frustrating year for all of us. My life has been curbside pickup at restaurants and grocery stores. My days are filled with watching movies and playing games with the family. I am suffering the quarantine weight gain disease and it is a different experience to have an annual physical via ZOOM.

I hope all of us are getting proper medical care, and staying healthy and safe. The bright spot for 2021 is that we are of the age to receive our vaccine shot before many others. I'm here to help you with the vision and dental programs for which MARS Associates provides discounts. Feel free to contact me.

Moving from PayPal to STRIPE

Beginning with the 2020 memberships, MARS created an online renewal process using PayPal. This was the first step toward allowing all event signups to go online. Of course, COVID put a major wrinkle in our plan to move forward with that effort.

For various reasons, we are transferring from the PayPal service to another service called STRIPE which has a much friendlier user interface from a bookkeeping perspective. At this time, and when it comes time for membership renewals in 2021, you will see references to STRIPE instead of PayPal. STRIPE is a PCI level 1 service provider as certified by an on-site assessment by a Qualified Security Assessor. This is the most stringent level of certification available in the payments industry. Other than the service name, you should notice no change.

We hope you continue to enjoy MARS activities once we get past COVID.

…Larry Stearns – our STRIPE interface, the Officers and Board of Directors

Membership Report

By Carl Kaminski
(carlcolo@centurylink.net)

MEMBERSHIP STATISTICS

As of January 1, 2021, there are 1,316 MARS Associates members, including 710 seniors.

Please welcome the following new members:

Colorado

Arvada	David Clair
Aurora	Judy & Jim Hardy
Castle Rock	Nancy & James Novotny
Centennial	Greg & Sheila Allen
Commerce City	Elaine Denton
Highlands Ranch	James Bradley
Littleton	Roy & Lori Adams, Jean Hawn, Mark Meyer, Stephen & Susan Winkler

Other States

South Carolina

Greenville	Mark & Tracy Wall
Summerville	Jeff Wead

Texas

Keller	David & Christiane Valore

Membership Renewal

Once again, it's time for membership renewal. A hard copy of the renewal form is contained in this issue of the STAR. In addition, clicking on the Membership tab from the main page of the MARS Retirees website (marsretirees.org → MEMBERSHIP) will provide access to a form that can be downloaded, filled out and printed for mail-in. You can type directly into this form from your web browser and print it out or printout the blank form and fill it in. Either approach should work. Also, you can renew directly online by selecting the red 'Renew' button under Membership Online Processing. This will allow you to pay via credit card and save the hassle of mailing your renewal form and payment via USPS. If you have any questions contact Carl Kaminski directly at 303-726-1546.

NEW MEMBERS

Do you know someone who recently retired from LM or ULA? First year membership in MARS is free for 2021. Direct them to the website for more information or have them contact one of the Officers or Directors.

Change of email address or phone number?

Given the rapidly changing environment we are all dealing with, it's more important than ever that we have current email and phone information for our members. Please remember to include the MARS membership team in your list of people to notify when you have a new phone number or email. We want to make sure all communications are timely.

MARS Associates

In Memoriam

By Norma Emerson
emer801@msn.com

Please contact me at the above e-mail address or at 303-646-1137 with information about the passing of a member, the spouse of a member or other MM/LM retirees so they can be acknowledged in the In Memoriam section.

MARS Associates expresses our deepest sympathy in the loss of your loved one, and a donation will be made to a charity chosen by the Officers and Board of Directors in their memory.

Members

Anderson, Carl "Andy" (D: October 2020)
(Survived by Jeanette Anderson)
Lakewood, CO
https://tinyurl.com/yyeeh334

Inman, Marjorie (D: September 2020)
Littleton, CO
https://tinyurl.com/y64ruroz

Lines, L. Robert "Bob" (D: October 2020)
(Survived by Jean Lines)
Highlands Ranch, CO
https://tinyurl.com/yy459y22

Reynolds, Elizabeth "Betty" (D: Nov 2020)
(Survived by Buck Reynolds)
Centennial, CO
https://tinyurl.com/yyf5xpse

Stearns, Harriett (D: October 2020)
Littleton, CO
https://tinyurl.com/y4lv7kf6

Taliaferro, Jack (D: October 2020)
Castle Rock, CO
https://tinyurl.com/yyota5f4

White, Gertrude "Trudy" (D: October 2020)
Centennial, CO
https://tinyurl.com/y46uuw2w

Non-Members

Ash, Arnold "Arnie" (D: April 2020)
(Survived by Mrs. Ash)
Littleton, CO
https://tinyurl.com/y4yntwql

Bagwell, William "Bill" (D: October 2020)
(Survived by Charlotte Bagwell)
Littleton, CO
https://tinyurl.com/y43drjhl

Castle, Christine (D: October 2020)
(Survived by Steve Castle)
Monument, CO
https://tinyurl.com/yylh7c2c

Clark, Patrick "Pat" (D: August 2020)
(Survived by Donna Clark)
Loveland, CO
https://tinyurl.com/yy8oeqn8

Cosgrove, Richard "Dick" (D: October 2020)
Colorado Springs, CO
https://tinyurl.com/y5tjfpgr

Duvall, George (D: October 2020)
(Survived by Sallie Duvall)
Boulder, CO
https://tinyurl.com/yxuhn24s

Janney, Charla (D: November 2020)
(Survived by Ron Janney)
Wheat Ridge, CO
https://tinyurl.com/yb8umfhh

Jubert, Sr., Joseph (D: October 2020)
(Survived by Veronica Jubert)
Aurora, CO
https://tinyurl.com/y5yh5sxg

Teets, Peter "Pete" B. (D: November 2020)
(Survived by Vivian Teets)
Colorado Springs, CO
https://tinyurl.com/y3gqu6ng

Thomas, Robert "Bob" A. (D: November 2020)
Lakewood, CO
https://tinyurl.com/yxf3z2sm

Watson, Mary (D: November 2020)
Littleton, CO
No obituary published

Wippermann, Donald (D: September 2020)
Littleton, CO
https://tinyurl.com/y6he2hjt

The Helping Hands Homeless Ministry

By Jan Rhea
(jan.lazycircles@outlook.com)

I got involved with Helping Hands Ministries at my church, Quail Springs United Methodist in Oklahoma City, because I missed working with Operation Santa Claus. Helping people in need with a like-minded team is what my heart needs. And all of us who do this kind of work know that the blessings we receive from seeing the happiness it brings is worth the hard work.

The mission of the Helping Hands Homeless Ministry is to reach out to homeless and low-income folks, let them know there are people who care about them and remind them that grace is for everyone. Each Thursday, we prepare and deliver 15 to 18 meals along with donated clothes and necessities. Our church has even donated furniture and household goods for our homeless friends that we've been able to help find homes for! I still keep in touch with them regularly. Every 4th week on Wednesday we prepare food for (pre-Covid-19) about 150 people (now about 85-115), and serve it at a downtown Oklahoma City church. We collaborate with other churches that do the same to round out the rest of the month. And every church helps serve the food every Wednesday. Other organizations participate, too, giving free haircuts, free pet food, etc. We also hand out donated clothes and other items.

I think most of you would be surprised to learn who stands on the street corners with a cardboard sign hoping you will notice them -- NO, they are not all dope addicts and alcoholics. In fact, I do not even know anyone like that in the group that I feed weekly. We have one elderly gentleman with Parkinson's disease so bad that he can hardly talk who tries to earn money because he cannot afford his prescriptions; we had a woman for a while who had her hours cut at Walmart and could not make ends

meet. One woman who was homeless and now has a roof over her head started her own business and is helping other homeless people. Some are just passing through, but in all cases, we provide a meal, resource information so they can get the help they need, smiles, prayers and except right now – hugs.

Everybody has a story, and most people just need a helping hand. You do not have to give money -- a bottle of water, a loaf of bread, hand warmers or rain ponchos are great. Your heart will thank you for it!

Historian Corner

By Barb Sande
barbsande@comcast.net

Titan History Roundtable Summary

On October 15 2020, MARS held a virtual roundtable discussion on ZOOM featuring seven panelists and approximately 40 MARS Associates members. The roundtable honored the 15th anniversary of the end of the Titan program (October 19, 2005). Participating on the roundtable were former Titan program personnel including Fred Luhman, Larry Perkins, Samuel Lukens, Dave Giere, Dennis Brown and Jack Kimpton. I acted as another Roundtable member (25 years on Titan) and as the moderator, with Steve Sande administering the ZOOM meeting. Two launch videos (TIVB-26 – the last Titan, and TIVB-33 – the Cassini launch) were highlighted and the discussions lasted nearly two hours.

Here is the link for the MARS Associates video on YouTube: https://www.youtube.com/watch?v=KYPCTWJc1zw&feature=youtu.be

The discussions centered on the best and worst memories of each panelist and the programmatic challenges they faced. After the panel discussion, the audience was asked to contribute and many participants had interesting stories to share. I would like to thank the group for participating in this unique forum and hope to schedule more in the future (hopefully in person). I encourage all members to view the video!

Program Profile

This issue is part 2 of the profile of the third planned lunar landing Apollo mission: Apollo 13. A minor clarification is in order- the wording was incorrect in the first paragraph of the Program Profile article in the previous MARS STAR. Apollo 13 was obviously not the third Apollo mission, but was the third planned lunar landing and the seventh manned Apollo mission overall.

Part 2 of the Apollo 13 Profile focuses on the aftermath and the failure investigation.

