THE NOON BALLOON

The Official Publication of THE NAVAL AIRSHIP ASSOCIATION, INC.

No. 111 Fall 2016

AIRLANDER UPDATE

Ed. and Sec.-Tres. chased the MZ-3A for 10 miles in their drop-top Eos before getting close enough to get these photos. Obviously the mission is based around the topside antenna structure somewhat unsuitable to airplanes, but NAVAIR and NRL passed the buck without releasing a statement. Noting the exponential spacing of elements suggesting longer wavelengths, while some are guessing it's testing local GPS enhancement. Whatever the mission it was short lived, see "Shore Establishments" inside.

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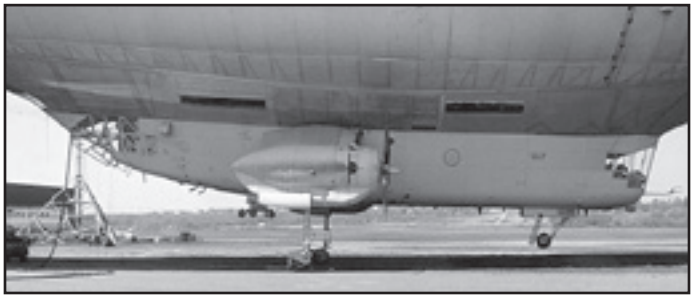
Be tender with the young, compassionate with the aged, tolerant of the weak, because someday in your life you will be all of these. ~ George Washington Carver ☺

On the Cover: Airlander (the former LEMV) takes to the skies at Cardington on August 24, 2016.



THE NOON BALLOON
Newsletter of the NAA
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EDITORIAL

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Wondering if anyone would notice last issue marked 10 years for your "new" team of Editor & Publisher, first called out as coming soon in issue #69, 2005. While the decade anniversary passed without comment, looking back, one could agree issues 70-110 represent quite a body of work, its own reward. We've always said we plan on remaining on station until properly relieved. These days we long to see him or her, so we can get on with the movie effort and test fly the airplane we struggle to finish, we try to remember the many Bravo Zulus we've received - as well as the touching stories members have shared. If Jackie Lewis' letter on page 35 doesn't bring tears to your eyes, it's 'cause you didn't read it.

TNBs are kept on file at Embry-Riddle Aero University and now, (see "Pigeon Cote") a full set of TNBs will be found in Pensacola's NNMA. Of course members can access the set digitally on our website, so researchers can obtain the benefit of our volunteers' research and other work. There is no denial, however, that the printed magazine is a luxury only affordable to organizations that can spread the cost over large membership body. Our sister LTA "clubs" are also suffering from dwindling membership for the same reasons. So, it's hard to imagine some sort of load-sharing (that has thus far eluded us) will not someday be necessary if one is to hold a magazine in one's hands. How many magazines need report the same press releases or leaked information? Let's keep an open mind and be ready to accept compromise for LTA.

As proud as we are of our first decade, and optimistically looking ahead to partnering to keep up the quality amid the challenges, this still will not leave us with a general reference book for researchers, and/or teachers to use as a textbook for LTA technology - and experience. Sadly there is no sign of relief, since we have no volunteer German-to-English translator to finish the effort started last year. Is there a need? Just read what Mark Lutz has learned about University LTA instruction today, without a textbook!

One notices a slight increase of LTA interest in the media lately, the pinnacle this quarter being AVIATION WEEK's detailing member Ron Hochstetler's paper presented at the AIAA AITO this past June in Washington DC. Ron found our Winter issue's devotion to Flying Carriers useful in polishing his paper, and has been so kind as to get us SAIC's incredible illustration for cover use.

This issue begins a series in which we examine the long-misplaced and forgotten Durand Committee Reports, their convoluted path to our pages a story in itself. Suffice to say Al Robbins is helping us understand the significance of conclusions of the best Aeronautical minds of their day.

Ed. and the Sec.-Tres. stopped by George and Dottie Allen's home a little bit ago and were finally able to present NAA's appreciation for his longtime service as president.

Their son Doug visited, we took some pictures and talked about George's experiences in ZW-1. There has been quite a lot of interest in the ZPG-3W of late, with hope in getting all the details down before Father Time makes that impossible. George also sent a photo ("Pigeon Cote").

Meanwhile Oshkosh AirVenture 2016 made history in many ways, such as the first appearance of the Canadian Forces' Snowbirds. With attendance up to about 563,000 moving through 891 commercial vendors helped by 5,000 volunteers, the showplanes total was 2,855 (up 7 percent over 2015): 1,124 homebuilt aircraft (up 11 percent), 1,032 vintage airplanes (up 7 percent), 371 warbirds (up 6 percent), 135 ultralights and light-sport aircraft. There were 101 seaplanes (including the first appearance of the incredible water-bombing Martian Mars), 31 rotorcraft, 41 aerobatic aircraft, and 20 non-categorized aircraft. Airships: 0, however in with the total of 1,050 forums and workshops attended by more than 75,000 people, yours truly belted out his usual "Airships: Past, Present and Future" presentation to his largest crowd to date. We passed out NAA brochures and TNBs were snapped up wanting for more. The EAA was a most gracious host, and the suggestion has been made we make the presentation on their website forums, with its large audiences. We're looking into that, and will keep you posted.

– Richard G. Van Treuren

View From The Top: PRESIDENT'S MESSAGE

I hope everyone has enjoyed the summer. We have an Executive Council meeting scheduled for the end of September and a very full agenda planned. The first item is to determine the particulars for our next Reunion/ Conference. As noted in my last message we sent a broadcast email to all members with an email address registered with us asking for their opinion on the date interval and location for the next event. From the responses it looks like a two year interval is recommended and Akron won as the preferred location. After a final presentation and vote, Akron in 2018 will probably be set. I am working on putting names on the many photos of the Pensacola gathering we have, courtesy of Bill and Jane Wissel, and they will be posted on our website very soon. Other items will be discussed including cooperation with allied LTA groups, archival issues, a recruitment effort to help boost our membership, and my proposed LTA Hall of Fame. My next *Noon Balloon* message will include a report on the meeting.

As noted before, we presented certificates to some Past Presidents to acknowledge their commitments to our association. Richard and Debbie Van Treuren presented one to George Allen at his house and a photo is enclosed of their presentation. I have mailed certificates and a personal letter on behalf of the Executive Council and NAA membership to John Fahey and to Norman Mayer's wife, Margaret. However, we still need help in getting current addresses for M. Eppes, L. Prost, W. Moore, F. Kleinberg, H. Biedebach, and R. Ashford. A surviving relative might be of help for those who have passed. Please help us get contact information so the certificates can be delivered. Please contact me if you know of any contact information.

Lastly, as noted in the last issue, my idea for an LTA Hall of Fame got postponed from lack of commitment. It is not dead and I am actively pursuing help in getting started again. I have formed a committee to screen any and all applications submitted and recently made an overture to an LTA association to propose a joint effort with us. I believe in this project and will do everything necessary to make it a reality. Thank you for your continued support of the Naval Airship Association and hope to see you at the next reunion; date and location to be announced soon thanks to your input.

Usually we have C. P. Hall do our book reports, but I asked if I could do this short one since I contributed some photos to the book and met the author in Bangor, Maine. NAA member Jonathan Eno has produced "Naval Visits to Frenchman's Bay" which is a collection of photographs, each with a brief and informative description, of Navy ships visiting the Bar Harbor area of Maine. The book is coffee table sized, almost 700 pages, and with photos dating from 1854 to 2014. Of particular interest to NAA members is that there are quite a few photos of airships. There are some good photos of the USS *Shenandoah* (with the USS *Patoka* and alone), blimps K-3, K-12, K-42, K-38, K-14, K-25, and K-34. Many of the K-ships are at Bar Harbor NAF, or overhead at the US Navy Ordnance Facility off of Porcupine Island assisting live fire exercises. K-14 is shown in the water off Mt. Desert Island after the crash. As many well know, Bar Harbor NAF was associated with NAS So. Weymouth and served as a base for forward deployed blimp squadron ZP-11. This book represents a number of years and dedicated research time; Jonathan did an extraordinary job in compiling all the photos and descriptions. Unfortunately, the book is not for sale, but has been distributed to local Maine libraries, historical societies, and museums. I am very proud to have assisted in this work and the NAA is recognized prominently. Thank you, Jonathan.

– Fred Morin, President

TREASURER'S STRONGBOX

Here it is September and we are three quarters of the way through our fiscal year.

The reunion in May required an infusion of funds from the General Fund to cover the expenses. The good news is that the funds were available to do so. We had a very nice reunion in Pensacola, Florida, that was fairly well attended due to the venue.

After printing out three newsletters so far this year, we still have a balance in the Checking Account of $4,707.76. The Savings Account has $20,334.00. There will be a few dollars in accrued interest which will post at the end of September. All of the bills are paid. No outstanding invoices.

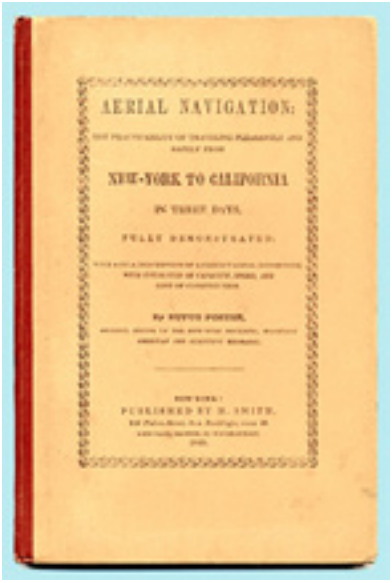
We have lost a number of members through natural attrition and non-renewal. Our numbers stand around 340+ at this point. The only thing I can add is this: when your dues notice is sent, please re-up as soon as possible. If we are going to keep our roster up-to-date, a cut-off date has to be imposed. Our Publisher has a devil of a time trying to figure out who should have a magazine and who shouldn't! Help us to keep all of this straight!

Thank you all for your support through the year.
Up Ship!

– Debbie Van Treuren, NAA Treasurer

PIGEON COTE

Barbara Jagla e-mailed, "I would like to share information about a native born Massachusetts son who perhaps could be added to your Historical Aviation Timeline. Rufus Porter was born in Boxford, Massachusetts in 1792. I first "met" Rufus through his fresco mural paintings in New England taverns and historic homes when I served on the North Reading Historical Commission. His mural Boston Harbor hangs in Boston's Museum of Fine Art.



I learned that Mr. Porter was also a prolific inventor and founded Scientific American magazine on August 28, 1845. His booklet "AERIAL NAVIGATION - The Practicability Of Traveling Pleasantly And Safely From New-York To California In Three Days," published in 1849, set out his design in considerable detail. He planned to fly people from the east coast to the gold fields of the west coast on his Aerial Locomotive. Porter gave public lectures and demonstrations of his model, but funding for construction became an issue. "

http://www.mfa.org/collections/object/boston-harbor-500074
http://www.rufusportermuseum.org/#!rufus-porter-inventions/c14uq
http://www.rufusportermuseum.org/#!rufus-porter-biography/clml
http://northreadinghistoricalcommission.blogspot.com/2011/02/rufus-porter-murals-damon-tavern.html **Ω**

Author Marc Frattasio (see "Media Watch") e-mailed, "In the last paragraph on page 31 of the summer Noon Balloon Steve Chalker states that NAS Weeksville, NC, was the first LTA facility in operation on the east coast other than NAS Lakehurst. This isn't quite right. In his otherwise fine article Mr. Chalker indicates that NAS Weeksville was commissioned on April 1, 1942, with LTA operations starting there on June 8th. NAS South Weymouth, MA, was commissioned on March 1, 1942, one month earlier than NAS Weeksville. In addition, blimp patrol squadron ZP-11 was established at NAS South Weymouth on June 2, 1942, and began to fly missions from the base on June 3rd. Thus, NAS South Weymouth was actually the first LTA facility in operation on the east coast after NAS Lakehurst. It is worth noting that squadron ZP-14 was established at NAS Weeksville on June 1, 1942, one day before ZP-11 was established at NAS South Weymouth. However, NAS Weeksville was apparently not quite ready to support LTA operations at that time so ZP-14 operated its blimp from nearby CGAS Elizabeth City, NC, until June 8th, when it was relocated to NAS Weeksville. It may also be worth noting that for some months following their establishment ZP-14 and ZP-11 had no blimps of their own and had to borrow them from ZP-12 at NAS Lakehurst. **Ω**

Our hard working member at NNAM Pensacola's Emil Buehler Library, Steve Kozlovski, had first noticed that more than half of *NOON BALLOON*s produced since 1984 did not make it to the reference shelves. We have printed new and replaced their missing issues there. Steve has been working on the rather labor-intensive task of scanning and attaching all the LTA oriented photos in the Library which have missing or incomplete captions. In the few dozen to date, Ed. has not been stumped yet, but if and when there is a real mystery we'll appeal to the readers to help with the i.d. In some cases the photos have been published, such as the photo of the American-crewed *Captain Cussian* which appeared in "Kite Balloons to Airships," the Navy's only official effort to chronicle its "Lighter Than Air Experience," dating to the 75th anniversary of Naval Aviation.

