

Air and Space this Week

Item of the Week

Two NASA Spacecraft

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KEY WORDS: GRAIL LADEE GRACE

The week marks the anniversary of the launch of two of NASA's lesser-known missions of the last decade, but that are still important to A+StW.

One of the high points of my career was a two-year detail assignment to NASA HQ, where I helped conduct educational programming at several launches and supported their "Year of the Solar System" promotion. I'd like to describe two of launches I worked for you here, the first one, a mission called "GRAIL" and the next-to-last launch I worked, the "LADEE" mission.

GRAIL: The [*Gravity Recovery and Interior Laboratory \(GRAIL\)*](#) was launched on September 10, 2011. It comprised two small satellites placed into different locations in the same orbit around the Moon, one ahead of the other. Detailed tracking of both, from Earth and by each other, yielded gravitational information from which the internal structure of the Moon could be determined. Sounds esoteric, but a similar mission conducted for Earth a few years earlier, the *GRACE Tellus* mission, a joint effort between NASA and the German space agency, DLR. The [*Gravity Recovery and Climate Experiment*](#) also comprised two satellites at different parts of the same orbit and detailed tracking. The "[*Tellus*](#)" part of the name was a pun; Tellus was the Roman goddess of planet Earth, and "tell us" refers to what the *GRACE* orbits could "tell us." *GRACE* ran for about 15 years, and returned a lot of extremely detailed data. An example: [GRACE data could reveal](#) underground water movements in agricultural areas.

The hope was that *GRAIL* data would be able to reveal the Moon's internal structure; I doubt they were looking for underground water....

GRAIL was scheduled to launch on September 8, 2011. I started at HQ the week previous. When my new boss and I were discussing launch-related public programming, I casually mentioned that the launch date was the 45th anniversary of the premiere of the original *Star Trek*. The new boss gave me a rather odd look, and turned to tap out an email and make a phone call in hushed tones, which I strove steadfastly not to overhear. It turns out that the KSC Visitor Center had a big display of *Star Trek* artifacts, including a number of props and costumes and a replica of the *Enterprise* bridge. The display was set to be removed by that weekend, the one before the *GRAIL* launch. The new boss not only paused the removal so the display would be available to the public during and after the launch, she also arranged for a personal appearance by long-time NASA friend, actress Nichelle Nichols, who played Lt. Uhura.

Nature was cruel to the launch managers and mission scientists that day, but kind to the engagement team. The day dawned clear, and it being on the Space Coast, even a smaller-rocket launch like the Delta II would attract a local audience. A number of families took the day off work and took the kids out of school to come down and see *GRAIL* head off to the Moon. Alas, high-altitude winds scrubbed the launch. It was too late to get back to work/school, so many of the disappointed-but-soon-to-be-glad folks came by the Visitor Center. When they saw a notice about Ms. Nichols' appearance, their disappointment turned to enthusiasm. I warned the Center security folks that they might want to beef up their presence near the auditorium and display area, and sure enough, the admission line wrapped around the entire building. Twice. Ms. Nichols had brought a large stack of 8x10 glossies to autograph, and we set her up in Kirk's Chair (think about that one from a historical perspective for a while), and she graciously signed away. Her stack of pix was gone in a flash, and we kept two color copiers on the verge of melting to keep up with the demand. [Later, I had the honor of working with her on outreach for a different mission, and her inspirational stories about her friendship with Martin Luther King (e.g. see: <https://www.youtube.com/watch?v=zrzygziT11I>) and the importance of an African-American woman in the Uhura role, in the command chain for a major vessel, had the audience in tears.]

Uhura's presence attracted a lot of media attention, too. Two weeks before the launch, only four media outlets had applied for press access; all four were small Space Coast weekly newspapers. The *GRAIL* mission, after all, was one difficult to explain to the public. However, once Ms. Nichols' participation was announced, the media interest **hexupled**, including access requests from all three TV networks' local affiliates.

The upper-level wind conditions abated, and *GRAIL* launched successfully on September 11.

In the post-mortem discussion back in HQ the week after the event, my new boss asked me how I'd known about the *Star Trek* connection to the original launch date. When she had given me the odd look when I first mentioned it, my heart sank because I thought I had labeled myself as a Space lightweight, and now that fear returned. I had known the connection because of Air and Space this Week! I had started A+StW well before my stint at NASA and I was keeping it going while I was there, and I had just completed the latest installment, which included September 8, right before going over to NASA HQ.

My concerns were short-lived. She was very familiar with the burst of public/media attention that resulted from engaging interest with the *Star Trek* connection. When I showed her my A+StW database, she immediately gave me a new assignment: emphasize the aeronautical development history parts, amplify the NASA parts, and work with her to get that database turned into an app. We did it, and you can see the results for yourself by **downloading the SPACE365 app** from your choice of the usual app sources (e.g. [here](#)). SPACE365 is now used by NASA as both an educational programming planning resource and an outreach medium.

NASA's sensitivity to public engagement is apparent in its asking school groups to suggest names for the two *GRAIL* orbiters. An elementary school class in Bozeman, MT, suggested

“[Ebb](#)” and “[Flow](#),” perfect since the Moon’s gravity (and the Sun’s) is responsible for the ebb and flow of Earth’s ocean tides.

The whole Nichelle Nichols thing was pretty cool, but there was one other aspect to our outreach programming around that launch that I found quite rewarding. Part of our program involved a “touchable” Moon rock. NASA prepared seven Moon rock slices to be used in Museums to engage interest. Six are permanently mounted in Museums, [one of which is NASM](#). The seventh was mounted atop a plexiglass plug, placed in a special case, and was allowed to travel to events such as the *GRAIL* launch. And it was my task to see to it that it got back to HQ safely.