Apollo 13 Mission Overview

Launched: 04/11/1970 19:13:00 UTC LC-39A
Splashdown: 04/17/1970 18:07:41 UTC, Southern Pacific, USS Iwo Jima recovery ship
Saturn V AS-508 Launch Vehicle
Hybrid/Free Lunar Trajectory Fly-by
CSM (Command/Service Module) Call Sign: *Odyssey* (CSM-109)
LM (Lunar Module) Call Sign: *Aquarius* (LM-7)
Crew: Commander Jim Lovell, LM Pilot Fred Haise, CM Pilot Jack Swigert (a last-minute substitution for Ken Mattingly)
Intended landing site: Fra Mauro Crater and Highlands
Connection to Lockheed Martin/ULA: The contributions of our heritage companies to the Apollo program were listed in the MARS STAR article about Apollo 11.

Establishing the Apollo 13 Review Board

After the worldwide sigh of relief that the Apollo 13 crew had returned home safely on April 17, 1970, the investigation began almost immediately. In fact, a letter was released by Thomas O. Paine, NASA Administrator, and George Low, Assistant NASA Administrator, on the very day of splashdown directing the establishment of the Apollo 13 Review Board. A follow-up letter on April 21, 1970, further defined the Board membership with the following participants:

Edgar M. Cortright, Chairman (Director, Langley Research Center)
Robert F. Allnutt (Assistant to the Administrator, NASA Headquarters)
Neil Armstrong (Astronaut, Manned Spacecraft Center)
Dr. John F. Clark (Director, Goddard Space Flight Center)
Brigadier General Walter R. Hedrick, Jr. (Director of Space, DCS/R&D, USAF Headquarters)
Vincent L. Johnson (Deputy Associate Administrator – Engineering, Office of Space Science and Applications)
Milton Klein (Manager, AEC-NASA Space Nuclear Propulsion Office)
Dr. Hans M. Mark (Director, Ames Research Center)

These board members were supported by legal counsel (George Malley, Langley), technical support (Charles Mathews, Office of Manned Space Flight), observers (William Anders, former Astronaut; Dr. Charles D. Harrington, NASA Aerospace Safety Panel; I. I. Pinkel, Lewis Research Center), a Congressional liaison (Gerald Mossinghoff), and a Public Affairs liaison (Brian Duff). Obviously, there was a marching army of support teams and groups brought in to do parts of the investigation.

The purposes of the Review Board were to:

1) Review the circumstances surrounding the accident during the flight of Apollo 13 and the subsequent flight and ground actions taken to recover, in order to establish the probable cause or causes and assess effectiveness of recovery actions.

2) Review all factors relating to the accident and recovery actions the Board determines to be significant and relevant, including actions undertaken by program offices, field centers, and contractors.
3) Direct further specific investigations as may be necessary.
4) Report as soon as possible the Board's findings relating to cause or causes of the accident and effectiveness of recovery actions.
5) Develop recommendations for corrective or other actions, based on findings.
6) Document findings, determinations and recommendations and submit a final report.

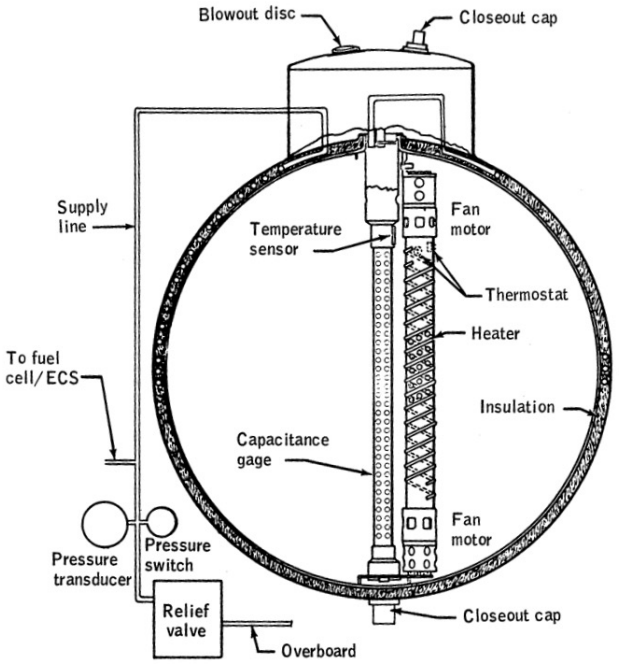
This sounds so familiar to anyone who was on the Titan program for any length of time or on other programs that had failures. We would lock down the data immediately, kick off an investigation board with an oversight panel, and start the painful and tedious process of determining what went wrong, with "all hands on deck". Obviously, in this case, NASA wanted the investigation and actions taken to be accomplished as rapidly as possible to support the remaining Apollo missions (14 through 17).

The Board convened on April 21, 1970, at the Manned Spacecraft Center in Houston. At the same time, another investigation team led by Astronaut and USAF Colonel James A. McDivitt was conducting its own analysis of the accident. The two investigation teams coordinated their efforts and findings. The Apollo 13 Review Board organization had major subgroups evaluating the accident - Mission Events, Manufacturing & Test, Design, and Project Management. The chronology of the mission was divided into pre-incident events, incident events, and post-incident events. A daily log in the Board report identifies the activities that took place almost every day from April 21 until June 7, 1970. The Board reconvened in Washington on June 15 to present its report.

Oxygen Tank No. 2 Build & Assembly History

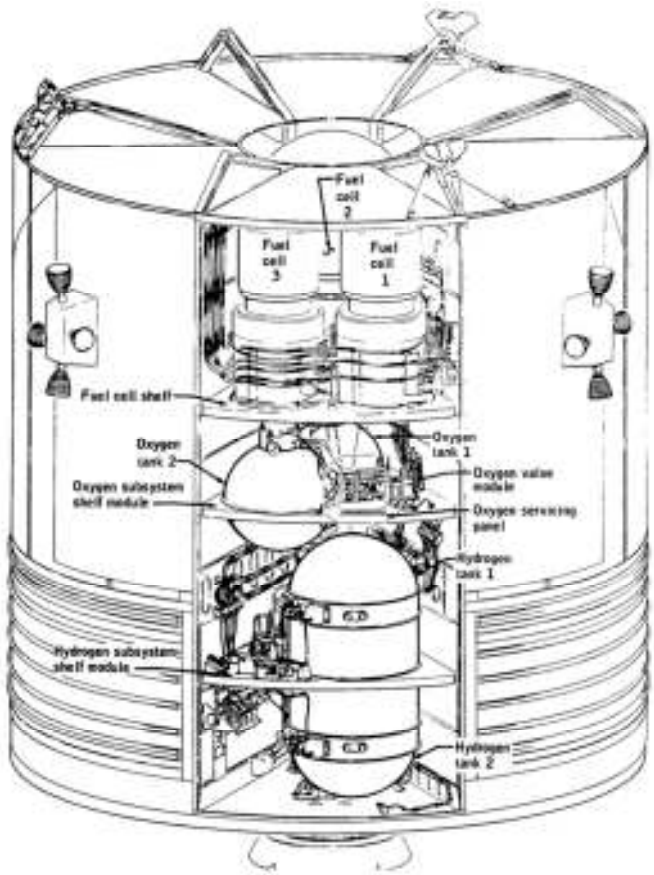
During the investigation, it became clear that the accident started in the Service Module cryogenic oxygen tank no. 2. Two oxygen tanks essentially identical to this tank on Apollo 13, and two hydrogen tanks of similar designs operated satisfactorily on several unmanned Apollo flights and on the Apollo 7, 8, 9, 10, 11 and 12 manned missions. The review emphasized differences in design, manufacturing, assembly and test for this particular tank.

On February 26, 1966, North American Aviation company and primary contractor for the Apollo Command Module (CM)/Service Module (SM) systems (later becoming North American Rockwell) awarded a subcontract to Beech Aircraft Corporation (located in north Boulder, Colorado) to build the Block II cryogenic gas storage subsystem for the service module. The simplified drawing below shows the design of the oxygen tank, with an inner and outer shell arranged to provide a vacuum space to reduce heat leak, and a dome enclosing the path into the tank for transmission of fluids and electrical power and signals. Insulation fills the spaces between the shells and in the dome. Two tubular assemblies are mounted in the tank: the heater tube contains two thermostatically protected heater coils and two small fans (1800 rpm) to stir the tank contents and the quantity probe has a capacitance gage to measure electrically the quantity of fluid in the tank. The inner cylinder of this second probe serves as a fill and drain tube and as one plate of the capacitance gage. A temperature sensor is mounted on the outside of the quantity probe near the head. The supply line from the tank leads from the head of the quantity probe to the dome, exiting through the dome to supply oxygen to the fuel cells in the SM and the Environmental Control System in the CM; the line also connects to a relief valve. Under normal conditions pressure in the tank is measured by a gage in the supply line and a switch near the gage turns on heaters in the tank if the pressure drops below a specified value.



The oxygen tank is designed for a capacity of 320 pounds of super-critical oxygen (oxygen maintained at temperatures and pressures that ensure it is a homogenous, single-phase fluid) at pressures from 865 to 935 psia, operating at temperatures from -340 degrees F to +80 degrees F. Burst pressures are at 2200 psi at -150 degrees F.

S/N 10024XTA0008 Oxygen Tank Number 2 (Apollo 13 tank) was manufactured in 1966 and was the eighth block II tank built; 28 block I tanks had previously been built by Beech. The assembly process results in a substantial amount of wire movement inside tank, where possible wire insulation damage can occur and not be detected before the tank is capped off and welded closed. Some tank rework was required due to welding flaws and a faulty fan motor. Acceptance testing of the tank included dielectric, insulation, and functional tests of heaters, fans, and vac-ion pumps.