History chair Mark Lutz helped with some new revelations about that "old" document, writing, "This evening I found the Official US Navy LTA History Document, "Kite Balloons to Airships",
on webapp1.dlib.indiana.edu.

The ENTIRE 80-page document comes up as a pdf. It is VERY slow to load (well, maybe something like 10 minutes) - I think limited by the Indiana U library server, not your internet connection speed. Be patient - give it time. The Navy's history site used to have it, split into the multiple pdf form Richard mentions. The Navy's history website appears to have become totally re-arranged, with "History now meaning 'the last 10 years'."

Ed. noted KTBA diverts from all other published history by stating that, besides K-74 vs. U-134, there were <u>two</u> K-ship attacks that "probably caused slight damage" to U-boats in WWII. No details given, and when Ed. talked to the original author, he could not remember where that data came from. It took Ed. many years to verify that report and discover its origin, not that the Naval History Center itself (let alone the mainstream media) has devoted resources to correcting the record. **Ω**

There has been some interest in the ZPG-3W lately, with George Allen and Ross Wood answering e-mails concerning the Navy's last off-the-line, largest and most innovative pressure airship. George found this photo (below) of three -3W alumni taken at an NAA Reunion.

Left to right, that's Dave Hayes, who we haven't heard from in a while; Dick Widdicombe, who participated in the 3W's BIS trials (Bureau of Inspection and Survey) who passed away a few years ago, George Allen, and Bob Kaiser. Bob had appeared with his family in a Goodyear photo taken in the -3W's dinette, which we ran last issue to illustrate the ladder leading to the topside ladder.

At the same time an e-mail from Bob's family came in informing us Bob had just had a pacemaker installed. Hope you readers will join the TNB team in wishes for Bob's speedy recovery. **Ω**

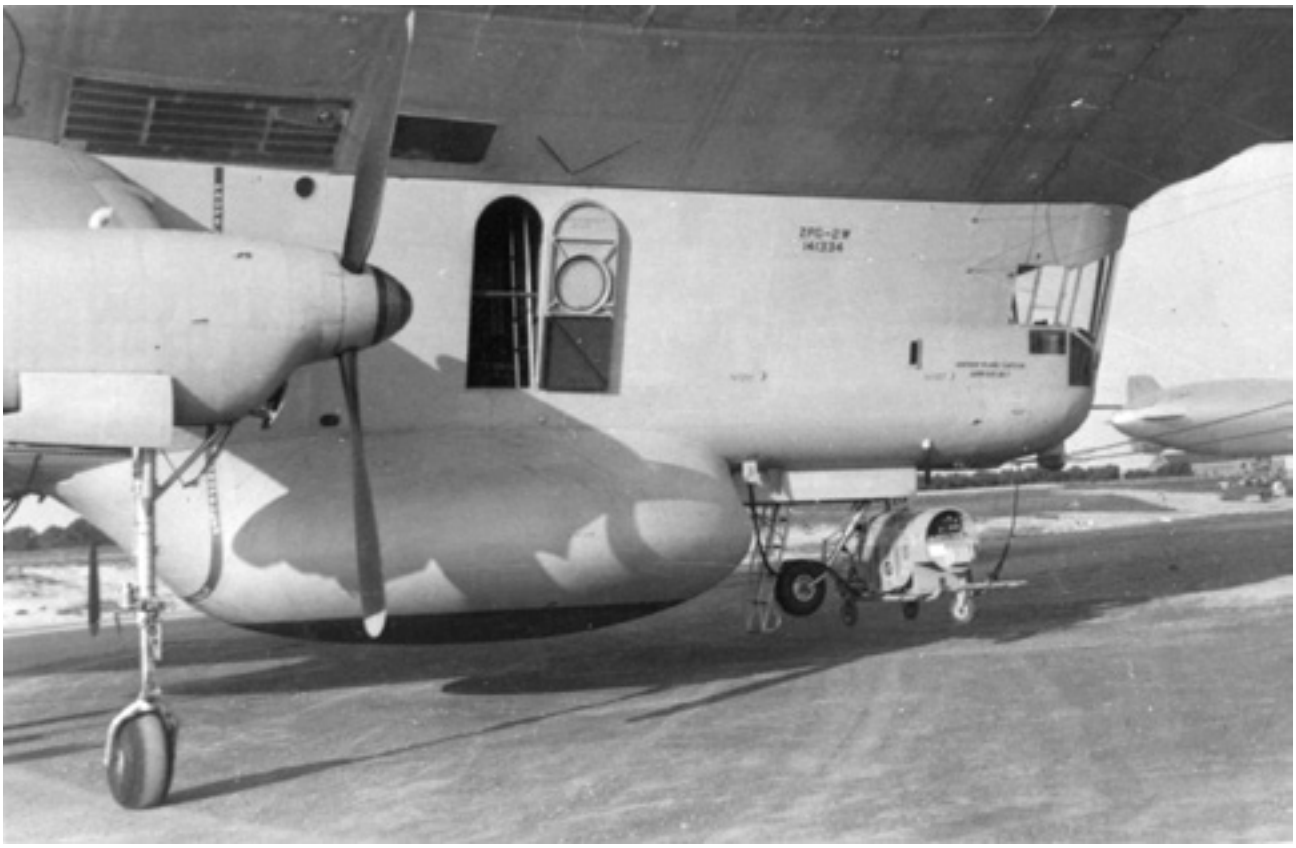
Don Kaiser forwarded a question which came through the NAA website with attached photos; the one above is probably J. P. Harder in training and dated 3-28-43. If you can help, please e-mail Don: "I have recently purchased a scrapbook at an antique store in Oklahoma that belonged to a Justin P. Harder, who I believe was originally from New Jersey, and who piloted U.S. Navy airships during World War 2 on patrol on the east coast and the Caribbean including Trinidad, Puerto Rico, and French and Dutch Guiana. I was wondering if anyone here might have any additional information regarding who this incredible man was? Thank you so much for your time, and I look forward to hearing from you at your convenience! Best Regards, Nick Dorris, Oklahoma."

Al Robbins responded, "Harder was one of 134 Ensigns commissioned on either 1 or 3 March 1944. (only 10 previously commissioned officers were in Class 3-44.) The 1944 classes were all huge, and the remaining squadrons were hard-pressed to perform their assigned missions, with practically no time or capability to adequately train and qualify their ration of nugget pilots. He was one of 10 graduates, all Ensigns, initially assigned to Blimpron 51. According to the FY 45 register, only 2 of the 10 were still in LTA EDEN in ZP-33 and Hink in ZP-31. Orr was assigned to Navy Training Center Miami. All the rest had been reassigned to N.A.T.S. for other aviation training. No info on specific training for Harder, where he was subsequently assigned, or when he was released from active duty. Perhaps Mr. Dorris' scrapbook might fill in some of the blanks."

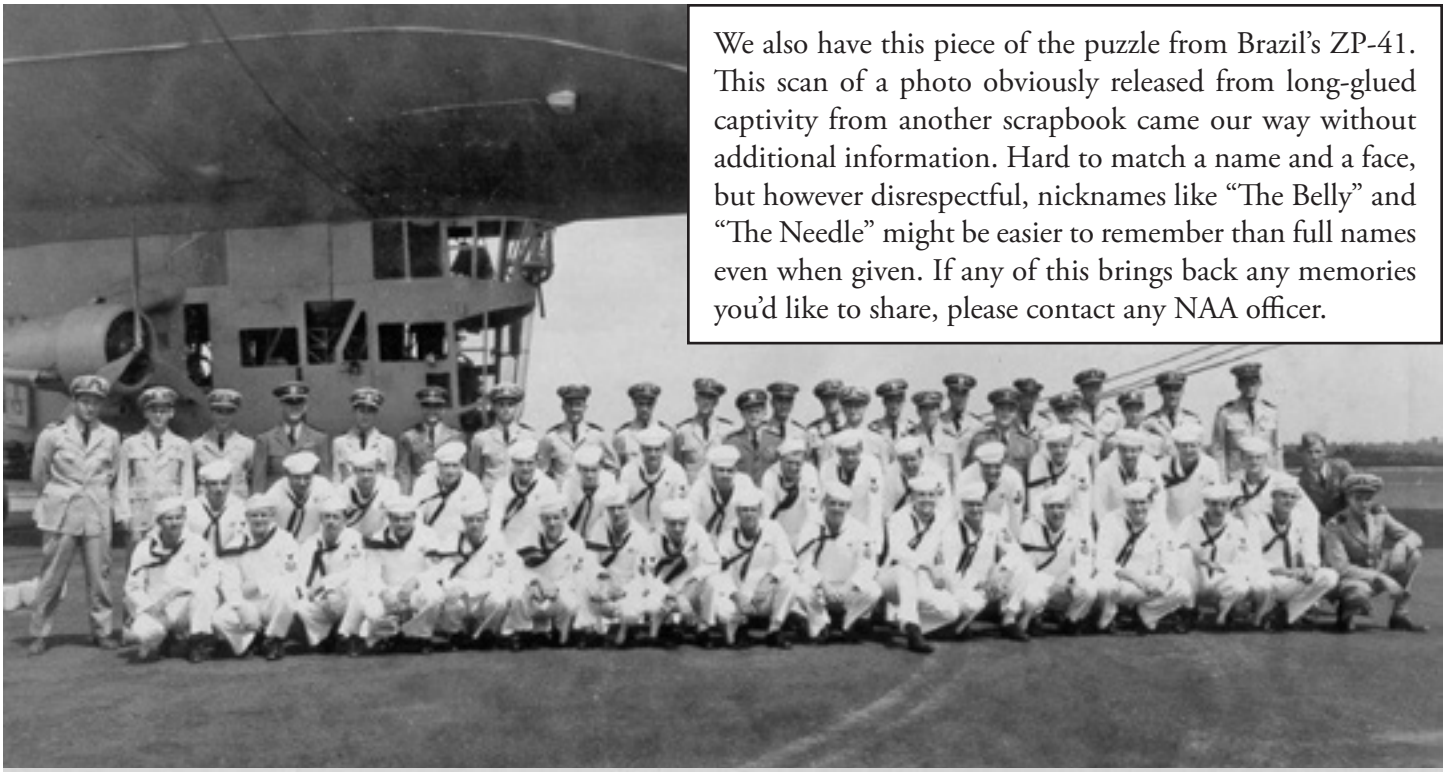
Ed. notes this caption leads one to believe the bodies recovered from an accident were laid to rest there in Dutch Guiana. While we do not have all the names of those lost in LTA service, so we could have missed this man Tom Harmon, we have no knowledge of a fatal accident in ZP-51 other than the inflight fire off Puerto Rico. Can anyone help here... was it an HTA crash perhaps? Also in the scrapbook was the photo below labeled "O.D. Vickers" **Ω**

Charlie Weithaus shared several snapshots from his ZW-1 days. In one of his shots the "M" ship in the background (above) appears to be modified to support the "Clinker" dish, and we're still trying to find out how to get more information on that program which surely would be unclassified by now. Also, one notices the rather large and seemingly turbine-shaped APU in the ZPG-2W shots. Charlie told us he remembers that APU was a small jet-powered unit much more powerful than the units we've seen in the photos and movies. He said it had enough guts to run everything, even all the heaters on cold nights. Charlie said they could not run the heaters with the common APU. Ross Wood verified the photo was not the usual APU. "At the end of a 36-hour 'barrier' flight, the landing party would hang an APU, before the air crew left the ship - adding weight to a relatively light ship. Now, regarding the shape of the APU, I totally agree - this was not the APU I remember. Incidentally, that ship we are talking about, BuNo. 141334 was a 2W I frequently flew. Charlie was in ZW-1 before I got there in Jan. of 58. The APU I remember was smaller and did not have wheels on the ground." **Ω**