I had spent a week in Florida hoping to see a Shuttle launch before the Shuttles were taken out of service. Alas, high-altitude winds and weather were not my friend, and the launch was delayed for more time than we could remain, so maybe the weather for the *GRAIL* launch was Mother Nature’s consolation prize. That meant that *GRAIL* would be the first rocket launch I would witness in person.

GRAIL was launched from a complex south of that used for the Shuttles, and there was a (former) NASA park across the river from there where the Moonrock and I went to see the launch. About three hundred people were of like mind. I realized that I was sitting there with what has to be the absolutely most-engaging item imaginable. So I got to work.

I went to the first picnicking group, and said, “Hi everyone, I’m from NASA, and we want to show our appreciation for your interest in the launch and the effort it took to come out for it. You are here to see something go to the Moon, so it’s only appropriate that we have something from the Moon for you to touch.” Needless to say, I got more than a few skeptical looks, but when I showed them the special case, opened it, and showed them the Moonrock, it was smiles all around. Everyone got to “touch the Moon.”

The next groups saw the interest of the first, so I didn’t have to struggle to be more-extroverted. I worked the entire line of groups along the river, and everyone got a chance to see and touch the Moonrock. When I was with the final group in the line, the Delta II lit up, and away *GRAIL* went. What a Day! As you might imagine, getting the Moonrock through TSA security was a bit interesting. The Moonrock was supposed to not leave my direct custody, so I called the TSA person in charge over and explained the situation. It was early in the morning, and few passengers were about. The manager quickly called several of the other guards over, to my momentary concern. But, it was all hands on deck, er, Moonrock. We had lots of smiling TSA folks taking each other’s picture with the Moonrock, and my trip through airport security was never smoother!

LADEE: The *Lunar Atmosphere Dust Environment Explorer* is the second mission for this Item of the Week. [FYI, “LADEE” is pronounced Laddy, not Lady; I know, it flies against normal English rules, but how many other exceptions to those rules are there?] *LADEE* was launched on September 7, 2013, from NASA’s Wallops Island facility. Wallops normally handles much of NASA’s rocketry for upper-atmosphere research, but *LADEE* was relatively small and a Minotaur V rocket, something that Wallops could handle, was sufficient.

Wallops is adjacent to Chincoteague Island on the Delmarva Peninsula. Some of you might know about the ponies that live on neighboring Assateague Island, the focus of the young person's book, [Misty of Chincoteague](#), by Marguerite Henry in 1947; I remember my fifth-grade teacher reading it to us. The book spawned several sequels and a [movie](#). The annual [pony roundup](#) continues to this day (pre-COVID anyway), and is a big boon to Chincoteague's tourism-based economy.

The *LADEE* launch was scheduled for the weekend following Labor Day, and NASA was promoting the event extensively. Normally, the end of Labor Day weekend marked the end of the season, after which most seasonal local businesses shut down. But because NASA was bringing a lot of folks in, they stayed open an additional week, and enjoyed business levels "better than roundup weekend" according to one restaurant proprietor I spoke with. The Wallops Visitor Center set an annual attendance record on launch day, with almost four months left to go in their year. The locals were certainly most friendly to their NASA visitors.

LADEE was to launch at night, and because the facility is smaller than KSC, visitors could get somewhat closer to the pad. The launch went off on schedule without a hitch. We were able to see the first staging clearly, with the first stage dropping slowly away, still firing weakly. Most impressive! We also saw the second staging in the distance before the rocket sailed from sight.

When the close-up pictures of the launch were examined, one frame showed the silhouette of a frog shot by the camera by the blast of the launch. Forsooth, the fate wasn't found of famous fotobombing [Frogstronaut Fred the Frog](#) after his five-seconds of fame.

The Moon has an extremely-tenuous atmosphere, so rarified that the exhaust gases from a landing spacecraft significantly changes the composition of the entire atmosphere. One of *LADEE*'s missions was to assess the atmosphere before it was contaminated by upcoming landings. It was also to assess the electric levitation of dust-sized material observed by other missions, and to serve as a test-bed for a communicator based on lasers rather than radio. The mission was successful but short-lived (like *GRAIL*), all three orbiters [were crashed](#) into the Moon at mission's end.

It was a joy to work this mission. The *LADEE* Education/Outreach lead is a fun-loving fellow, and we had a lot of good-natured banter about the mission during the preparation for the launch program. We got a mutual hoot out of the idea of getting Pink Floyd to re-unify for a Wallops concert prior to the launch to perform their wonderful, but in-aptly named, *Dark Side of the Moon*. Alas, Roger Waters was performing in Stuttgart ... [While that idea was very silly and we were only joking, NASA really did do something similar later by enlisting Queen's Brian May, who actually holds a Ph.D. in Astronomy and is an expert on inter-planetary dust, for outreach programming relating to the Pluto fly-by of the *New Horizons* spacecraft. *Way to go, LC!*]

And, as many of you have heard, the *LADEE* launch was how my wife and I ended up with two cats. There were a number of rescued cats on Chincoteague that week, and two of them are now lounging around upstairs as I write. Naming the male "LADEE" was an obvious choice (and that's why the Laddie pronunciation is important!), and since the next (and last) launch I would

support was that of the *MAVEN* spacecraft now in orbit around Mars, the choice for LADEE's sister's name was obvious, too!

Last Edited on 07 September 2020