The tank itself was leak tested at 500 psi and proof tested at 1335 psi with helium. After the proof test, the tank was filled with liquid oxygen and pressurized to a proof pressure of 1335 psi by use of the tank heaters powered by 65 V (AC). Heat-leak tests were run over 25-30 hours over a range of conditions and outflow rates. The tank was then emptied by forcing the LOX out through the fill line. The rate of heat leak into the tank was higher than permitted by specifications and was accepted with a waiver of this condition (this apparently did not factor into the failure modes). The tank was shipped to North American Rockwell (NAR) on May 3, 1967.

This tank, and the companion oxygen tank no. 1, were combined into the assembly known as the oxygen shelf at NAR in March, 1968 and designated for SM 106 for Apollo 10. The diagram above shows the installation in the SM. An unrelated problem with electromagnetic interference with the vac-ion pumps on the tank domes required a modification to the oxygen shelf. This shelf was removed from SM 106 for the modification and was planned to be installed on a later spacecraft. During the initial attempt to remove the shelf and extract it, one bolt was mistakenly left in place; as a consequence, when the shelf was raised about two inches, the fixture broke, allowing the shelf (with both tanks) to drop back into place. The closeout cap on the dome on oxygen tank no. 2 likely struck the underside of the shelf during this incident. The shelf assembly was retested, including proof-pressure tests, leak tests, and functional tests of transducers, switches, and vac-ion pumps. No cryogenic testing was conducted at that time. These tests would not disclose any fill line leakage within oxygen tank no. 2. The discrepancy was considered low risk for any significant damage.

Oxygen Tank No. 2 Test History at KSC

The shelf assembly was installed in SM 109 assigned to Apollo 13 in November, 1968 and shipped to KSC in June, 1969 for further testing, assembly on the vehicle stack, and launch. Now we get into a very interesting testing scenario at KSC that likely created the conditions leading to the failure during the Apollo 13 mission while in its trans-lunar trajectory. The Countdown Demonstration Test (CDDT) began on March 16, 1970. Previous subsystem and shelf assembly testing at KSC was nominal. During the CDDT the oxygen tanks were evacuated to 5mm Hg (Mercury), followed by a pressurization to 80 psi. Cryogenic oxygen was loaded and pressures increased to 331 psi without anomalies. During the CDDT, the oxygen tanks are normally partially emptied to about 50% of capacity. Tank no. 1 behaved normally, but tank no. 2 only went down to 92% of its capacity. The accepted procedure during CDDT is to reduce the quantity in the tank by applying gaseous oxygen at 80 psi through the vent line and to open the fill line. This procedure failed and the decision was made to document the anomaly in an Interim Discrepancy Report and complete the CDDT, then return to the detanking problem.

Detanking operations were resumed on March 27, 1970, after discussions with KSC, MSC (Manned Spacecraft Center), NAR and Beech personnel. The first step was to vent oxygen tank no. 2 through its vent line (it had self-pressurized to 178 psi and was 83% full). This decreased the quantity to 65%. The troubleshooting team considered a possible leak in the path between the fill line and the quantity probe due to a loose fit in the sleeves and tube -- a manufacturing artifact that was encountered on many builds, but the condition might have also occurred because of the drop incident. Another discrepancy report was written and a "normal" detanking procedure was conducted on both tanks, pressurizing through the vent line and opening the drain lines. Tank no. 1 emptied in a few minutes; tank no. 2 did not. A decision was made to try and "boil off" the remaining oxygen in tank no. 2 by using the tank heaters. The heaters were energized with 65 Vdc from the GSE (Ground Support Equipment) power supply, and 90 minutes later the fans were turned on to add more heat and mixing. After six hours of heater operation, the tank quantity had only decreased to 35 percent, so pressure cycling was tried, pressurizing the tank to 300 psi and venting through the fill line. Five pressure/vent cycles were required and the tank was finally emptied after 8 hours of heater operation.

The team suspected the loosely fitting fill line as the problem and determined that if they could fill the tank without problems, the leak in the fuel line would not be a issue in flight, as they speculated an electrical short between the capacitance plates of the quantity gage would result in low levels of energy that would not be problematic. Replacement of the tank itself on the oxygen shelf was

considered too risky to the schedule and could cause collateral damage to other tank assemblies (sound familiar?). Flow tests on the tanks were performed again on March 30; both tanks filled without difficulty, but tank no. 2 again required numerous pressure cycles with the heaters turned on. The team did not consider the drop incident during any of their discussions and they were also under the impression that the detanking process at Beech was different, so it was not relevant to the problem at KSC. That impression was false, as the successful detanking process at the supplier was very similar.

The team focused on the potential for a loose fill tube and did not pay attention to possible concerns for the extended operation of the heaters and fans and its effects on the tank due to excessive heat. The heaters are protected with thermostatic switches, which are intended to open the heater circuit when the switch senses a temperature of 80 degrees F. The switches failed to open at KSC when the heaters were powered from a 65V dc supply as the switches were rated for 28V dc spacecraft power; no testing had ever been done to assess the capability of these switches to open while under full current conditions. Because the switches did not function, the temperature in the tank likely exceeded 1000 degrees F during detanking, resulting in serious damage to Teflon wiring insulation. This catastrophic condition was not known prior to flight and the team accepted the tank and the mission processing continued. In retrospect, the tank damage was a significant hazard during tank fill and operations before launch, as well as during flight operations up to the point of the actual failure.

Part 1 of this program profile (in the last MARS STAR) has details of the anomaly as it occurred during the Apollo 13 mission and the actions that were required to bring the crew home safely. The Review Board analyzed telemetry data and determined that combustion in oxygen tank no. 2 lead to failure of that tank, damage to oxygen tank no. 1 or its lines and valves, explosive removal of the bay 4 panel, and the loss of all three fuel cells, leading to the mission abort. The extended heater operation at KSC damaged the insulation on wiring in the tank, making it susceptible to a short circuit condition that occurred immediately upon command to stir the tanks. This combined with the super-critical oxygen in the tank, ignited the damaged tank insulation, resulting in an explosive condition.

Review Board Findings

Many key findings were documented in the Review Board report, which can be obtained by accessing the Apollo Flight Journal documents (see link at the end of the article). Here are some of the more critical findings, many of which were confirmed in testing during the investigation:

1) Oxygen tank no. 2 contained materials, including Teflon and aluminum, that would burn if ignited in supercritical oxygen.
2) The tank contains potential ignition sources, including electrical wiring, unsealed electric motors, and rotating aluminum fans.
3) During the difficulties with detanking of oxygen tank no. 2 at KSC following the CDDT, the thermostatic switches on the heaters were required to open while powered by 65 Vdc to protect the heaters from overheating. The switches were rated at 30 Vdc and would weld closed at the higher voltage. This subjected the wiring around the heaters to very high temperatures.
4) The cause (failure mechanism) of the failure of oxygen tank no. 2 was combustion within the tank, most likely due to the ignition of Teflon wire insulation on the fan motor wires due to electrical arcs in the wiring.
5) Failure of the oxygen tank no. 2 caused a rapid local pressurization of bay 4 of the SM by the high-pressure oxygen escaping from the tank.
6) From a design standpoint, the need to stir the oxygen tank contents and the use of materials that are potential ignition sources constitute an undue hazard. The pure oxygen hazards and deficiencies associated with this design were not recognized during the recovery from the Apollo 204 fatal fire.
7) The thermostatic switches were rated at 7 amps at 30 Vdc. While the switches could carry this current at 65 Vdc in a closed position, they would fail if they started to open to interrupt this load. These switches had never been qualified or acceptance tested at 65 Vdc nor had they been operated in flight or on the ground under load because the heaters had only been used with a relatively full tank, which kept the switches cool and closed.
8) The unique conditions during the detanking operations following CDDT at KSC welded the switches shut and disguised the effects of the off-scale high temperatures (1000 degrees F) in the tank during the special detanking. There were ammeters on the tank heater control panels at KSC that would have indicated the lack of switch operation, but that information was not reviewed.
9) The fan motors were unsealed and immersed in the supercritical oxygen, which is a questionable practice.
10) The tank design is "blind" to inspections after completion of assembly, which can result in damage to electrical wiring. Loose fill tube parts are also a likely artifact of the manufacturing process. For the tank on Apollo 13, the potential damage that occurred during the shelf disassembly might have exacerbated the fill tube displacement concerns. This anomaly was not discussed at KSC during the detanking problems.
11) Launch operations personnel were not aware of the thermostatic switch limitations at 65Vdc and assumed the tank was protected from overheating by those same switches.
12) The Block II design specifications from NAR required the tank heater assembly to operate with 65 Vdc GSE power only during tank pressurization. Beech Aircraft did not require their Block I thermostatic switch

supplier to make a change in the switch to operate at the higher voltage. This incompatibility between design and specification was not detected during product reviews and testing.

13) In flight at the critical time of the incident (55:53 hours elapsed time) , oxygen tank no. 2 pressure rose from 887 to 954 psia and again to 1008 psia, likely due to combustion occurring within the tank. Due to inhibition of the master alarm in the CM (occurred due to an unrelated low hydrogen pressure), neither the crew nor Mission Control was alerted to the ox pressurization rise. The master caution and warning system on board could allow a problem to go unnoticed because of the presence of a previous out-of-tolerance condition in the same subsystem. This would not have stopped the failure from occurring, however, as the combustion was already underway in the tank.