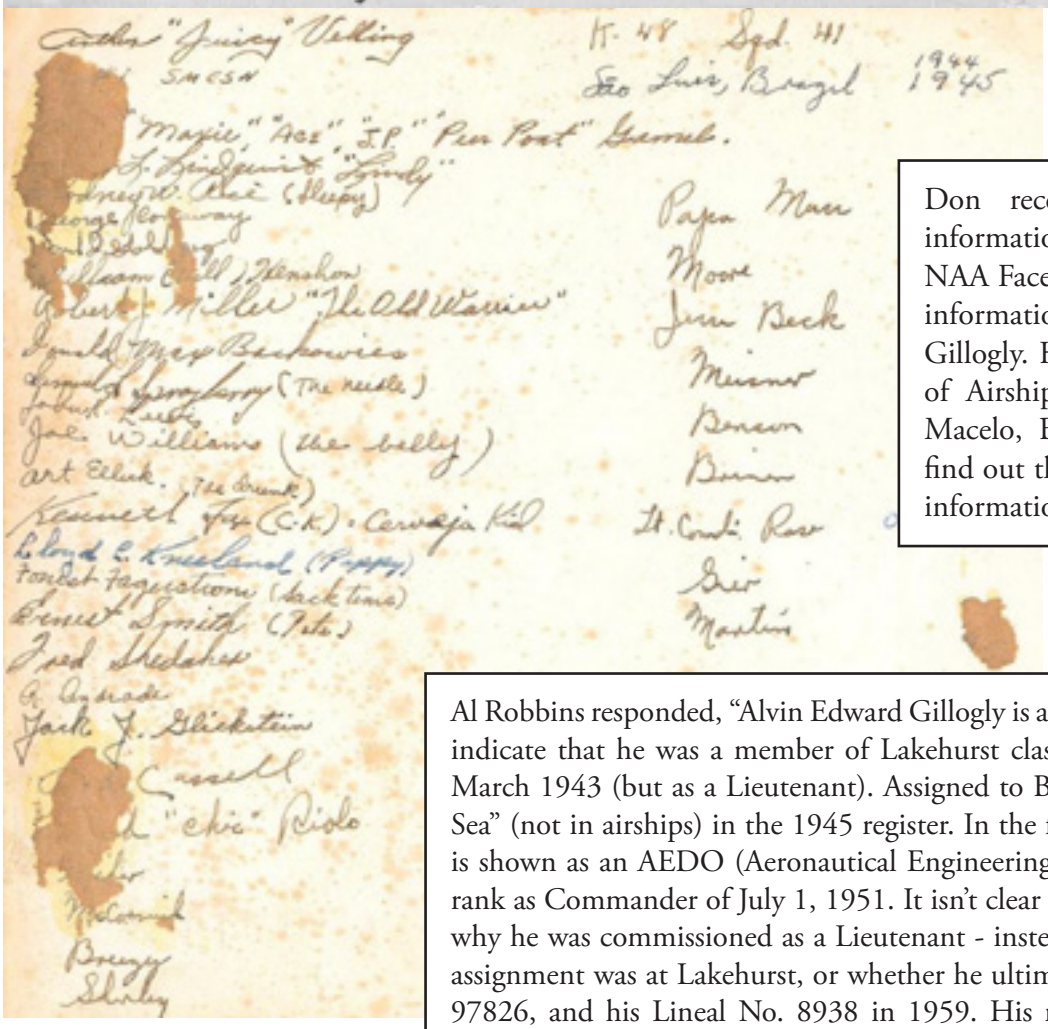
C.P. Hall e-mailed Giles Camplin concerning AIRLANDER, "Fully realizing that this is a 'modern' experiment while DIRIGIBLE's focus is "historic" I would still point out that this "World's biggest aircraft" is approximately the gas capacity of Vickers' s R.80 of almost 100 years ago and smaller than ZPG-3W of 60 years ago. No sign of any comment regarding 'lift and trim' except it might be rebuilt(?) to carry 40+ passengers. I seem to recall that there was a proposal to 'rebuild' R.80 to carry passengers from England to Rome? I would like to see a comparison of these two airships when data become available! Observations & Questions: Why is there a gap between control car and hull? Will a single rudder be enough or will engines be assisting directional stability? This new craft seems to have four engines, just like R.80. however as a matter of shape and 'twin floats' under the hull, the profile more resembles Sir Dennis Burney's "Elliptical Ship." I trust that someone has installed a seismograph in the vicinity of the final resting place of Sir Barnes Wallis for if it is a success?!" **Ω**



We also have this piece of the puzzle from Brazil's ZP-41. This scan of a photo obviously released from long-glued captivity from another scrapbook came our way without additional information. Hard to match a name and a face, but however disrespectful, nicknames like "The Belly" and "The Needle" might be easier to remember than full names even when given. If any of this brings back any memories you'd like to share, please contact any NAA officer.



SÃO LUIS, BRAZIL 1944 1945 K-48 SQD 41



Don received another request for information received through the NAA Facebook page: "I am looking for information about my uncle Alvin E. Gillogly. He was the Officer in Charge of Airship Squadron 42 stationed in Macelo, Brazil. My aunt is trying to find out the dates he was there and any information."

Al Robbins responded, "Alvin Edward Gillogly is an incomplete entry. My records indicate that he was a member of Lakehurst class L1-43, Commissioned on 1 March 1943 (but as a Lieutenant). Assigned to Blimpron 42-1 but listed as "At Sea" (not in airships) in the 1945 register. In the final, 1959, Airship register, he is shown as an AEDO (Aeronautical Engineering Duty Officer), with a date of rank as Commander of July 1, 1951. It isn't clear if he had prior enlisted service, why he was commissioned as a Lieutenant - instead of Ensign, what his specific assignment was at Lakehurst, or whether he ultimately retired. His File No. was 97826, and his Lineal No. 8938 in 1959. His relatives should be able to get further information from the Navy."

Renewing member Julian Benscher reports "We are moving our Skyship Services main office to George Spyrou's old airship office in Elizabeth City (the Blue Building) but it will take a month or two to complete the move." **Ω**

An inquiry seeking potential reviewers for a new TV series on U-boats prompted Ed. to e-mail, "I am Rich Van Treuren, editor of The Noon Balloon, magazine of the Naval Airship Association, and author of the study Airships vs. Submarines. TV rarely mentions the LTA part of the ASW battle in either World War. I would be surprised if this new series breaks that mold. If, however, there is some mention of airships, I'd be happy to review that episode. If anyone is interested in WWII LTA we have a one-page illustrated summary at:

http://naval-airships.org/page-660682

One Dave Winkler of navyhistory.org responded, "Good Question…I forwarded the query to the production team!

I'm cc'ing our digital content collector in chief Matt Eng who might have an interest in having your organization post a few blog stories with us. Also I am doing a historical perspective on naval aviation for Sea Power in October and this would be something I could highlight."

No further response at press time. **Ω**

Prof. "Red" Layton complemented TNB and e-mailed; "Shipmate, the Naval Academy Alumni magazine, reports the death of LDCR Richard M. Shively, Jr. (See "Black Blimp".) The obituary states that he trained as an airplane pilot and as a lighter-than-air pilot of Navy blimps. It adds that during his LTA service he was able to make a very successful landing on an aircraft carrier in a blimp. I remember him slightly and I believe that he was in ZP-1. I can relate to 2 of the stories in the excellent article by Luther Franklin in the spring 2016 issue: In the one about the tail wheel, unless there were two such episodes at Weeksville during that period, I not only witnessed the event but I have the tail wheel. I found it and kept it as my last tie to LTA. A picture of this wheel is below on the left.

In Franklin's story about the towed sonar accident, I was closer to the accident than he was: I was in the right seat. The cause of the mishap was: Mathematics. While recovering the towed sonar at a low airspeed, the pilot flying the airship in the left seat made full rudder turn. This caused a loss of airspeed and the airship descended 55 feet. Since we were flying at 50 feet altitude, you can see that what caused the accident was Mathematics(!)" **Ω**

Don Morris sent this clipping and wrote, "I asked Al Robbins if this airship was ever patented. Al couldn't find any Gouldhart patents but as far as I know, this could be the earliest reference of an airship associated with the USN. Unfortunately, it seems to have gone no further than the article but it may have planted an important seed in the minds of those officers mentioned. The article was sent to me by Hugh MacDougall, a visitor to our NAA website who discovered it doing research on Gouldhart, his relative." **Ω**

AIRSHIP INVENTOR AT NAVY YARD

Corp. Gouldhart of the Marine Corps, Stationed on the Wabash, Hopes to Solve the Problem of Aerial Navigation.

HELPED IN HIS WORK BY NAVY OFFICERS

Theories Upon Which He Works, Which Are Radically Different from Those of Others, and How Power Will Be Supplied.

SHORE ESTABLISHMENTS

LAKEHURST

MZ-3A arrived from Frederick, Maryland, and was put in Lakehurst Hangar #1 on 6/15. All antennae and gear/equipment off-loaded 6/16-6-17. Deflation commenced 6/18, everything hastily packed by 6/21. Apparently the traditional deflation and packing methods were not employed, with no plastic or ground cloth visible on the hangar floor.

AKRON

During July and August Akron and Northeast Ohio enjoyed the presence of two Goodyear Blimp NTs. *Wingfoot One*, based in Pompano Beach, Florida, was at the Wingfoot Blimp Base for maintenance and

crew training. In addition to frequent training flights, the airships also covered area sporting events.

The airships, *Wingfoot One* and *Wingfoot Two* were seen over the Cleveland Cavs' Victory Parade, at the NFL Hall of Fame Induction Ceremony in Canton and several Cleveland Indians baseball games. On August 8, *Wingfoot One* began its five-day return trip to Pompano Beach.

– Alvaro Bellon

Giant Blimp-Like Airships Are Making A Comeback

by Arjun Kharpal, CNBC (excerpt)

Giant flying blimps - or airships - were all the rage in the period between the two world wars before a tragic disaster in the late 1930s involving an aircraft brought their popularity to an end. Now the inflated flying structures are making a comeback with developments by the aerospace industry's biggest players and new challengers promising to develop airships for anything from luxury travel to transporting cargo to remote parts of the world. And it could be just two years before airships begin to take to the skies for commercial use.

In a hangar nearly 60 miles north of London sits a 302-foot beast called the Airlander 10, which is vying to become a leader in an industry that could be worth $50 billion over the next 20 years, according to companies building these aircraft. "What a hybrid aircraft can do is very efficiently carry a heavy load and that heavy load can basically be three things - people, cargo or it can be fuel - and it has ultra-long endurance," Chris Daniels, head of partnerships at Hybrid Air Vehicles, one of the companies developing an airship, told CNBC, explaining the appeal of the aircraft type.

"The use cases are plenty, according to manufacturers, and could include transporting cargo for companies, surveillance, search and rescue missions, and even luxury travel", Daniels said. Hybrid Air Vehicles sees a lot of opportunity in delivery of items to consumers in emerging markets where the infrastructure is poor, but users are increasingly connected through mobile devices.

"Mobile phones have managed to skip landlines in the developing world and we think in cargo, there will be no point putting in expensive roads or railways if there is an alternative," Daniels said. Why the interest in airships?

Airships were in vogue in the period between the two world wars in the early 1900s, but quickly fell out of favor after the Hindenburg disaster in 1937 in which the German passenger airship caught fire causing several deaths. The incident brought an end to the airship era. But now the aircraft are making a comeback.

Behind the rising interest in airships is the aerospace's continuing drive for efficiency to reduce cost. The Airlander 10 travels at 100 miles per hour—compared to an Airbus A380's top speed of 630 miles per hour, but it is built for endurance, not needing to refuel for a long time. Skeleton Technologies is one company that creates ultracapacitors - an energy storage technology backed by Tesla boss Elon Musk. Ultracapacitors are able to give a short burst of energy for situations such as stabilizing or accelerating the airship, and then can recharge in a matter of seconds and will be used in aircraft being developed by a French firm called Flying Whales. "That's where the hybrid system comes into play. Using hybrid systems, you can downsize the engine, leading to weight and volume savings," Taavi Madiberk, CEO of Skeleton Technologies told CNBC by phone.