The board came up with many more observations and findings from the actions that were required to bring the crew home; these were turned into recommendations for corrective actions that should be taken before the next Apollo flight. The key corrective actions are noted below:

1) Remove from contact with the oxygen all wiring and unsealed motors, which can potentially short circuit and ignite adjacent materials
2) Minimize the use of Teflon, aluminum and other combustible materials.
3) The modified cryogenic oxygen storage system should be subjected to a rigorous requalification program.
4) The warning system on board the Apollo spacecraft and in Mission Control should be modified to increase the differential between master alarm trip levels to avoid unnecessary alarms; revise the logic to prevent an out-of-limits alarm from blocking another alarm; establish a second level of limit sensing to ensure alarms are not overlooked; and provide talkback indicators for each of the fuel cell reactant valves.
5) Improve the lifeboat compatibilities between the LM and CM (see the first profile for an example of the incompatible Lithium Hydroxide canisters).
6) Whenever significant anomalies occur in critical subsystems during final preparation for launch, revise the standard procedures to require a presentation of all prior anomalies on that particular piece of equipment, using expert testimony. Ironically, NASA completely forgot this lesson during the run-ups to the Challenger failure (O-ring temperature deformation, which was a known issue) and Columbia failure (debris damage during ascent, another known issue).
7) Reviews should be conducted of all hazardous subsystems (particularly for those containing oxygen or oxidizers). These reviews should include materials compatibility.
8) Reassess all Apollo spacecraft subsystems and ensure adequate understanding of the controls of engineering and manufacturing details at the subcontractor and vendor level.

Apollo 14 was being processed at this time and actions were taken to redesign the oxygen tanks for the SM and ensure the hazardous designs were likely eliminated and the heaters were protected by the thermostatic switches at the proper voltages. Other actions from the issues identified in the non-standard flight of Apollo 13 were obviously assessed for the upcoming missions. Confirmation of incorporation of those changes is not easily found looking at the documentation available from NASA but the remaining four missions were successful in accomplishing their goals of multi-day lunar exploration.

A few personal observations: I spent most of my career in Mission Success and became a subject matter expert in system failures, having evaluated many failures for lessons learned, conference papers, and intra-company and conference tutorials. The Apollo 13 anomaly had the potential of destroying the spacecraft, killing the crew and ending the Apollo missions. NASA is quite fortunate that the failure occurred on the way to the moon, that they had an amazing technical staff in Mission Control and could rely on a veteran commander on board the mission (Lovell was on his fourth spaceflight). This failure had the following systemic attributes that I observed:

1) A major contractor (NAR) was not fully cognizant of the test processes and change management deficiencies at a sub-tier supplier. This included not understanding the tanking test process at Beech and not realizing that the requirements for the Block II thermostatic switch upgrades to 65Vdc operation were not incorporated. A rigorous compatibility analysis review would have likely discovered the non-incorporation of the design change for the switches.
2) That same major contractor had undergone significant system design changes after the fatal Apollo 1 fire to alleviate concerns for pure oxygen environment hazards, but the design of the cryogenic tanks for the SM was overlooked during this process. These tanks were designed with hazardous materials and assembled with the potential for damage within the tank that could not be detected by in-line testing.
3) Personnel running the CDDT at KSC were not aware of the operating voltage design limitations with the thermostatic switches and were also not aware of the dropped tank anomaly that occurred during modification work on the Ox tank shelf at NAR. The detanking process led to major damage within ox tank no. 2 and this damage could have manifested itself anytime as an explosive condition during the processing and launch phase of the mission. The potential for damage from the drop was never properly discussed in light of the difficulties that occurred during detanking.
4) The warning system on board the Apollo spacecraft would mask additional concerns that might crop up in

a subsystem if the master alarm was inhibited due to an unrelated previous issue.

5) During system reviews, all anomalous conditions down to the sub-tier supplier need to be reviewed and discussed, including concerns from previous missions that were still being evaluated or closed out. Anomalies that occur during rework and modification efforts need special attention. The tendency to normalize deviations in critical systems is a recurring problem in our industry and other industries. In the Apollo 13 case, loose ox tank fill tube discrepancies were considered "acceptable".
6) In this unforgiving business, we seem to learn the same lessons over and over again. Some aspects of this mission remind me of the decisions that were made with the extensively repaired SRM segment that was moved around and finally flown on TIVA-11 in what was assumed to be a more favorable structural position at VAFB in August 1993; that segment burned through to the case during flight, resulting in the loss of that mission. Another mission failure, TIVA-20 in August 1998, was attributed to wire harness damage that caused shorting to structure (the harness was unprotected and was likely stepped on during a – you guessed it – unrelated and late special inspection).

I highly encourage anyone interested in more details to explore the Apollo Flight journals. They are an extremely valuable resource!

References for Apollo 13 article

Apollo Flight Journal: https://history.nasa.gov/afj/
Apollo 13 Failure Review Board Report:
https://history.nasa.gov/afj/ap13fj/pdf/report-of-a13-review-board-19700615-19700076776.pdf
NASA Apollo Program:
https://www.nasa.gov/mission_pages/apollo/missions/apollo13.html

On This Date in History

This section lists milestones retrieved from publicly available information for LM, ULA and heritage programs from 10 to 60 years ago (2010, 2000, 1990, 1980, 1970, and 1960). Delta launches prior to the formation of ULA, unless it included an LM or heritage company payload or upper stage, are not listed. No classified programs are identified, even if the program is now considered unclassified, with the exception of the Discoverer program (Corona). The events reflect milestone activity in the quarter previous to the release of the MARS STAR -- where appropriate, key press releases are also included; significant milestones are in bold. There will be gaps if no events occurred in that decadal year for that month. The list is not intended to be all-inclusive due to historical record inaccuracies.

Events in October (10 to 60 years ago)

- 10/28/2010: LM BSAT-3b (for Japan) launched on Ariane 5 ECA, ELA-3, Kourou, French Guiana
- 10/11/2000: STS-92 (Discovery) launched, LC-39A, KSC; seven crewmembers, 100th shuttle launch
- 10/20/2000: DSCS III B-11 launched by LM Atlas IIA, SLC-36A, CCAFS
- 10/06/1990: STS-41 (Discovery) launched, LC-39B, KSC; five crew, deployed Ulysses spacecraft
- 10/31/1980: FLTSATCOM4 launched by GD Atlas SLV-3D/Centaur, LC-36A, CCAFS
- NO EVENTS IN OCTOBER, 1970
- 10/05/1960: Lockheed UGM-27 Polaris A1 launched, LC-25A, CCAFS
- 10/07/1960: MM HGM-30A Titan I launched, LC-20, CCAFS
- 10/10/1960: Lockheed UGM-27 Polaris A1 launched, LC-25A, CCAFS
- 10/11/1960: GD SM-65E Atlas launched, LC-25A, CCAFS; **FAILURE**, maiden launch of Atlas E
- 10/11/1960: SAMOS-1 launched by GD Atlas LV-3A/Lockheed Agena-A, Point Arguello LC-1-1; **FAILURE**, Upper stage
- 10/13/1960: GD SM-65D Atlas launched, LC-576B-3, VAFB; **FAILURE**
- 10/13/1960: GD SM-65D Atlas launched, LC-11, CCAFS
- 10/15/1960: Lockheed UGM-27 Polaris A1 launched, USS Patrick Henry, ETR
- 10/16/1960: Lockheed UGM-27 Polaris A1 launched, USS Patrick Henry, ETR
- 10/18/1960: Lockheed UGM-27 Polaris A1 launched, USS Patrick Henry, ETR
- 10/22/1960: GD SM-54D Atlas launched, LC-14, CCAFS
- 10/24/1960: MM HGM-30A Titan I launched, LC-19, CCAFS
- 10/26/1960: Discoverer 16 launched by Thor DM-21/Lockheed Agena-B, LC-75-4-5, VAFB; Maiden flight of Thor-Agena B. **FAILURE** (stage separation)

Events in November (10 to 60 years ago)

- 11/06/2010: COSMOS-4 launched by ULA Delta II 7420-10, SLC-2W, VAFB; last launch of Delta II 7420
- 11/21/2010: USA-223 launched by ULA Delta IV Heavy, SLC-37B, CCAFS
- 11/10/2000: LM GPS IIR-6 launched by Delta II 7924-9.5, SLC-17A, CCAFS
- 11/13/1990: DSP-15 launched by MM Titan IVA/IUS, LC-41, CCAFS
- 11/15/1990: STS-38 (Atlantis) launched, LC-39A, KSC; 5 crewmembers, deployed USA-67 and Prowler
- 11/12/1980: *Voyager 1 flyby of Saturn system; launched on a MM Titan IIIE with GD Centaur upper stage*
- NO EVENTS IN NOVEMBER, 1970
- 11/07/1960: Lockheed UGM-27 Polaris A1 launched, LC-25A, CCAFS
- 11/10/1960: Lockheed UGM-27 Polaris A2 launched, LC-25A, CCAFS; maiden flight of Polaris A2
- 11/12/1960: Discoverer 17 launched by Thor DM-21/Lockheed Agena-B, LC-75-3-5, VAFB; **FAILURE** (spacecraft)
- 11/16/1960: MM MGM-31 Pershing I launched, LC-30A, CCAFS
- 11/17/1960: Lockheed UGM-27 Polaris A1 launched, LC-25A, CCAFS; **FAILURE**
- 11/23/1960: RCA TIROS-2 (B) launched by Thor DM-19 Delta, LC-17A, CCAFS
- 11/30/1960: GD SM-65E Atlas launched, LC-13, CCAFS; **FAILURE**

Events in December (10 to 60 years ago)