Hybrid Air Vehicles' blimp costs around $40 million to buy. As a comparison the cheapest Airbus, the A318 has an average list price of $75.1 million. But airships face a few challenges getting off the ground and scaling. While manufacturers claim that the airships are able to land in remote areas and take off vertically, analysts said that there is no infrastructure in place to load or unload the aircraft. And there are also concerns that the current low oil price investment could put off companies from buying the airships or using them for cargo.

"I think when you look at one of the advantages of hybrid airships, one is the cost in terms of fuel consumption, if you start to lower that whether that is in lorries, cars or marine, it will slow the commercialization of it," Glynn Bellamy, U.K. head of aerospace and defense at KPMG, told CNBC by phone.

Hybrid Air Vehicles is not the only player making airships. Lockheed Martin's LMH1 airship - which also costs around $40 million - is a competitor to Hybrid Air Vehicles with the company touting the potential to deliver cargo to remote areas. And the aerospace firm has already signed its first contract with Straightline Aviation (SLA) signing a letter of intent to purchase 12 airships, in a deal worth $480 million.

And governments are also backing the transport method. The French government recently backed a project to build an airship called the LCA60T. A Chinese state-owned enterprise called AVIC General, and a Moroccan private firm called Marita Group have also invested in the project. The idea was born out of a problem in France's forestry industry, one of the biggest in the industry. Despite a large amount of production, there is a problem transporting wood to the mills, according to Sébastien Bougon, CEO of Flying Whales, one of the companies building the airship. He told CNBC the applications go beyond that. The LCA60T is likely to go into production in 2021 with plans for a prototype on their way. Bougon is not concerned that a low oil price could put off investment. **Ω**

COVER STORY

Airlander Aloft, 3rd Approach Suffers Hard Landing

There was only a 6m clearance from the fin tip to the sides of the hangar doors when Airlander emerged, taking 20 minutes for the 92m hull to clear the hangar. Once masted she was free to "weathervane" nose into wind. Special "shoes" minimized wear on the landing skids.

Airlander 10 took off from the historic Cardington Airfield in Bedfordshire at approximately 19:45 on Wednesday 17th of August, after a short flight it landed at 20:00, before dark. The four massive but quiet engines were started approximately 30 minutes before takeoff. Obviously without cargo or passengers, the ship was said to be trimmed at 850 kg HTA. Once airborne, Chief Test Pilot David Burns, accompanied by Test Pilot Simon Davies, flew within a six mile (five nautical mile) area around Cardington Airfield. Airlander climbed to a height of 500 ft and reached a maximum speed of 35 knots. All test objectives were met during the flight. Some technical tests on its hull pressure were also undertaken. Chief Test Pilot Dave Burns said, "It was privilege to fly the Airlander for the first time and it flew wonderfully. I'm really excited about getting it airborne. It flew like a dream."

Locals report the ship made a second flight on the 24th reaching a speculated 60 mph and made a level landing.

The New York Times reported on 8/24 that the Airlander 10 went down in a "slow and gentle plunge." In footage uploaded to YouTube, the spectators could be heard saying, "Oh my God, he just crashed it," as the nose of the airship hit the ground after descending slowly prior to coming to rest at Cardington Airfield in southern England. The Daily Express (UK) (8/24) adds that one witness to the incident said, "A line that was hanging down from the plane hit the telegraph pole about two fields away. Then, as it came in to land, it seemed to nose dive and landed on the cockpit, smashing it up." Media reports included coverage of a resulting power outage to five homes.

Once the high voltage and ship's line contact was confirmed, the video easily suggests a link: the fly-by wire controls appear unresponsive. Continuing on its last course and AOA, the car's bow took the brunt of the slow-motion but heavy impact with the field, busting up the cockpit.

HAV press release states the line contact caused no damage to the ship and promises an investigation as to the cause of the impact. No one was hurt in the incident. The ship was towed back into the shed nose first, opposite of exit.

E-mail communications flew back and forth with wide speculation, with eventual focus on pitch control and ballonet slosh. Designed for higher altitudes, the LEMV had rather large ballonet volume in relation to hull volume. A photo from LEMV's only flight, showing a difficult pitch angle, lent weight to the argument the lateral stability problem had been known but inadequately addressed in the re-assembly. Discussion included the apparent instability of hybrid designs, tackled by Lockheed after flights of its P-791 scale prototype, using advanced software akin to the F-35 and in their airship flight simulator. **Ω**

Hybrid Enterprises Receives First Customer's Letter of Intent to purchase L-M airships

(compiled from internet)

Last March Straightline Aviation (SLA) signed a letter of intent to purchase up to 12 Lockheed Martin (NYSE: LMT) Hybrid Airships with a potential value of approximately $480 million. SLA is working with Hybrid Enterprises, Lockheed Martin's Hybrid Airship reseller, to finalize the purchase agreement. Based in the U.K., the leadership team of SLA has deep-rooted experience in airship operations and established the company specifically to act as an owner-operator of Hybrid Airships. "We are delighted to be first in line with this magnificent aircraft that is going to dramatically change the way cargo is moved around the world," said Mike Kendrick, SLA co-founder and chief executive officer. "The clear-cut economic and environmental advantages of these Hybrids are attracting vast amounts of attention from a wide-range of potential end users."

The airship is the result of more than 20 years' worth of research. When fully built, the LMH-1 will be a 21 metric ton, 300-foot-long and 78-foot-tall airship that is intended to carry truck-size loads to areas that are inaccessible to more traditional modes of transportation. Lockheed Martin has said the airship will be able to carry up to 47,000 pounds, 19 passengers and burn less fuel than conventional aircraft. The airship will have four fairly small engines and gets about 80% of its lift from helium. An air-cushion landing system allows the airship to land on wild terrain such as open water, sand, snow or ice. The air-cushion landing system also allows the dirigible to stick to the ground like a suction cup so that it doesn't move with the wind, said Bob Boyd, program manager for the Lockheed Martin hybrid airships.

The full-sized LMH-1 could have its first flight by late 2017, and it is expected to be in commercial service by the end of 2018. With about 80,000 ft² of envelope to inspect during assembly and maintenance, Lockheed Martin's Skunk Works has developed a robot to scour the hull of its LMH-1 commercial heavy-lift hybrid airship for helium-leaking pinholes in the Vectran.

Craig Johnston, business director for Lockheed Martin's Skunk Works facility, emphasized the airship's focus on cargo. A square-shaped cargo bay in the back of the cockpit was specifically designed with loading in mind. "This is designed from the ground up to be a cargo vehicle," he said.

Lockheed Martin has installed 19 seats in the LMH-1 mock-up, representing the largest passenger load currently permitted without requiring a cabin attendant The LMH-1 cabin is thought to be the first large scale passenger accommodation mock-up built by Lockheed at Palmdale since the days of the L-1011 TriStar in the 1960s.

The hybrid airship program is expected to employ about 150 workers in Palmdale, though Johnston said the positions might not necessarily be new jobs. **Ω**

Why Airships Should Replace Jets For Moving Freight
by Darah Hansen

The desire for financial efficiencies has long been a great driver of innovation. But, with global warming bringing the threat of super storms and rising seas (literally in some cases) to our doorsteps, it appears that environmental sustainability is providing equally powerful motivation to change.

That's certainly the thinking behind University of Manitoba professor Barry Prentice's latest research exploring the futuristic realm of airship technology. His paper, "Sustainable Transportation: Airships Versus Jet Airplanes," was presented at the recent Canadian Transportation Research Forum in Toronto.

Dr. Prentice, an expert in supply-chain management at the Winnipeg university's Asper School of Business, and co-author Robert Knotts of the British-based Airship Association envisage a world in which giant, cigar-shaped aircraft, fuelled by methane or hydrogen, are used in place of traditional jets to transport goods and services around the world. The authors argue that the shift to a lower- or zero-carbon emission transport system will significantly reduce greenhouse gasses and other dangerous pollutants that contribute to climate change.

"Without question, jet airplanes used for dedicated freight transportation are the most polluting segment of the aviation industry. These are typically the oldest and least fuel-efficient jetliners, but they are also the segment of air transport that might be replaced most easily," the paper states.

According to the authors, "limited but viable" investment into the development of airship technology is already taking place globally, with a number of companies looking into "heavy lift transport airships."

So far, though, most designs are still in the conceptual phase. The limited availability so far hasn't lessened Dr. Prentice's enthusiasm for the technology. He's pushing for a national airship policy to focus Canada's talents and investment into an economic opportunity that, he says, "is not just green, it is golden, too."

It would allow Canada to open up its northern regions to resource development, and, ultimately, carry goods to Asia and Europe via efficient polar routes. The ultimate bonus? "Airships are a green technology that can reduce transport costs and create thousands of jobs directly and tens of thousands indirectly," he says. **Ω**

AITO: June's AIAA AITO Washington, DC, featured a day's presentations by international members of the AIAA LTA Technical Committee.
These included:

"Modeling Transient Heat Transfer in Stratospheric Airships" (AIAA 2016-4222) Mohammad I. Alam, Rajkumar S. Pant

"Dynamic simulation of breakaway aerostat with emergency deflation valves" (AIAA 2016-4225)Alap Kshirsagar, Rajkumar S. Pant, Kowsik Bodi

Lighter-Than-Air (LTA) "AirStation" - Unmanned Aircraft System (UAS) Carrier Concept (AIAA 2016-4223) Ronald D. Hochstetler, John Bosma, Girish Chachad (See "Media Watch")

"Stability Augmentation System for a Tethered Airship" (AIAA 2016-4224) Jonatas S. Santos, Stojan Stevanovic, Konstantin Kondak, Florian Holzapfel, Luiz C. Góes, Rajkumar S. Pant

"This paper presents the dynamic analysis of an unmanned tethered airship in hovering flight using a stability augmentation system. A comparison between tethered aerostats and airships is made, and the benefits and issues related to a tethered airship are highlighted. Since airships are not designed to be stable as tethered aerostats, a stability augmentation system is implemented in the flight control system. The dynamic equations of motion and the controller for the tethered airship are described. A linearized model is obtained by finite difference approach and the gains are obtained using LQR technique. The details of the flight control system and experimental set up are provided. Outdoor flight testing of the tethered airship was conducted and the stability of natural dynamics and active control response was analyzed in the time domain using flight test data. The results obtained validated the closed-loop system for the range of wind condition tested once the stability augmentation is achieved."

Ron Hochstetler closed the sessions with a presentation covering the current status of the airship industry: the demands airships can fulfill, such as DoD's demand for insertion of materials to difficult to reach areas. Assessing 51 organizations of all sizes and types, 18 firms are actively signing, building or operating airships and aerostats. TP aerospace inflatable tube rigid airship - the Atlas 50 French Dirisolar DS 1500 solar-electric and another, A-NSE designing a variable shape / variable volume non-rigid An Argintine company: Aerovehicles Aerocat R-40 Two Russians: RosAerosystems and Airship GP. **Ω**

Airships in US Aerospace Engineering Schools Today
By Mark Lutz

2014: University of Alabama, Huntsville Aerospace Students and Professors with their Aircraft Carrier Blimp One man holds the Blimp's Aircraft, which is a quad-copter (with bumper rings)

University Of Alabama, Huntsville

I of course have to start with the University of Alabama, Huntsville (UAH) Blimp of 2014, because it is our Editor's favorite type of Airship: an AIRCRAFT CARRIER! UAH Assistant Professor Robert Griffin (Atmospheric Science) wanted a way to do fast, close, long endurance examination of crops. He approached UAH Associate Professor D. Brian Landrum (Aerospace Engineering) for help. Professor Landrum's solution is an electric quad-copter for close camera work, which periodically returns to its Mother Blimp to get its battery recharged.

You can see in the photo above that the very fine Blimp envelope was probably commercially made. The man holding one of the Blimp's propulsion assemblies, for the photo serves as ground crew and "mast" all in one – possible in calm conditions, and an advantage of a relatively small Blimp. The quad-copter appears to be one of the larger, more expensive ones available to the public. Both the Blimp and the quad-copter are UAVs (Unmanned Aerial Vehicles).

University Of Michigan, Ann Arbor

The University of Michigan Engineering Department definitely has the most active student Blimp program of any US University. All entering Engineering students take Engineering 100, which is an introductory course giving a complete Design-Build-Test-Compete experience. Section 700 is the Blimp section, which is offered every term, and has been offered since 2006. For a while the faculty didn't understand why the program was so popular; they hadn't realized the Freshmen were posting video of their Blimps in flight on U-tube, and prospective students, upon seeing the video, were quite excited and came to school wanting to be in the Blimp section. The Freshmen in the Blimp section get a feeling of accomplishment and pride that most University Engineering programs don't offer until the Senior Project. Here's a link to one of the University of Michigan Student posted Blimp flight videos which generates so much interest, made 22 November 2015:

https://www.youtube.com/watch?v=C06BxcbA8MI

The students who made the video wrote: "After initial testing, we had to replace the envelope and the suspension, which we knocked out in 2.5 hours. Now it works great!" Here's the link to the description of Eng 100 Sec.700

http://eng100.engin.umich.edu/list/sec700/

Close-up of the propulsion of one of the student blimps. The propeller blades spin too fast to be made out in their cylindrical housings. Hanging down is the blimp's battery.

In a *separate* program, 18 University of Michigan "Students for Exploration and Development of Space" (SEDS), acting as advisors/mentors, held their first "Build a Blimp Day" for 13 7th-8th-9th graders on Saturday 20 February 2016 (this year!) All the Junior High School student Blimps, built in just five hours, flew successfully.

The University of Michigan Aerospace Department also has two programs which appear to be Undergraduate Senior Design programs, which *could* be satisfied by designing, building, testing, and flying a more sophisticated Blimp. These are: the "Solar Drones Team" and the "M-Fly SAE Aero Design Team."

The Director of the University of Michigan Aerospace Department, Professor Carlos Cesnik, supports the Blimp programs and is one of the faculty advisors. Before coming to the University of Michigan, Professor Cesnik was Boeing Assistant Professor of Aeronautics at MIT.

University Of Minnesota (UMN)

Professor William Garrard (Aerospace Engineering and Mechanics) has a list of recent projects which include guidance and control of air ships, and student high altitude balloons. Professor Garrard is also Director of the NASA funded Minnesota Space Grant Consortium for students K-12 through Grad School. In 2009, he authored two Engineering Journal articles on airships.

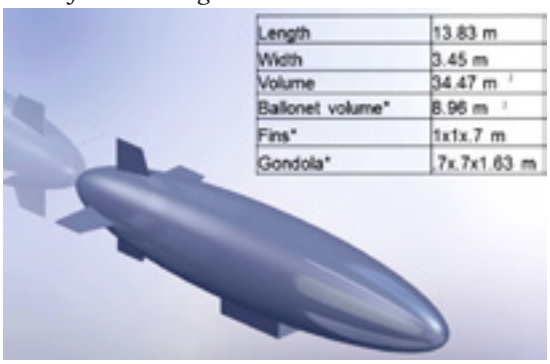
The University of Minnesota Center for Distributed Robots has "scout" robots which are just 4.25 inches long by 2.6 inches in diameter. They are intended to work in groups, and were developed with the assistance of MTC, Honeywell, and ATC.

Scout robot Blimp

The Scout was modified to run an external interface to control the motors of a Blimp. Using visual servoing techniques, the Blimp can function as an aerial observation platform. (Clearly not much effort was put into the Blimp's envelope.)

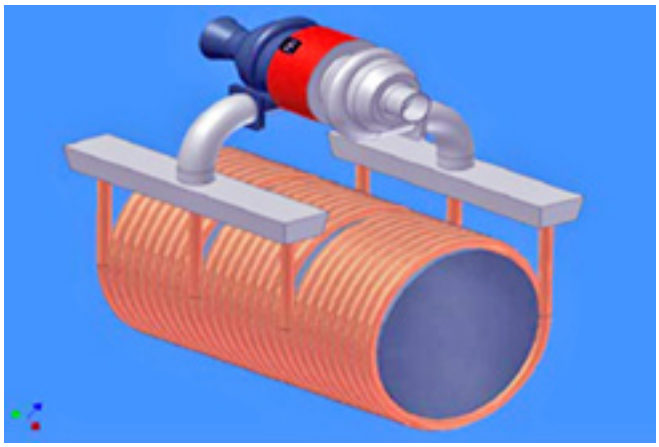
Undergraduate Seniors formed a University of Minnesota Aerospace Engineering Student Team which did a feasibility design study for a small Blimp for science work in the atmosphere of Saturn's moon Titan. The blimp would travel in a Saturn probe un-inflated, and would deploy and inflate from a gas cylinder on the probe when it arrived at Titan. The students claim their blimp is lighter than NASA's proposed Titan non-blimp aircraft, and that their blimp is also more versatile.

Below: University of Minnesota, Minneapolis Aero-space Engineering student designed Blimp for science work in the atmosphere of Saturn's big moon, Titan.



Titan Blimp length: 45 feet; volume: 2,100 cu ft; max speed: 6 mph. It does have ballonets. Total Earth weight of Blimp: 500 pounds. The high density of Titan's atmosphere, due in part to its very cold -300F temperature, makes it possible for such a small Blimp to lift so much weight.

MMRTG is NASA's Multi-Mission Radioisotope Thermal Generator, which uses the heat from the decay of Radioactive Elements to provide power. The off-the-shelf 2nd Generation MMRTG has an Earth weight of 95 pounds. All power generators using heat as their power source also need a cold source (sink) – steam turbines use condensers, your automobile engine uses the atmosphere. In the case of the off-the-shelf MMRTG, cooling fin radiators are used; those fins are intended for use in the vacuum of space. Since Titan has a dense, very cold atmosphere, the students proposed a modification using the cylindrical cooling loops shown. A turbine operating in the center of the cylinder both enhances cooling and provides propulsion. The MMRTG also provides electricity for the Blimp's scientific equipment, communications, and control systems.



Proposed Titan Blimp 2nd Gen. MMRTG propulsion

Texas A&M University (TAMU)

In 2011, Professor Shirath Girimaji (Aerospace Engineering) announced the start of an LTA program. Professor Girimaji said he planned to build a student team to work on innovative Airship payloads and high altitude Airship operations. Professor Girimaji is also the student advisor for the TAMU "High Altitude Balloon Club".

Texas A&M University Blimp under radio control by a student, 2011. Clearly it has a very well made envelope.

Contacts:

Perhaps NAA members might want to try to contact one or more of the Professors involved in these University Blimp programs – maybe to offer to be a student mentor or resource, or to see what they are doing today and write a Noon Balloon report. The contact information is as I found it online in the University Faculty Directories.

University Of Alabama, Huntsville 35899

Associate Professor D. Brian Landrum, Dept. of Mechanical and Aerospace Engineering Office: Technology Hall OKT N267, phone (256) 824-7207, email david.landrum@uah.edu

Assistant Professor Robert Griffin, Atmospheric Science. Office: CRH 3046, phone (256) 961-7783, email robert.griffin@uah.edu

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Associate Professor Peter D Washabaugh, Department of Aerospace Engineering Office: 3028 FXB, phone (734) 763-1328, email pete@umich.edu

Professor Carlos Cesnik, Director, Aerospace Engineering Advisor: M-Fly SAE Aero Team Office: 3024 FXB, phone (734) 764-3397, email cesnik@umich.edu

Professor Louis P Bernal, Aerospace Engineering Office: 3048 FXB, phone (734) 764-3396, email lpb@engin.umich.edu

Associate Professor Ella M Atkins, Aerospace Engineering (autonomous flight) Office: 3056 FXB, phone (734) 615-7456, email ematkins@umich.edu

University Of Minnesota, Mpls, 55455

Professor William L Garrard, Aerospace Engineering & Mechanics. Office: 121 Akerman Hall, Phone: (612) 625-9002, email wgarrard@umn.edu

Professor Garrard is Director, Minnesota Space Grant Consortium, K-12 to Grad School http://www.aem.umn.edu/msgc/

Texas A&M University College Station, 77840

Professor Sharath Girimaji, General Dynamics Professor of Aerospace Engineering Chief Scientist, ASTRO Center. Faculty Adviser, High Altitude Balloon Club. Office: HRBB 607B, phone (979) 845 1674, email girimaji@tamu.edu **Ω**

Tanzania could now hold the solution to the world's chronic helium shortage (excerpt)

by Tom Mendelsohn (UK) Ars Technica

It might be the second most common element in the observable universe but until very recently, Earth, it was thought, was running out of helium... and in recent decades we've burned through most of our once-enormous reserves.

Helium is used mostly as a coolant, especially in MRI scanners, which use around one fifth of the world's reserves in liquid form to cool the machines' superconducting magnets. The semiconductor industry also uses it to grow crystals, while modern materials science also uses its high-yield cooling properties, as do certain advanced telescopes.

Researchers from Durham and Oxford universities, however, have surprised the scientific world by discovering a huge new reserve in Tanzania's Rift Valley in east Africa—using a new technique which could be used to find even more. It turns out that volcanic activity helps release the gas from the ancient rocks which usually hold it, allowing it to rise to shallower gas fields.

Diveena Danabalan, of Durham University's Department of Earth Sciences, said: "We show that volcanoes in the Rift play an important role in the formation of viable helium reserves. Volcanic activity likely provides the heat necessary to release the helium accumulated in ancient crustal rocks. However, if gas traps are located too close to a given volcano, they run the risk of helium being heavily diluted by volcanic gases such as carbon dioxide, just as we see in thermal springs from the region. We are now working to identify the 'goldilocks-zone' between the ancient crust and the modern volcanoes where the balance between helium release and volcanic dilution is 'just right'."

The new discovery, estimated to be about 54 billion cubic feet in size in just one small region of the valley, could fill more than 1.2 million MRI scanners—of which there are only an estimated 25,000 actually in existence throughout the world. Humans use around eight billion cubic feet of helium per year, so it represents a sizeable addition to the dwindling total reserves previously believed to be available, but it also gives hope for helium prospectors. Previously, the gas was always discovered by accident, but the team's discovery will now allow people to proactively hunt for more. **Ω**

FOUR AIRSHIPS WITH STERN PROPULSION

By Mark Lutz (NAA History Chair)

This is a follow up of my Airship Boundary Layer Control article published in the 2015 Fall Noon Balloon (#107) pages 27-32. Toward the end of that article I wrote that I was unaware of any operational airships with stern propulsion. Since then I've found four good-sized operational airships with stern propulsion. Stern propulsion is of interest because calculations and wind tunnel tests indicate it should be more efficient. Had the US Navy LTA program continued instead of ending 1961-62, new airships would almost certainly have been ordered with stern drive.

ONE: 1968-1969: SILENT JOE II

Goodyear Blimp *Mayflower* in Silent Joe Stern Drive configuration, Oct-Nov 1968

In May, 1969, Goodyear reported to ARPA on their October 1968 to April 1969 "Silent Joe II" tests. Silent Joe II was a stern-propelled airship, intended for very quiet low speed operation. Silent Joe II was an investigational project, put together with quickly available, relatively easy-to-install parts, which perhaps would pave the way for possible silent night surveillance above the Ho-Chi-Minh Trail. During the Vietnam War, this constantly changing trail ran along the Vietnamese border with Laos and Cambodia. The Communist North Vietnamese used the trail to supply their guerrilla forces in South Vietnam. Trail traffic usually flowed at night to avoid detection by US/South Vietnamese forces. It seems traffic was often long columns of very determined North Vietnamese pushing military loads tied to bicycles. Large guns were taken apart, and transported in pieces. Silent Joe, if used, would have flown silently above the trail at night, and used infrared equipment to detect people down below, people who were often under the forest canopy. Toward the bottom in the front of *Mayflower's* envelope (previous photo) is an infrared light source / spotlight, for use in case body heat alone doesn't provide adequate imaging, as, for example, for spotting many parked bicycles. This infrared lamp only flew on some of the test flights. Goodyear developed Silent Joe II by modifying their N4A *Mayflower* of the time, which had a 147,300 cu-ft envelope. (Probably *Mayflower* 6 or 7 - the *"Mayflower"* has been replaced many times with different designs, each carrying the same name.)