- **12/15/2010: Lockheed Martin Press Release: NASA's Mars Odyssey Orbiter Passes Longevity Record** (still functional as of November, 2020)
- 12/01/2000: STS-97 (Endeavour) launched, LC-39A, KSC; five crewmembers, ISS assemblies
- 12/06/2000: USA-155 launched by LM Atlas IIAS, LC-36A, CCAFS
- 12/01/1990: LM DMSP 5D2 F10 launched by GD Atlas-E/Star 37, SLC-3W, VAFB
- 12/02/1990: STS-35 (Columbia) launched, LC-39B, KSC; 7 crewmembers
- 12/09/1980: OPS 3255 launched by GD Atlas E/F-MSD, SLC-3W, VAFB – **FAILURE,** booster engine loss of control
- NO EVENTS IN DECEMBER, 1970
- 12/06/1960: Lockheed UGM-27 Polaris A2 launched, LC-25A, CCAFS
- 12/07/1960: Discoverer 18 launched by Thor DM-21/Lockheed Agena-B, LC-75-3-4, VAFB
- 12/12/1960: MM MGM-31 Pershing 1 launched LC-30A, CCAFS
- 12/15/1960: Pioneer P-31 launched by GD Atlas-Able, LC-12, CCAFS; **FAILURE** (launch vehicle), last Atlas-Able
- 12/16/1960: GD SM-65D Atlas launched, LC-576B-3, VAFB
- 12/20/1960: Discoverer 19 launched by Thor DM-21/Lockheed Agena-B, LC-75-3-5, VAFB
- 12/20/1960: MM HGM-30A Titan I launched, LC-20, CCAFS; **FAILURE**
- 12/22/1960: Lockheed UGM-27 Polaris A1 launched, USS Robert E. Lee, ETR

Reference websites:
https://nssdc.gsfc.nasa.gov/planetary/chronology.html#2014
https://en.wikipedia.org/wiki/Timeline_of_spaceflight
https://www.ulalaunch.com/missions
https://news.lockheedmartin.com/news-releases?year=2020
https://space.skyrocket.de
http: www.astronautix.com

Next Edition

Check back in the next MARS STAR for the story of the Apollo 14 mission, which has its 50th anniversary in early 2021. The History on the Road stories are suspended at this time due to the difficulty in traveling and visiting museums.

Barb Sande, MARS STAR and MARS Facebook Page Historian. Contact me at barbsande@comcast.net or 303-887-8511 or find MARS Associates on Facebook.

Bridge Club

By Dave & Kathy Martz
(martz20@comcast.net)

MARS Bridge is currently suspended but we hope to be back soon. Right now, plans are to evaluate the return on a month-to-month basis, until we receive an "all clear" from our many government agencies, the Buck Center and the willingness of our members to return. Some members are keeping their bridge skills in-tune by playing online with apps like Bridge Base Online at https://www.bridgebase.com/v3/.

In October we lost one of our long-time members, Trudy White. Trudy will be missed when we all come back again to play our favorite card game.

Meanwhile, we are still accepting requests to join our Club. We meet monthly to share the camaraderie and a good game of bridge! All MARS members and their guests are welcome. We play on the **3rd Friday of each month at the Buck Community Recreation Center (Littleton) from 10 AM to 2 PM.** You'll need to pack a lunch, as we stop midday to eat. The club provides the cards and all required items for the games. We also provide coffee, tea, and hot water. There is a small fee for the Buck Center, as well as a small fee to the club (which helps with supplies and the year-end party in December).

We have couples, as well as singles, playing. If you're a single, invite a friend to be your partner, as your partner does not need to be a member of MARS to play.

If you have any questions, please contact any of the following Bridge Club Officers:

Presidents:
Dave & Kathy Martz, 303-683-9524
Vice-President:
Bill Kacena, 303-973-2685
Secretary:
Theodore Bornhoeft, 303-933-9730

There were no 4th Quarter 2020 winners, since all play was cancelled.

Car Club

By Roger Rieger
rrieger10731@gmail.com
303-912-6217

Carol Lovelace
cyberbear51@comcast.net
303-358-7459

I hope you and your loved ones enjoyed a happy and safe holiday season during these uncertain times. As you know, due to the COVID-19 virus, most local car events in 2020 were postponed or cancelled. We are tracking upcoming 2021 events that would be of interest to our members and will organize attendance as safety permits. These include car shows, luncheons, museums, day travel, and hopefully the MARS picnic car show.

The Club is planning to email the "Space Cruisers" newsletter to its members quarterly. Other than Club updates there will be For Sale/Looking For and Recommendations categories. This will give members another avenue to increase their love for their current car

and/or bring a new one into their garage. And, sharing your good and bad experiences with vendors would be very helpful to others.

We are also planning to spotlight members and their cars in the Club newsletter. In January, you will be learning more about Bob and Karen Paulson and their baby, Ruby.

Ruby

The Club invites all car enthusiasts to become members, meet other like-minded people, and enjoy / share our love for the automobile. Be safe out there and I look forward to seeing you on the open road! For more information about the Car Club, contact Roger Rieger (rrieger10731@gmail.com) or Carol Lovelace (cyberbear51@comcast.net).

Dinner Club

By Becky and Gary Englebright
englebright@me.com
303-941-3167 (Gary)
303-263-6457 (Becky), and
Anita Kannady
(anitakannady@yahoo.com)
303-794-9210

On a happy note, we had a wonderful Italian lunch at Maggiano's in October. Considering the state of affairs, we had a good turnout and as always Maggiano's provided excellent food and service.

In all cases, the restaurant staff went out of their way to ensure that all of the necessary protections were in place and followed and they did an outstanding job of taking care of everyone. The good news is that we have not heard that any of the attendees have become ill.

As far as the next year goes, we were looking to book restaurants that have a large separate room that we can use for our events or have an outdoor patio that we can utilize. We had even booked restaurants for January and February, and then the situation changed. Due to the current state of the pandemic and state and local regulations, we have cancelled Outback and Olive Garden for the time being, with the hopes of rescheduling them for later in 2021. Details will be coming in future emails and posted on the MARS website as plans are finalized.

We would like to say "Thank You" to everyone for their patience and understanding with the luncheon cancellations. If you're reading this and have not been getting update email from us, it is probably because we don't have an email address for you. If you would like to be added to our email list, you can call or email us your email address. See contact information above. Any email information sent to us will be kept in confidence.

We want to encourage anyone who is interested to join us for any of luncheons. Please send us an email so that you can be added to our mailing list.

Golf League

By Bo Rodriguez
(boandpat@comcast.net)

Happy New Year to all! Hopefully the New Year is a vast improvement over last year in that it brings us tranquility, good health and brings us back to a state of normality.

It is hard to believe that the 2021 MARS Golf League's season is just a couple of months away and our committee is underway planning for our "kick-off" meeting to commence the new season. Each year, we attempt to increase our golf league membership by encouraging MARS Associate members (both **men and women)** to join. Ladies, come join Adriana Munoz, Kathy Rieger and Kelli Whitehall to increase our women player numbers in the league.

Our golf league invites you to participate in our summer golf league beginning on Thursday, April 1st, 2021. League play will be on each Thursday, exclusively at Englewood's Broken Tee Golf Course, weather permitting. Our primary purpose as a club is to realize a pleasurable golfing experience by promoting social interaction and friendly competition using the certified USGA handicap system. We are having our annual "Kick-Off" golf meeting on Thursday, March 4th, 2021 at the Broken Tee Golf Course grill (2101 W. Oxford Ave.) at 10:00 A.M. We encourage you to attend this meeting as we will review our league's order of business and the rules of golf imposed by the USGA. **If in the event the COVID-19 virus prevents Broken Tee from having open access to their community room for our "Kick-Off" meeting, we will arrange a method to communicate our golf league information to all MARS Associate members interested in participating.** In this case, please contact me or Tom Ripper our Handicap Chairman by email in advance so that we can arrange the exchange of information with you to accommodate commencement of our league play:
Tom Ripper – tomripper@q.com
Bo Rodriguez – boandpat@comcast.net

See the enclosed flier in the MARS Star for more information.

Broken Tee Golf Course is an 18-hole championship course with some tight fairways and some small lakes to challenge the average golfer. It offers affordable golf rates (**age 62+** non-resident, $25 green fee, **age -62** non-resident, $30 green fee), which is hard to beat in the region. If you choose to ride, golf carts are $17 per player. The great thing about our league is that there aren't any up-front green fees; you only pay when you play. Come join us this season for fun and exercise! League members get "Happy Hour" prices on select bar beverages. If you have any questions, regarding our golf league, please feel free to view our MARS website: www.marsretirees.org and click on "Golf" or contact me at: (303)708-9157.

A big congratulation goes to Paul Boykin for being our league's most improved player this past year! Mind you, Paul's handicap rating at the start of last season was pretty darn good. He ended the season with a 4.3 handicap index; by far the best.

Finally, as I mentioned in the last issue of the MARS STAR, Tom Hall, a long standing MARS golf league member, passed on to me a file of records going back to the inception of our league as near as I can tell. A tab-run dated October 30, 1987 from the Colorado Golf Association shows eighteen members. Names I'm familiar with include: Herman Bauer, Glick Bishop, Cleve Claxton, Andrew Neary and Ben Rotruck. The following year, the golf club had forty-one members with its officers being: Leon "Dabby" Dabkowski, President; George McGee, Vice President; Allen Mann, Handicap Chairman; Nelson Cox, Treasurer. That year, George McGee made several policy revisions that may still be in effect today. Glick Bishop was the club champion with a two round net score of 140. Leroy Hollins, Martin Marietta Recreation, contributed three Raccoon Creek golf balls for every member as well as providing a $25 gift certificate toward awards. From what I could determine, the golf club membership grew to its highest participation in 1998 with 127 players. There were so many players that the club had to divide into four groups because the golf courses in the Denver area could not accommodate tee times for the MARS Golf Club. Members were assigned certain weeks during the season to arrange tee times for players in their group at various golf courses in the region. In a given week, members in group A may have played at Overland Golf Course; group B at Englewood Municipal; group C at Foothills; and group D at Mira Vista or other courses in the area. This approach was done with the intent to schedule the members each week if possible. Sometimes it worked and sometimes it didn't.

Hiking Club

By Sue Janssen
(susan.g.janssen@gmail.com)

What a year 2020 has been! Between COVID restrictions on gathering and poor air quality, the hiking club was moderately active. Not many organized group hikes, but members were out there on the trails with their families. Some are recovering from back and knee surgeries. Now we are looking forward to an active and fun 2021. Hang in there, stay safe and stay well. Wishes to all for a healthy and happy New Year!

Val Gregory, Lee Janssen, Sue McKaig and Jeff Schnackel pause on the rocky trail at Mt. Galbraith. (Photo by Sue Janssen)

The club celebrated National "Go Take a Hike" Day (17 Nov) with a morning hike on Mount Galbraith. The rocky trail climbs through evergreens and makes a loop around just below the summit. Jeff Schnackel scrambled to the very top of the mountain for a 360-degree panorama of Golden, North and South Table Mountains, Downtown Denver, Lookout Mountain, and the foothills. The weather was perfect with a crisp but sunny morning to keep us comfortable. It felt so good to be outside and talk with friends while taking a walk.

If you wish to join the MARS Hiking Club, contact Sue Janssen at susan.g.janssen@gmail.com who will add you to the club's distribution list. Please provide your email address, home phone and cell phone for the roster. The schedule of hikes is posted on the MARS website (http://www.marsretirees.org/). Even if you have never gone snowshoeing or hiking you are welcome to join in the fun.

Happy trails!

The MARS Associates Website

By Jim Kummer
(jkummer@comcast.net)

Despite the pandemic, the MARS website, www.marsretirees.org, provides members with a wealth of information about the organization, its officers and charter, health benefits, and the clubs.

To keep yourself safe during the pandemic, we are instructed to wear a mask, wash our hands and keep interpersonal distance. Similarly, to keep our internet health safe, we must use appropriately chosen passwords for our email and websites. To be safe, passwords should be 8 or more characters that include upper and lower case, numbers and special characters (e.g. $, %, etc.). You can use a mnemonic to help you remember your passwords. For example, a password "**TTL*hi?wur**" can be remembered for "twinkle twinkle little star, how I wonder what you are" – note the use of the special characters asterisk for "star" and question mark for "wonder". Use your imagination – the available mnemonics are limitless -- it should be noted that not all sites accept all the special characters. If you offer a password choice to a site and it is rejected, it might be for an unacceptable special character you've used.

If you want to use unique passwords for multiple sites that are both very strong and easy to remember, you could make a password for each by adding the first three letters of the site name to the beginning of the mnemonic password. Some sites require changing the password periodically – you can accommodate this requirement by adding a letter or number at the end of the password and just increment that for the change. Note that reusing a portion of the password over and over does make it slightly less secure – if your password for one site is compromised, fragments of that compromised password could be used as a template for breaking into your other sites' passwords.

To be most secure, completely different passwords should be used for each different website or email account. If you write down your passwords, be sure that the note is kept secure. If you have more than a few passwords, you should consider getting a password manager software tool. Such tools can be used to automatically enter ID and passwords when the website prompts for them, and it can even generate very strong passwords you can use for your websites. Several good password managers can be acquired at no cost, unless you exceed their fairly liberal password number limit. If you perform an internet search for "free password manager" you will find several, such as DASHLANE, 1PASSWORD, and KEEPER. The free password managers are good for but a single computer. If you want one that distributes your password list among several computers, then you'll have to pay for one that keeps your passwords in the "cloud".

Many events and club activities are on hold during the COVID-19 pandemic. The MARS website provides members of the latest club status and event planning. We list a monthly Site of the Month for the enjoyment of our members. Below are the most recent for the past quarter.

Oct – Check facts at www.poynter.org/media-news/fact-checking
Nov – Funny, Cool & Interesting Videos at Big Geek Daddy
Dec – Check out this Colorado COVID-19 Exposure Map

Your website committee members welcome your suggestions for improvement, and for proposed websites of the month. Email them to me at jkummer@comcast.net. Your website committee members are: Al Butvidas, Bob Knickerbocker, Linda Stearns, Duane "Smitty" Smetana, and Jim Kummer (Webmaster).

Photography Club

By John Chapter
johnchapter@msn.com
303-986-8277

Unfortunately, the COVID-19 Pandemic is not going away any time soon, so we will continue to meet virtually. Jim Kummer developed the initial September 2020 *ZOOM Virtual Program*. Susan Janssen and Tom Frickell made the October program on *Converting F-film Slides to Digital*. This was followed in November by Jim Kummer with *Details on ZOOM Operations*. Our final program for 2020 was by Tom Frickell in December with his program covering his *River Cruise on the Columbia River*.

The January 2021 program is by John Chapter covering his recent trip to the US southwest with emphasis on *Cliff Dwellers of Arizona Archaeology*. February is an unusual presentation by Maris Biela on the *2010 Earthquake in Haiti*. In March, Becky Englebright will show her images of *Peru Including the Inca Ruins of Machu Picchu.*

It is easy to join our club and we hope that new retirees will continue to join. The Photo-Club is free to all MARS retirees and our monthly virtual meetings will continue. We will use email to maintain group contact with members.

Even though things will not be back to normal for a while, we have many exciting programs to look forward to which you can be a part of via ZOOM.

Colorado Springs Lockheed Martin Retiree Group News

By Doug Tomerlin
(dougincs@aol.com)

The Colorado Springs Lockheed Martin Retiree Group is an organization for retirees from any Lockheed Martin division. However, a large percent of our members live in the Colorado Springs area and have retired from divisions located there. Retirees from heritage companies Philco, Philco-Ford, Ford Aerospace, and Loral are also welcome to join the group. There are no fees to belong to the group. Luncheons are usually held twice a year to allow retirees to stay in contact with each other. In additional, information about deaths, services, and other pertinent information is disseminated via email.

Our retiree group has not sponsored any group activities since the last newsletter, due to the COVID-19 pandemic. We are hoping that we will be able to have a luncheon soon after it is safe to do so. If you would like more information about the group or the luncheons, please contact Doug Tomerlin at dougincs@aol.com.

We were all deeply saddened by the passing of fellow retiree Dick Cosgrove in October and also for Chris Castle, the wife of retiree Steve Castle. Steve was the Lockheed Martin Southern Colorado Engineering Manager prior to his retirement.

Cape Canaveral News

By Dick Olson
(Olsons5145@aol.com)

Luncheons

Looking at the Covid numbers today I don't see any decrease in numbers of new cases. I would suggest that we cancel the luncheons for the rest of the year and take a look at it in January. What are your thoughts? If I don't hear a hue and cry for continuing I will let Kay's know that we will get with them after the first of the year.

We are coming to the end of this miserable year and I would like to wish you all a Merry Christmas and a Better New Year and take a moment to reflect on the Canaveral Titan Team members that we lost this year. No longer with us are Ernie Hirchert, Ulysess Bradshaw, Tim Hanrahan, David Halcomb, Bob Moyer, Gary Hill, Willie Carter, Merri Love, Roy Ferrell, Don Anderson, Jim Milby and Pete Gaenicke. Another, Beth Rodamer, is in critical condition at hospice care as we speak. Our thoughts and prayers are with the families of these Titan Team members.

With the virus vaccine soon to be available but the number of cases still rising I think it would be wise to delay our Titan luncheons for at least a couple more months. I know we are all chomping at the bit to get out and see folks but it would sure be a shame to catch it now when the end may be in sight. Let me know your feelings.

Recent Obituaries

Larry Eugene Jarrell, 77, passed away on February 1, 2017. Larry worked as an Engineer on the Titan IV rocket program, retiring after 35 years.

Don Anderson, 87, passed away on Oct. 13, 2020. Don joined Martin Marietta in 1972 and headed up Technical Training and ran the Calibration Lab until retiring in 1995.

James Milby, 79, passed away on November 30, 2020. Jim went from technician to Operations Engineer and then into the Test Conductors office and retired as a Launch Conductor on the Titan IV/Centaur program.

Pete Gaenicke, 87, passed away Dec. 1st. Pete was a Systems Mechanical Engineer working both airborne and ground systems on the Titan Team.

Nettie Elizabeth Rodamer, 80, aka "Beth" passed away on 21 Dec. Beth first joined Martin Co. on the Pershing program at the Cape and later transferred to Titan II at CX 15 where she worked for Dick Trehune. She left Martin to start a Patricia Stevens modeling school. Bob and Beth celebrated their 60th wedding anniversary this past February.

Lockheed Martin (LM) News

After spacecraft's sample from asteroid runneth over, Lockheed Martin, partners prepare material for long journey home.

By Judith Kohler
jkohler@denverpost.com, The Denver Post

Confident that the spacecraft OSIRIS-REx captured a good-sized sample from the surface of an asteroid, the team working on the NASA project will start the process of stowing the material in a capsule set to return to Earth in 2023.

Starting Tuesday, scientists and engineers on the Lockheed Martin Space campus in Jefferson County will work to release and stow the ring-shaped head at the end of a robotic arm. The capsule, containing NASA's first-ever sample of material from an asteroid, is expected to land in a Utah desert.

"This team is prepared to go around the clock until we can get all those steps completed. We believe that the earliest that things will be complete will be late on Wednesday," said Sandra Freund, the OSIRIS-REx mission operations manager for Lockheed Martin.