Silent Joe II's tail motor was hydraulic, powered by an electrically driven pump in the car – probably an aircraft hydraulic system pump. Hydraulic motors are very light, making the tail setup possible on the existing blimp envelope. An electric motor was considered, but with its gears, it was 128 pounds heavier than the hydraulic motor. The electric motor had to be geared down to supply the high-torque, low rpm propeller requirements. There is a black tube along the outside of the belly of the envelope running back to the tail, which contains the hydraulic supply and return lines. The pump ran off of aircraft batteries. In initial tests, the pump just sat on the floor of the car, loose, but later it was put in a sound insulated box, which sat on vibration-dampening mounts, with a fan in the box to cool the pump.

The three bladed propeller, 20 feet in diameter, was probably the rotor for a small helicopter. At its lowest speed, it operated at 39 rpm. That's 1.5 seconds per revolution. You could take your finger, starting when one of the blades was at the top, and trace the circular path of the blade with a gentle motion, saying one one-thousand, two for a complete revolution back up to the top. 140 rpm was the maximum useful rotational speed, but it could be pushed up to 170 rpm for a bit. It may be hard to believe such a low propeller rotational speed actually did anything, but in fact it pushed the *Mayflower* up to at least 9 kts airspeed (10 mph).

Silent Joe II was tested for ground noise. My interpretation of the description of the result is, it was inaudible flying 1,000 feet up at 10 mph, but could be heard when 500 feet up. ARPA had hoped it would be silent at 500 feet; the 1,000 foot height test may have been done after the 500 foot test failed. (ARPA

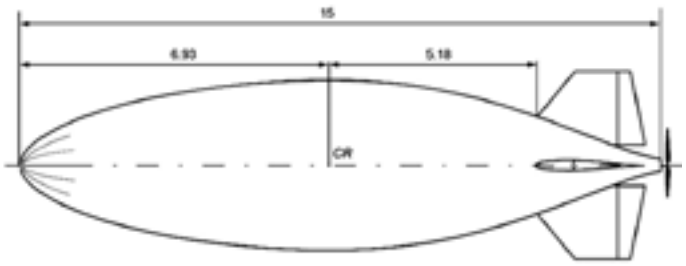
is Advanced Research Projects Agency - today called Defense ARPA, or DARPA.) The report was written in 1969, which was 47 years ago – we haven't yet passed the elapsed years required for declassification. Thus full information of exactly what was done is not available yet.

A remote control system was designed using off-the-shelf components as much as possible. The blimp would have been operated by radio control, with a backup system so it could find its way back home even if the radio control failed. Whether this equipment was just designed, or was also built, installed, and tested is unclear.

The large, 20-foot-diameter propeller was used because airship boundary layer plots show the boundary layer widens as it travels down the envelope, fanning out as it approaches the tail. A large propeller is required to engage enough of the tail boundary layer to get good efficiency.

Would 10 mph have been useful over the Ho-Chi-Minh Trail, or would winds have been too strong? Consulting "Wind Resource Maps for Cambodia" published in 2013, I conclude that more than half the time, the winds over the trail are 10 mph or less. They would probably be lower at night. Given that the *Mayflower* still had its car-mounted engines, which could have been used as-is to get to, and return from, the Ho-Chi-Minh Trail, it might have been useful just as seen in the photo. But, Silent-Joe II was just a test of a concept, put together as fast as possible.

TWO: 1993-2002? RESEARCH AIRSHIP "LOTTE" (STUTTGART UNIVERSITY)



Scale drawing of "Lotte" Length: 15m (about 50 ft)

Lotte-1 was built in 1993, it was followed by Lotte-2 and then Lotte-3. Lotte-3 was flying until, apparently, 2002. Lotte has solar panels and batteries for power, and an electrically powered tail rotor. It is radio controlled. Lotte, at 50 feet long, with 3,850 cubic foot envelope volume, is the smallest of the four airships in this article. Professor Thorsten Lutz of the University of Stuttgart's Institute for Aerodynamics has published a number of very technical papers on theoretical analysis of air-flow around Lotte; they are available on-line. Professer T. Lutz's work shows that, at least theoretically, Lotte achieves better than 100% propulsion efficiency, because it is taking advantage of the wake via its stern propeller. In comparison, a well designed propeller-driven airplane achieves something like 90% efficiency. Lotte, pronounced LAO-tah by Germans, is a female name and apparently has "free" as one of its meanings.

Students working on Stuttgart University "Lotte"

THREE: 2005-2010 HI-SENTINEL AIRSHIPS

The Hi-Sentinel Airship prototypes were designed and built by South West Research Institute, a good-sized non-profit organization in Texas.

One of the three sizes (versions) of the Hi-Sentinel Airships during inflation test.

The Hi-Sentinel Airships were built using funds from the US Army Space and Missile Defense Command. These are Stratospheric Airships, with demonstrated 60,000 to 75,000 foot operation. There is a Hi-Sentinel 20, a 50, and an 80. They carry payloads of 20, 50, and 80 pounds respectively, at speeds up to 20 kts. The Hi-Sentinel 80 weighs 1,116 pounds total - that's everything – 80 pound payload, envelope, electric motor and prop, solar panels, battery, radio control. At 65,000 foot elevation, Hi-Sentinel 80 is 200 feet long with 240,000 cu-ft envelope volume. It does not have a ballonet. The high strength nylon composite envelope

initially operates with daytime sun-heated internal pressure of 11 inches of water (0.44 psi). Compare envelopes of 1940-1960-era US Navy blimps which operated at about two inches water, and whose helium overpressure relief valves opened at three inches of water. At 65,000 feet, Hi-Sentinel Airships experience -100F at night, and +45F during the day. The 11-inch daytime pressure drops to something like 8 inches at night due to thermal contraction. The flight ends when enough helium diffuses out, or perhaps slowly leaks out through tiny holes, to the point that the airship gets too floppy to retain control, which can be hours, or days, or even weeks. At that point, the payload and a number of the heavy components detach and parachute to ground (there are two parachutes). It's not totally clear what happens to the envelope.

A Hi-Sentinel stratospheric airship launches like a stratospheric research balloon, which has the right amount of helium for operation at 60,000 to 75,000 feet, which makes it look seriously under-inflated at ground level. There are solar panels in the envelope's nose, inside the envelope. The nylon envelope is translucent enough to let in adequate sunlight for them. The stern propeller's blades launch folded up; the folded blades and their electric motor are at the bottom end of the "tail" in the launch photo. The blade design is smaller than that seen on "Silent Joe" because it is optimized to work in 1 psi atmospheric pressure rather than the 14.7 psi atmospheric pressure at sea level for Silent Joe's stern propeller.

The 147-foot-long Hi-Sentinel 20 launched 8 November, 2005, from Walker Air Force base in Roswell, NM, flying at 74,000 feet for five hours. Hi-Sentinel 50 launched 4 June 2008, from Holloman Air Force Base, NM, flying at 65,000 feet for one hour (the envelope developed a leak, resulting in early actuation of the flight termination sequence). The 200-foot-long Hi-Sentinel 80 flew at 66,000 feet for six hours in 2010. Hi Sentinel was a "spiral" program, which means it started small, and used the lessons learned from each smaller-sized stratospheric airship to design the next larger one. There were three turns of the "spiral" producing the -20, -50, and -80 Airships. The stated Defense Department reason for the program was to do surveillance across a 600-mile diameter disk - the area of the earth visible from 60,000 feet up. The original program plan called for further "turns" of the spiral, eventually reaching an airship of 200-pound payload rating. If the 30-pound increment of the 2nd and 3rd airships had continued, the -80 would have been followed by a -110, -140, -170, and -200. Perhaps due to sequestration and the resulting wholesale cuts to all parts of the Federal budget, including the military, this program was cancelled in 2012, as were all the other airship programs. A report on US Military LTA programs prepared for Congress in 2012 says the Hi-Sentinel program cost just $11 million.

Launch of Hi-Sentinel 80 in 2010

In the photo above, just the nose of the airship is inflated; the rest it hangs below, like a tail, and will inflate as the ship rises up to the stratosphere. At 65,000 feet, the atmospheric pressure will be about 1 psi, compared to 14.7 psi at sea level. Therefore, the helium in the nose will have expanded to about 15 times its sea-level volume when the airship reaches 65,000 feet. A ZPG-3W-sized envelope, operating at 65,000 feet, would have its lift reduced to the sea level lift of a WW2 "L" trainer blimp. Stratospheric airships require a huge envelope volume to lift a relatively small payload. The secondary balloon at the left side is a way of removing a wide clamping strip used to hold

the helium bubble in the nose until the nose lifts high enough to make the rest of the airship vertical.

Vertical orientation is needed for a controlled flight up. The secondary balloon has a tether line which limits its height. When the tether height is reached, the clamp is opened, freeing the airship from the secondary balloon.

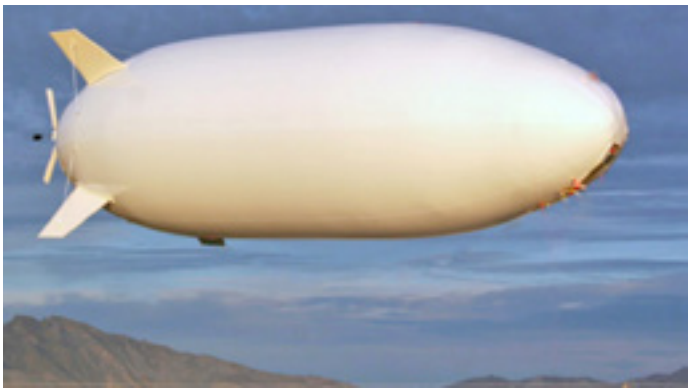
The relatively high envelope operating pressure (11 inches water) at 60,000 feet means the amount of helium put into the nose at the ground will result in excessive rate-of-rise. To bring the rate-of-rise down to a safe speed, there is a ballast weight (liquid – maybe alcohol to prevent freezing?) which is dropped when the airship approaches operational height. Dropping the ballast weight allows the airship to rise to its final height, and still maintain "super" pressure. The envelope technology is derived from that used on NASA super-pressure stratospheric balloons, which loft scientific instruments for one month observation periods above the Antarctic.

Hi-Sentinel 50 stern propulsion unit

The 50-pound payload of Hi-Sentinel 50 included an Iridium Satellite Transceiver, a GPS receiver, eight fixed video cameras pointing in eight different directions, a camera selector switch, an S-band video transmitter sending out the selected one of the eight camera views, an electronic compass, a strobe-light, an FAA transponder, pressure and temperature sensors, a telemetry transmitter, and control electronics. 50 pounds of payload of today's miniature, light-weight electronic devices accommodates a delightfully large number of them.

FOUR: 2016 SKY SENTINEL

(Completely different from Hi-Sentinel)



Sky Sentinel 3 Concept with Stern Propulsion

Sky Sentinel (not to be confused with Hi-Sentinel) is a "normal" altitude un-manned airship – an airship version of a UAV. There are multiple versions which are all manufactured by Airship Manufacturing, Inc., in Mesquite, Arizona. Sky Sentinel-1 is 82 feet long with 25,000 cu-ft envelope volume, can handle a 300 pound payload, has a 6,000-foot ceiling, and max speed 65 knots with its two 30 hp motors. Sky Sentinel-2 is 90 feet long, 35,000 cu-ft envelope, can handle a 400-pound payload, 10,000-foot ceiling, max speed 65 knots with three 30 hp motors. Sky Sentinel 1 and 2 are similar in size to the Goodyear Pony Blimps of 1920, which had a 40-knot max speed with 40 hp motor, and carried one pilot plus one passenger.

Sky Sentinel Gondola

Sky Sentinel-1 and -2 are not stern propelled - their motors are mounted to their gondola. Sky Sentinel 3 and 4, however, are going to be stern propelled. 3 and 4 will have an electric motor powering a stern propeller. A small, lightweight diesel generator in the gondola is to supply electric power. Sky Sentinel 3 and 4 are in the design and test phase, but I think they're close enough to operational to be worth including in this article. The company is also working on a completely silent stern

drive for operation 500 feet up, for wildlife research. A Civilian "Silent Joe" 50 years later! These airships are all UAVs. According to Gizmag, since the FAA currently prohibits commercial operation of UAVs in the US, the president of Airship Manufacturing Inc., Paul Adams, sees Europe, South America, Africa...the rest of the world as markets for his Sky Sentinel UAV Airships.

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THREE: "Hi Sentinel & Stratospheric Airship Design Sensitivity", 2013, PDF available on-line. Also, NASA 20-20-20 Airship Challenge, accessed April 2016: http://go.usa.gov/c7FPh and http://kiss.caltech.edu/study/airship/final-report.pdf
FOUR: Sky-Sentinel Website: www.airshipmanufacturing.com

Some scientists, including Dr. Jason Rhodes at NASA's Jet Propulsion Lab, were delighted when they learned of the Military Hi-Sentinel and the High Altitude Airship programs, including the Lockheed-Martin Hale-D demonstrator. These scientists immediately realized these ships would be great platforms to carry instruments to do work in the stratosphere – work not easily done otherwise. Astronomers wanted to install instruments to look up to do infrared astronomy because at 65,000 feet, most of the infrared gets through, while the atmosphere at the earth surface blocks infrared. Other scientists wanted to install instruments to look down to do earth science over a 600-mile-diameter footprint, and atmospheric scientists wanted to look all directions from a height not usually available to them. These scientists were very dismayed when all the airship programs were cancelled, with zero manufacturers and zero operators offering a stratospheric airship they could use. They are concerned that the stratospheric airship engineering talent is being lost because there is no longer funding. To try to remedy the situation, Dr. Jason Rhodes of JPL has convinced NASA to run a 20-20-20 Airship Centennial Challenge in hopes of re-energizing established engineers, interested engineers still in school, and getting a stratospheric airship design NASA could have built. The winning stratospheric airship entry must fly a 20 kg payload (44 pounds) at 20 km (65,000 feet) for 20 hours, or better: 20-20-20. There is a $1.5 million dollar prize, and NASA reserves the non-exclusive right to buy the technology from the winner, if NASA likes it well enough. Entrants must have a $1 million liability insurance policy, FHA Airship approval, and provide a monthly report to NASA on expenditures. NASA's Centennial Challenge Office says it will offer advice on how to get FHA Airship approval.

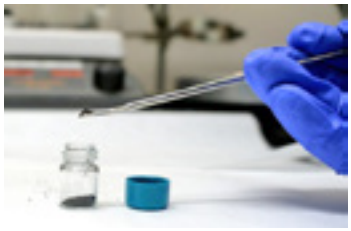
Stratospheric airship design is not easy. The Hi-Sentinel program engineers tested the motors, and envelope material, and electronics in environmental chambers. The chamber operates at the 1 psi atmospheric pressure of 65,000 feet (achieved with a vacuum of 28 inches of mercury if the chamber is at sea level). The chamber test alternates between the -100F night temperature and the +45F day temperature. UV lamps provide the intense UV exposure the equipment would experience at 65,000 feet. All parts of the airship must be very much lighter than in a 1940-1960 US Navy Airship, because the 62-pound lift per 1,000 cu ft helium at sea level drops to about four pounds lift per 1,000 cu ft at 65,000 feet. Thus the envelope volume has to be immense.

I have to admit to some puzzlement. Why doesn't NASA just acquire the rights to the Hi-Sentinel 50 from the South West Research Institute? That airship met most of the requirements of the 20-20-20 challenge. All three Hi-Sentinel versions missed rather badly on the hoped-for up-to-one-month envelope life – the life "high" pressure stratospheric balloons sometimes have. Is fixing that a huge engineering challenge? Or, because the US Army paid for the research, is it off limits for civilian use? Ω

Ed. note: In related history, Valdimir Pavlecka, who continued development of metalclad technology after Ralph Upson's passing, proposed several designs utilizing both boundary layer control and stern propulsion, via internal thrusters (as seen in the above graphic). **Ω**

SHORT LINES

New fuel cell design powered by Graphene-wrapped Nanocrystals could lead to faster fueling, improved performance for hydrogen-powered vehicles. While there remain scientific challenges to making hydrogen-based energy sources more competitive with current automotive propulsion systems and other energy technologies, researchers at the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) have developed a new materials recipe for a battery-like hydrogen fuel cell—which surrounds hydrogen-absorbing magnesium nanocrystals with atomically thin graphene sheets—to push its performance forward in key areas. (Photo: Eun Seon Cho/Berk. Lab: A powdery mixture of graphene-wrapped magnesium nanocrystals, produced at Berkeley Lab, is stable in air.) The mixture's energy properties show promise for use in hydrogen fuel cells. The graphene shields the nanocrystals from oxygen and moisture and contaminants, while tiny, natural holes allow the smaller hydrogen molecules to pass through. This filtering process overcomes common problems degrading the performance of metal hydrides for hydrogen storage. These graphene-encapsulated magnesium crystals act as "sponges" for hydrogen, offering a very compact and safe way to take in and store hydrogen. The nanocrystals also permit faster fueling, and reduce the overall "tank" size. "Among metal hydride-based materials for hydrogen storage for fuel-cell vehicle applications, our materials have good performance in terms of capacity, reversibility, kinetics and stability," said Eun Seon Cho, a postdoctoral researcher at Berkeley Lab. The research, conducted at Berkeley Lab's Molecular Foundry and Advanced Light Source, is part of a National Lab Consortium, dubbed HyMARC (Hydrogen Materials—Advanced Research Consortium) that seeks safer and more cost-effective hydrogen storage, and Urban is Berkeley Lab's lead scientist for that effort. Jeff Urban, a Berkeley Lab staff scientist and co-author, said, "This work suggests the possibility of practical hydrogen storage and use in the future. I believe that these materials represent a generally applicable approach to stabilizing reactive materials while still harnessing their unique activity—concepts that could have wide-ranging applications for batteries, catalysis, and energetic materials." Ω



Sixteen People Killed In Hot Air Balloon Crash In Maxwell, Texas. NBC Nightly News (7/31) reported that the National Transportation Safety Board (NTSB) said the balloon traveled about eight miles before striking a high-powered transmission line and going down in flames. ABC (7/31) reported that the NTSB is investigating the crash site, and has so far recovered 14 cellphones and 3 cameras, which it hopes may provide some sort of insight into the final moments before the crash. The AP (7/31) reports that NTSB member Robert Sumwalt said during a news conference, "There is physical evidence to indicate that the balloon, or some component of the balloon, hit the physical wires themselves and not the tower." Although the names of the victims have not been publicly announced, the pilot's roommate has identified him as Skip Nichols, the chief pilot for Heart of Texas Hot Air Balloon Rides. WRC-TV Washington (7/30) reported that Sumwalt reiterated that NTSB investigators will be looking at "three things – human, machine and environment," including maintenance history and weather conditions from the day of the crash. Reuters (7/31) reports that this crash comes two years after the NTSB recommended that the Federal Aviation Administration extend greater oversight of the hot air balloon industry. CBS News website stated that the FAA rejected those recommendations "and the NTSB classified the FAA's response to the two balloon safety recommendations as 'open-unacceptable.'" FAA spokesperson Lynn Lunsford said that "until we've had a chance to gather and examine the evidence in this particular case," it will be difficult to determine whether or not the Texas crash will cause the FAA to reconsider the NTSB's original recommendations. AFP (7/30) reports that currently the FAA requires balloon pilots to be certified and that balloons have certificates for "air worthiness." Additionally, the FAA inspects commercial-use balloons "after 100 hours of flight time or at least once a year." AP (8/1) reports that even though commercial hot air balloons such as the one that fatally crashed in Texas over the weekend often carry more passengers than plane and helicopter tours, aviation experts say that balloon operations have long received less scrutiny from federal authorities. In addition, while commercial balloon operations require licensed pilots, "the licensing requirements are less stringent than those for other commercial pilots." *Ed. note: Balloon Federation of America officers volunteered and met with Government officials in the aftermath of this tragic accident; it was known the pilot was not a BFA member.* **Ω**

Lawmaker Aims To Have FAA Require Better Fuel Systems For Helicopters The KUSA-TV Denver (6/2) website reports that legislators want the FAA to require better fuel systems in newly manufactured helicopters. Rep. Ed Perlmuttter (D-CO) recently authored legislation on the issue. Perlmutter explained, "The FAA just needs to say it's time. Get it done. They don't need to wait any longer to put this rule in place." A spokesperson for Perlmutter said he will consider attaching the legislation to the FAA's reauthorization bill. **Ω**

NASA Super Pressure Balloon Sets Flight-Duration Record PC Magazine (7/6) reports the latest mission began on May 16 in New Zealand and lasted for almost 47 days until NASA brought it down over a mountainous region in Peru due to altitude variations. NASA's Balloon Program Office Chief Debbie Fairbrother stated that the mission was "far and away the longest mid-latitude flight of a NASA heavy-lift balloon to date," adding, "We'll continue to strive for even longer duration flight, 100 days or more, and what we learn from this year's mission will help take us there." Popular Mechanics (7/6) explains that the Super Pressure Balloon was designed to fly at an altitude of 110,000 feet, "but started dropping to 70,000 or 80,000 feet at night over the last few weeks," due to a suspected loss of helium. After terminating the mission over Peru, NASA is now recovering the balloon and its payload, including the Compton Spectrometer and Imagery instrument. The article adds that the space agency hopes that future long-duration balloon flights "will provide a low-cost alternative to launching satellites for astronomy and atmospheric science." Engadget (7/6) adds that Orbital ATK Vice President John Pullen, whose company partnered with NASA on the project, stated that "(t)his mission marked the most rigorous test yet of a super pressure balloon," adding that "(a)ll of these accomplishments point to future growth for NASA's balloon program, which continues to offer reliable and affordable options for exploring the universe." **Ω**

ISS Astronauts Enter Inflatable Space Room The AP (6/6) reports that astronauts at the ISS opened the doors to the first inflatable space room on Monday and "floated inside." The AP notes that the Bigelow Expandable Activity Module (BEAM) arrived at the ISS in April and was inflated to its full size in late May. NASA astronaut Jeffrey Williams, who was first to enter the space room, "said it was pristine but cold inside." **Ω**

New Material For Aircraft Frames Developed By MIT, Industry Research Aerospace Technology (8/5) reported that MIT aerospace engineers have developed a new technique that uses carbon nanotubes to fasten and bond composite layers to create a "significantly stronger and more damage-resistant material when compared with other advanced composites." Aerospace groups "such as Airbus Group, Boeing, Embraer, Lockheed Martin, Saab, Spirit AeroSystems, Textron Systems are also involved in the research." The team "found that stitched composites were 30% stronger than the current composite materials." **Ω**

Investments Booming For Space Startups MIT Technology Review (7/1) reported that space balloon startup World View recently "closed a $15 million round of funding led by Silicon Valley venture capital firms Canaan Partners and Norwest Ventures," constituting "the latest in a string of substantial space investments." The article highlighted that while the commercial space industry "has been dominated in recent years by companies founded and largely financed by a few passionate billionaires," the efforts by those companies have now "spawned a number of startups backed by entrepreneurs and smaller investors who see the potential for profits in space." World View CEO Jane Poynter said, "Space is finally being taken seriously by the investment community," adding, "We've been talking about a vibrant ecosystem of entrepreneurs and investors for decades, and finally it's actually emerging." **Ω**

The Senate Armed Services Committee Pushes For Advanced Cargo Airship Technology For The National Defense Authorization Act (Ndaa) For Fiscal Year 2017 The Department of Defense has had ongoing interest and has conducted research and development of cargo airships for potential military and humanitarian applications. They are now encouraging the Department of Defense (DoD) and placed this act on the Senate floor for further involvement in development of cargo airships. **Ω**

HISTORY: "Durand Committee" Reports

Found at last: These reports were prepared by a committee appointed by the Science Advisory Board at the request of the Secretary of the Navy. Later, on discontinuance of the Board in December 1935, the Committee was continued by the Government Relations and Science Advisory Committee of the National Academy of Sciences.