The mission is led by the University of Arizona and is part of NASA's ongoing quest to learn more about the origins of the solar system and Earth. The spacecraft, built by Lockheed Martin, was launched in September 2016 by Centennial-

based United Launch Alliance from Cape Canaveral in Florida.

In 2018, the spacecraft reached the asteroid Bennu, which is 200 million miles from Earth, and started taking images and mapping Bennu's geology and other properties. Freund said the quick touchdown Oct. 20 on the surface to get samples of regolith, dirt-like material, was "pretty much picture perfect."

The goal was to use the craft's robotic arm, called Touch-And-Go Sample Acquisition Mechanism, or TAGSAM, to collect at least 60 grams, or 2.1 ounces, of regolith. Photos showed that TAGSAM likely collected much more than that, but also revealed that larger particles got wedged in a flap, creating a couple of gaps where some of the material drifted out.

As a result, Freund said it was decided to stow the sample container in the capsule about a week earlier than planned. The team doesn't know exactly how much material was collected because it is skipping a spin maneuver that would help determine the mass of the sample. Scientists don't want to risk losing more of the particles in space.

"We're confident that we have over 60 grams, which is the mission's requirement. Unfortunately, it looks like we're going to have to wait until we're back on Earth to know exactly how much we have," Freund said.

To collect the regolith, the TAGSAM's arm extended and the device blew compressed nitrogen gas to stir up the dirt and collect the material in a filter in the ring-shaped canister. The asteroid, a little over the size of the Empire State Building in diameter, is more than 4.5 billion years old, according to NASA.

"Bennu itself is a piece of the early solar system that formed the Earth, and we ourselves are a product of the Earth," said Beau Bierhaus, Lockheed Martin's lead scientist on TAGSAM. "By virtue of learning about Bennu and learning about Jupiter or learning about Mars, we're not only learning about those other destinations, we're learning how they have affected Earth and how they have contributed to the evolution of Earth in the solar system."

Lockheed Martin strikes $4.4B deal to buy Aerojet Rocketdyne

By The Associated Press

BETHESDA, Md. — Lockheed Martin is buying rocket engine manufacturer Aerojet Rocketdyne Holdings for $4.4 billion in a deal that brings together companies that already had been working together in the aeronautics industry.

The acquisition announced late Sunday is part of Lockheed Martin's attempt to gird for competition from recent industry entrants, Space X and Blue Origin, which are backed by two of the world's richest men, Elon Musk and Jeff Bezos.

"Acquiring Aerojet Rocketdyne will preserve and strengthen an essential component of the domestic defense industrial base and reduce costs for our customers and the American taxpayer," Lockheed Martin CEO James Taiclet said in a statement.

Bethesda, Maryland-based Lockheed is paying $56 per share, 33% above the Friday closing price of Aerojet Rocketdyne's stock. The final price will be reduced to $51 per share after accounting for a special dividend of $5 per share that will be paid just before the deal closes. The companies are aiming to have the deal wrapped up during the second half of next year.

United Launch Alliance News

Intern Rocket Program Perseveres

Over the course of the summer, around 50 United Launch Alliance (ULA) interns from Denver, Colo., Decatur, Ala. and Cape Canaveral, Fla. participated in the annual ULA intern rocket program. The program, led by ULA's Derek Blash and Cara Hope, is designed to provide an opportunity for interns to connect with each other while building and launching high power sport rockets.

"This year's intern rocket launch was a little different from years past. Instead of launching one big rocket, interns and mentors were invited to build and launch their own rocket," Cara said. "Each person launched a Level 1 or Level 2 class rocket, then recovered their rocket and received certification." Typically, interns receive an L1 certification from their local rocket club through the National Association of Rocketry.

2020 interns participate in the annual intern rocket program.

Interns and mentors utilized virtual community platforms to facilitate training and building sessions in light of the social distance guidance brought on by COVID-19.

"Being there in person is really helpful when you are trying to instruct during the build phase, since this was not possible, [online platforms] provided a great alternative," Derek said. "I also wanted this to be a fun opportunity for them to connect with one another and I think it worked out really well in light of the circumstances."

The program introduces the fundamentals of rocketry to interns from all over the company, and provides interns who do not come from engineering backgrounds the hands-on opportunity to participate in a mentor-led launch.

"My passion for aerospace started back when I was a kid building Estes rockets with my dad," said corporate finance intern Nick Dolanski. "Participating in the intern rocket program helped me connect the work I'm doing as a member of the finance team to our overall mission of launching rockets."

Each year the program coordinators evaluate what type of rocket the interns will build and launch. Last year ULA and Ball Aerospace interns celebrated the Apollo anniversary by launching the 35-foot tall Future Heavy Super Sport rocket that reached a peak altitude of 5,500 feet.

"I think everyone was really excited to get the chance to build a rocket this year," Derek said. "At a minimum, this program represents what ULA hopes for its interns; we want to see them succeed, develop relevant skills, and hopefully one day return to contribute as a full-time employee here at ULA."

Vulcan Centaur: Rehearsal helps shape new rocket's countdown formula

ULA launch team members conducted a simulated countdown Dec. 1 to test their work in crafting the procedures and timelines that will be used next year to launch the first Vulcan Centaur rocket.

Dillon Rice, a veteran Atlas V and Delta IV launch conductor, orchestrated the simulation at Cape Canaveral with the assistance of ULA Chief Launch Conductor Doug Lebo.

The event also provided training for the control room operators staffing the liquid oxygen, pneumatics and propulsion consoles. A half-dozen engineers participated in the test from those stations.

The rehearsal enabled the team to evaluate the ongoing development of plans and procedures for the portion of the countdown when liquid oxygen is loaded into the Vulcan Centaur rocket's first stage. The demonstration offered a realistic practice session to check time requirements and the cadence of activities.

The successful simulation is just one step in shaping the countdown formula needed to ready a Vulcan Centaur rocket for launch.

The test began from the T-minus 3 hour point in the countdown with a "go" from the launch conductor to the first stage liquid oxygen console operator, known as LOX1, to initiate a simulated chilldown. That is the precursor step to thermally condition the transfer line from pad's giant liquid oxygen storage sphere to the rocket.

Once chilldown parameters were achieved, the launch team activated and oversaw the automated computer files that control filling the rocket's main stage with oxidizer.

The team mimicked achieving a full tank, then set off to perform standard countdown steps including valve cycling tests and charging the POGO system that dampens oscillations in liquid-fueled rockets.

After the simulation participants voiced their satisfaction that the countdown objectives had been met, the rehearsal then switched to its next phase to demonstrate the plans for draining the liquid oxygen out of the rocket.

Detanking and safing procedures also went smoothly in the test, giving the ULA Launch Operations team a success in its preparations for the inaugural Vulcan Centaur mission.

Future simulations will evaluate other elements of the launch countdown development, leading to a real-life fueling test and a Flight Readiness Firing using a pathfinder Vulcan Centaur rocket on the pad.

MARS ASSOCIATES

2021 MEMBERSHIP RENEWAL (DUES) NOTICE

It is time for **all** regular and senior members to renew your membership for the year March 1, 2021 — February 28, 2022, regardless of which month you joined MARS Associates.
Please complete the **Membership Renewal Form** below, cut at the dashed line and mail it to:

MARS ASSOCIATES, PO Box 1128, Littleton, CO 80160-1128

with a check or money order made out to "**MARS ASSOCIATES**" in the amount shown below, to be received not later than March 31, 2021.
Members whose dues are not paid as of March 31, 2021, will be notified and will be dropped from membership if dues remain unpaid. Membership expiration is determined by Membership Database records. Members who have been dropped will not be eligible for MARS clubs or member discounts for activities or benefits after March 31. Retain your current membership card–cards are not reissued annually. Your membership number is included on the address label of your MARS STAR mailing. More information about MARS is on the back of this page. If you have questions, contact the Membership Vice President, Carl Kaminski, at **CARLCOLO@CENTURYLINK.NET** or 303-726-1546.

Please complete all the blanks — The treasurer separates checks from forms upon receipt!

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Membership Renewal Form

Mail to: **MARS ASSOCIATES, PO Box 1128, Littleton, CO 80160-1128**

(New members must complete and submit the New Members MARS Membership Application form found on the website (MARSRETIREES.ORG → MEMBERSHIP) or contact Carl at CARLCOLO@CENTURYLINK.NET.)

Membership dues for FY2021 are as follows: **(Please check appropriate box.)**

Current Regular Member residing in Colorado **all or part** of the year.	$15.00 ☐
Current Regular Member residing full-time outside Colorado.	$10.00 ☐
Current Senior Member (or surviving spouse) whether residing in Colorado or out of state, whose retiree-member birth date is earlier than March 1, 1946.	$10.00 ☐

Check # _____Check Date_____

Please confirm your membership information — remember to enclose your check!

Name(s) _____

Spouse (or significant other) _____

Address _____ Apt/Unit _____

City/State _____ Zip _____ Zip ext._____

Phone _____-_____-_____ Email Address _____

Do you want your email address listed on the MARS website? YES ☐ NO ☐

Do you want to receive special notices from MARS by email? YES ☐ NO ☐

Are you interested in volunteering in support of MARS? YES ☐ NO ☐

If you volunteer with any organization, please tell us who it is: _____

Snowbirds:

Please notify the Membership Vice President by telephone, email or "snail mail" when you know your travel dates to your alternate address AND what that address is.

MARS STARs are mailed by Standard (Bulk) Mail to keep the cost of mailing low—every rejected or forwarded MARS STAR incurs an additional postage cost to MARS Associates.

Membership

- **Low annual membership dues** - $15.00 in-Colorado, $10.00 out-of-Colorado and seniors (≥ 75 years of age); includes you and your spouse or significant other
- **Dental, Vision** at very reasonable rates
- **Vendor Discounts** – visit our website (http://www.marsretirees.org)
- **Social Events** – annual picnic, happy hours, luncheons, Rockies games, etc.
- **MARS STAR Quarterly Newsletter** – information on past and current events relating to the organization as well as Corporate, LMSSC and ULA happenings
- **Informational & Educational Presentations** – periodic seminars on topics of interest (e.g. Medicare 101)
- **Connectivity with other retirement associations throughout the corporation**

Volunteer Opportunities

- **Community Service & Event Support** – help your community and/or the companies with the MARS team, for example, the Fun Run, Health Fair, Community Support Programs
- **MARS Support** – Web Committee, In Memoriam, Event Photographer
- **MARS Leadership** – Board of Directors and Officer positions of leadership, maximum of two 2-year terms (see the Bylaws and Policy Manual posted on the MARS website)

Current Club Activities

- **Bridge Club** – lively party bridge, singles welcome
- **Car Club** - Invites all car enthusiasts to become members, meet other like-minded people, and enjoy and share our love for the automobile.
- **Dinner Club** – private lunches, brunches and dinners at attractive and reasonably priced local restaurants in the *Denver Metro* area
- **Golf League** – a handicap league open to men and women that plays weekly games throughout the summer with a tournament in September and a banquet in the Fall
- **Hiking Club** – planned hikes for various levels of ability
- **Photography Club** – monthly meetings at Littleton Bemis Library (*except June, July, August*), photo-related presentations and programs – including travelogues, photo contests, help with equipment and photography; open to everyone.
- **Special Interests** – You are encouraged to start a club for your special interest

There is something for everyone to enjoy and all activities are open to all members. Come check us out on our website at http://www.marsretirees.org for more information. MARS ASSOCIATES IS A REGISTERED 501(c) (7) SOCIAL AND RECREATION CLUB

MARS VIRTUAL ANNUAL MEETING

The Officers and Board of Directors of MARS Associates are pleased to invite you to the virtual Annual Meeting on Wednesday, March 3, 2021. The meeting will be held on ZOOM from 1:00 p.m. to 3:00 p.m.

If you are interested in participating in the meeting please send your R.S.V.P. to Linda Duby at lindaduby@comcast.net by February 24, 2021. Please include in that email the following information:

Name
Email address
Phone number

MARS Associates will send you a link to the March 3 meeting, a few days prior to the meeting, by email. If you do not get the email or have questions about the meeting, please contact me at the above email address.

ZOOM Introduction

ZOOM is easy to use. All you need is a computer, smart phone or tablet. A camera is nice to have, but not required. All smart phones, tablets and laptops come with a built-in camera, or you can add one to your desktop. Without a camera, you can see others, but they cannot see you.
If this is your first time using ZOOM allow a little extra time for application setup. See https://support.ZOOM.us/hc/en-us/articles/360034967471-Getting-started-guide-for-new-users for additional guidance.

Getting into the ZOOM Meeting

Five minutes (10 min. for new users) before the 1 p.m. start time, select the link to the meeting in your MARS invitation email, which will be sent a few days prior to the March 3 meeting. Click on the link and follow the responses, you will have the opportunity to download the ZOOM App if not loaded on your device.

After the ZOOM App is loaded, you will then be prompted to open the ZOOM link AND "Join the Meeting". **You may wait a bit to be admitted by the host**. Upon admission, you'll want to select FULL-SCREEN and SPEAKER VIEW (deselect GALLERY). These options are normally shown in the upper right corner of the screen. You should now be in the meeting and be able to see everyone else in the meeting.

While on the ZOOM Meeting

Down in the left corner of the ZOOM screen, there are two boxes called Audio and Camera. If there is a red bar across either of them, you are not connected with that item in the meeting. Clicking on that icon should remove the red bar and allow you access. If there is not a red bar across the item, and you still can't access the audio or camera function, there is a down arrow right next to the icon. By clicking on that, it will bring up other choices. Several systems may have more than one app for the audio or camera function. If you see several choices, click on another choice, and see if that brings up the correct app for the audio or camera. Keep trying that until you find one that works.

In large meetings, it is advisable to mute your audio when you are not talking. That way, background noises, telephone ringing, and kids or pets making noise in the background won't be heard by everyone in the meeting. You can unmute your audio when prompted by the host.

You will find that participating in a ZOOM meeting is easy, and can be fun.

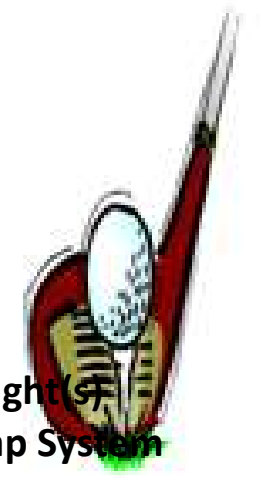
MARS ASSOCIATES GOLF

Men & Women Members

League play every Thursday,

April 1st thru October

weather permitting



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  - **Closest To The Pin**
  - **Low Net Winners per Flight(s)**
  - **Certified USGA Handicap System**
  - **CGA Membership**
  - **Annual Golf Registration, Club and User**

Fees - $75.00

- ✓ **End of Season Most Improved Player**
- ✓ **Pay As You Play (Regular Weekly Green**

Fees +$5 Prize Money)

- ✓ **Annual Championship Tournament**
- ✓ **Pays Low Net Winners**
- ✓ **Medalist Trophy to Low Gross Player**

ENGLEWOOD'S BROKEN TEE GOLF COURSE

2101 West Oxford Ave.

Englewood, Colorado

Contact: Bo Rodriguez

Golf League President

boandpat@Comcast.com

Tom Ripper

Handicap Chairman

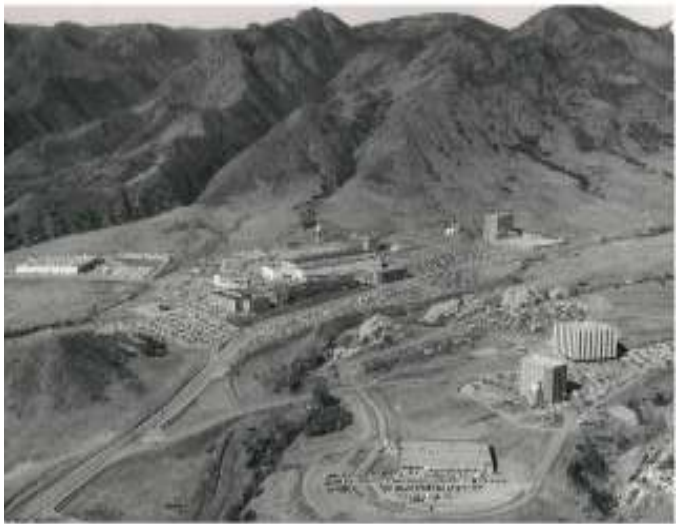
tomripper@q.com

To learn more go to www.marsretirees.org and click on "Golf"

in the clubs listing section

Martin Marietta Waterton
Birth & Growth

Provided by Monte Kopke



MARS STAR has gone digital!!

If you currently receive a printed copy you will continue to receive a printed copy. If you wish to receive hard (printed) copies in the future, contact Carl Kaminski at 303-726-1546 or via email at carlcolo@centurylink.net.

Schedule Addendum (See last page)

1. BOD meets as required
2. Officers/Directors meet 1st Wednesday of every month on Zoom at 09:30 am.
3. Bridge Club meets 3rd Friday of every month at 10:00 am at Buck Recreation Center.
4. Dinner Club (All events are lunch unless otherwise noted): TBD
5. Golf club meets every Thursday from April through Oct of each year.
6. Hiking Club: Outings on 3rd Wednesday of the month. Check website for Point of Contact for each hike.
7. Photo Club meets 2nd Thursday every month (except Jun, Jul & Aug) at 1:00 pm on Zoom
8. Web Committee meets on or before the Tuesday prior to BOD/Officer mtg on Zoom or email.
9. OLDP Presentation - Feb 3 on Zoom
10. **2021** Annual Meeting - Mar 3 on Zoom
11. **2021** Senior Recognition Luncheon - Jul 7 at TBD
12. **2021** MARS Day at the Rockies - Aug 18
13. **2021** Annual Picnic - Sept 8 at Clement Park
14. **2021** Holiday Celebration - Dec 1 at Wellshire

Please review dates and times and notify Dick Sosnay (richardsosnay@gmail.com) if you have any changes or additions.

ASSOCIATES
P.O. Box 1128
LITTLETON, CO 80160

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DATE: January 2021

MARS ASSOCIATES EVENT SCHEDULE

EVENT/MONTH	2021											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Officers/Directors	6	3	2	1	5	2	7	4	1	6	3	11/30
Bridge Club	15	19	19	17	21	18	16	20	17	15	19	17
Dinner Club	-	-	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	-
Golf Club	-	-	-	Thur	Thur	Thur	Thur	Thur	Thur	Thur	-	-
Hiking Club	20	17	17	15	20	16	21	18	15	20	17	15
Photo Club	14	11	11	8	13	-	-	-	9	14	11	9
Web Committee	5	2	1	3/31	4	1	6	3	8/31	5	2	11/29
MARS Events												
Happy Hour												
OLDP Zoom Discussion		3										
Annual Meeting			3									
Senior Recognition Luncheon							**7**					
CO Rockies Game								18				
Annual Picnic									8			
Holiday Celebration												1
MARS STAR Schedule												
Items due for MARS STAR												
STAR Flyers Due to Comms	4			5			5			4		
STAR Input to Editor	5			6			6			5		
STAR Repro. Deadline	18			19			19			18		
STAR Mailing	27			28			28			27		