February 18, 1935
To: Dr. Karl T. Compton, Chair, Science Advisory Board
Massachusetts Inst. of Tech., Cambridge, Massachusetts

Dear Mr. Chairman:

Reference is made to Executive Order No. 6238 (The White House, July 31, 1933). It is requested that the Science Advisory Board, under the authority conferred by the reference, appoint a suitable committee to review and analyze the past and present situation as to the design and construction of airships (dirigibles) and to make recommendations as to their future design and construction.

It is to be emphasized that the requested inquiry should be of the broadest scope relating to airships (dirigibles) in general, whether for military (naval) or commercial purposes. The usefulness of airships (dirigibles) for military (naval) purposes is entirely incidental to the general question and, in fact, a matter of other and separate consideration subsequent to the determination of the best design and construction.

Sincerely yours,
(s) Claude A. Swanson, SECNAV

March 3, 1935
To: Dr. W. F. Durand, Stanford University
Stanford University, California

My Dear Dr. Durand:

At the request of the Secretary of the Navy, as expressed in the enclosed copy of his letter, the Science Advisory Board desires to appoint you chairman of the following committee:

- William F. Durand, chairman, Professor Emeritus of Mechanical Engineering, Stanford University
- Theodor von Karman, Professor of Aeronautics and Director of the Daniel Guggenheim Laboratory, California Institute of Technology
- William Hovgaard, Professor of Naval Design, Massachusetts Institute of Technology
- Stephen Timoshenko, Professor of Engineering Mechanics, University of Michigan
- Alfred V. de Forest, Associate Professor of Mechanical Engineering, Massachusetts Institute of Technology
- R. A. Millikan, Director of the Norman Bridge Laboratory of Physics, and Chairman of the Executive Council, California Institute of Technology
- Frank B. Jewett, President Bell Telephone Laboratories,
- Charles F. Kettering, President, General Motors Research Corporation

I hope very much that you may find it possible to undertake this assignment.

It will be left to the judgment of this committee to determine its best course of procedure. It will, of course, be free to call in for consultation such men as Dr. Lewis of the National Advisory Committee for Aeronautics, Dr. Tuckerman of the Bureau of Standards, and Dr. Hunsaker of M.I.T. I am sure also that the members of the Navy Department and of the Goodyear-Zeppelin organization may be counted upon for co-operation. I understand also that there are at least some aspects of the problem which are pretty well agreed upon as forming a starting point for the investigation.

It has been the practice of our Board and of its committees to serve without compensation except for reimbursement of expenses incident to the work. I believe that the Navy Department will provide funds to take care of such expenses and also to provide such technical assistance as may be desirable.

I should be pleased to receive your acceptance to this appointment if this is possible, at your early convenience.

Very sincerely yours,
(s) KARL T. COMPTON, Chairman

Report No.1: GENERAL REVIEW OF CONDITIONS AFFECTING AIRSHIP DESIGN AND CONSTRUCTION WITH RECOMMENDATIONS AS TO FUTURE POLICY

JANUARY 16, 1936

Honorable C. A. Swanson, SECNAV, Washington, DC

My Dear Mr. Secretary:

The Committee appointed at your request by the Science Advisory Board is intended to review and analyze the past and present situation as to the design and construction of airships and to make recommendations as to their future design and construction."

We have understood the first phase in the specification of our field of investigation as indicating a study, historical and analytical in character, and logically essential in order to proceed with the second specification relating to the future of such construction.

At the present time we desire to make a report of progress relating in particular to the basic question of the practicability of the design, construction, and operation of airships with a reasonable assurance of their safety and reliability, and with such technical characteristics as to offer good promise of potential usefulness for either commercial or military (naval) use.

While, in accordance with our instructions, we make no attempt to discuss the technical phases of the uses of airships, either military (naval) or commercial, we cannot present our conclusions regarding the practicability and potential usefulness of such structures independent of some recognition of the general fields in which they seem to offer effective service.

Thus referring to the Annual Report of the Secretary of the Navy for 1935 and in particular to the report of Rear Admiral King to the Secretary, uses of the following character seem to be indicated:

1. Coastal-patrol service, especially detection of submarines and mines.
2. Guidance of troop convoys and naval vessels through mine fields.
3. It is also common knowledge that the large airship is looked to especially for services of the character of strategic reconnaissance and as an airplane carrier.

For the first-mentioned services, nonrigids (blimps) and rigid airships of small or moderate size are indicated; while for the last-named service, ships of the largest size will be required.

In the commercial field, we recognize the possibility of effective service for ships of various sizes, small, medium, or large, according to the various traffic requirements. Demonstration of such service in recent years is given by the "*Graf Zeppelin*" of the Luftschiffbau-Zeppelin, and is further indicated by the continuing policy of this Company as evidenced not only by their construction of the LZ 129, now approaching her test trials, but also their announced intention of building additional ships.

We now consider, therefore, the basic question: Can a reasonably safe and useful airship be designed, constructed, and operated, and, if so, under what broad conditions?

DESIGN AND CONSTRUCTION OF A SAFE AND USEFUL AIRSHIP

The answer to this question turns immediately on the meaning attached to the two words "safe" and "useful."

First, regarding safety in the various means of transport. Nothing is entirely safe. Railway travel has its accidents and casualties, surface ships are wrecked, airplanes crash, and the automobile, including errors of operation, is perhaps the most unsafe of all modern agencies of transport. Yet in the face of these all too familiar occurrences, we do not contemplate giving up any of these means of transport.

The reason is partly or perhaps largely psychological. These means of transport have established themselves as a part of our modern civilization. They are performing a service which, in the mass estimate of our people, justifies their retention and development in the general scheme of the transport of persons and things, despite the numerous continuing accidents and casualties.

Obviously it is impossible to fix any definite percentage or measure of performance as constituting a safe surface ship, a safe airplane, or a safe airship. We may perhaps, however, define a safe airship as one, the performance of which, in the mass estimate of those

interested in this mode of transport and with some competence of judgment, is such as to justify its present retention in the general scheme of transport and its development at least to the point of demonstrating whether or not it is or will be capable of attaining and retaining an assured and useful place among other competitive means. The point here is that, quite aside from the question of safety, the airship, especially the airship of the largest size, must be considered as not yet having acquired a wholly assured place as an agency of transport, and in order to make practicable a satisfactory determination of this latter question the structure itself must be given a measure of safety which, in the mass estimate of those with some competence of judgment, will justify its further development and use to the point of definite demonstration.

In connection with the general question of airship safety and the future of the airship as an agency of transport, we have given special attention to the record of the principal casualties which have marked the development of this type of structure. Regarding these casualties, both in the United States and in Europe, we note especially two points:

1. All development of a new form of transport and more broadly all new developments are subject to possible hazards. This has been true in marked degree with the airplane, the heavier-than-air form of air transport. We have, however, accepted these hazards and casualties as a part of the price which must be paid for all such steps forward.

2. Our study of the record of these casualties leads us to the belief that, with the lessons which have been drawn from them, and with the general advance in our understanding of the technical problems of airship design, construction, and operation, the probability of a repetition of such casualties under like conditions should, for future construction, be reduced to a point which if not vanishing entirely, may be considered as 'acceptable' in comparison with the promise of useful service.

Regarding the question of a useful airship, we have already referred, in broad terms, to the apparent fields of potential service for structures of this character and we do not consider that further discussion of this phase of our problem is essential at this point.

Regarding the safety of such types of construction, we consider the entire record of the service of small nonrigids and of rigid airships of moderate size, in convoy and patrol services, during the Great War and elsewhere, as warranting the assertion that safe and useful ships of these types and sizes can be designed, constructed, and operated.

As regards airships of the largest size, such as the "Akron" type and upward, it becomes necessary to define more carefully the conditions under which a reasonable and proper margin of safety can be secured.

With reference to this type, your Committee is prepared to give likewise an answer in the affirmative, as to the practicability of a safe and useful airship, but under general conditions as follows:

1. Design in the light of the most careful and thorough analysis of world experience with airships up to the present time and including in particular all failures and casualties, regarding the causes of which reasonably adequate information is available.

2. Design in the light of the most recent studies and advances in the mechanics of typical airship structures.

3. Specification of aerodynamic loads, whether due to maneuvers or to storm conditions (gusts, etc.), in the light of the most recent and careful studies based on:

a) Approved aerodynamic theory, including the most recent advances.

b) Results of wind-tunnel research and of experience with actual ships.

c) Recent advances in meteorological science with special reference to the structure of gusts, polar fronts, line squalls, etc.

4. Construction under conditions as to supervision and inspection which will insure the practicable approach in the completed structure to the qualities and characteristics contemplated in the design.

5. On the completion of the structure itself, opportunity for operation, under some co-operative arrangement between builder and owner, over a period of time sufficient to permit the taking of strain gauge readings at all critical points of the structure and other technical observations under progressively more and more exacting conditions (maneuvers and weather)

up to and including conditions approaching the most severe to be anticipated. Such period of test should not be curtailed or hurried. It is of vital and fundamental importance. It will furthermore give opportunity for the development and correction of many matters, important or otherwise, which may always be expected when a new design first takes the air.

6. When delivered for service, operation by personnel thoroughly trained and experienced in the handling of airships and in the light of the most complete meteorological information available, analyzed for the guidance of the command by an experienced aerologist trained in the more recent advances in meteorological science.

Of these various conditions, it seems proper to note at this point that for the designs of the "*Akron*" and the "*Macon*," Nos. 1, 2, 3, and 4 seem to have been met within the measure of the information available at the time when these designs were developed. While there have been differences among experts in airship design regarding the relative value of certain general types of structure, especially as to certain features of what may be called English design and German Zeppelin design, the adoption of the general type of Zeppelin structure seems to have been justified on the ground of successful experience. And with the adoption of this general type of design, the requirements of conditions Nos. 1-4, as based on the information available at that time, and the methods of design then current, seem to have been consistently undertaken.

The history of the trial runs, however, shows that condition No. 5 was not adequately met.

Regarding operation as referred to in condition No. 6, we express no present opinion, especially in the sense of indicating responsibility for the loss of either the "*Shenandoah*," the "*Akron*," or the "*Macon*." Furthermore, in the cases of these ships, the question of operation as a factor involving personal responsibility for their loss has already been passed on by official Naval Boards of Inquiry, and a review of the findings of these various Boards is no part of the specified duty of this Committee.

IMPROVEMENTS IN CONDITIONS FOR AIRSHIP DESIGN SINCE 1928

Regarding airship design and construction at the present time or in the immediate future, as compared with the situation in 1928 when the designs of the "*Akron*" and the "*Macon*" were developed, improvement in these various conditions may be noted as follows:

Condition No. 1: There is a large amount of actual experience available at the present time which was not available at the earlier period. This includes:

a) Actual flying experience with the "*Akron*" and the "*Macon*" for 3257 hours of time and over 160,000 miles of distance, together with the special studies relating to the conditions surrounding the loss of these two ships.

b) The experience of the "*Graf Zeppelin*" in demonstration flights around the world and in commercial flights during the past six years aggregating some 11,868 hours of flying and covering some 736,289 miles of distance. Through the kindness of Captain Eckener and his Governing Board in permitting both officers of the Navy and American engineers in civil life to participate in the trips of this ship in regular flights between Europe and South America, the salient features of this long and successful period of airship operation are at the disposal of American designers in connection with the development of new designs.

Condition No. 2: In recent years there have been developed certain advances and refinements in the theoretical treatment of the mechanics of structures such as airships, all of which will aid in obtaining enlarged assurance of the desired and contemplated relation between the loads assumed and the strength of the structure provided to carry such loads.

Condition No. 3: The importance of aerodynamic loads and of due allowance for their effect on the structure has received continued and careful study over the period since the preparation of the "*Akron*"-"*Macon*" design and there has been a continued accumulation of information which, we believe, will serve as a more adequate basis for the estimate of such loads than was possible in 1928. In addition this Committee has now under investigation certain phases of this general problem, especially as regards the aerodynamic load on fins and its distribution, together with studies on the structure of gusts and their influence on airship structures as a whole or locally. We have also in mind recommendations for further studies on this particular

subject, all of which should aid in making practicable a more adequate estimate of the loads to be provided for, due to various combinations of aerodynamic conditions.

Likewise in meteorology, since the period of the design of the "Akron" and the "Macon," there have been great, even revolutionary, changes in the technique of accurate forecasting. It may be assumed that there will always be a possible hazard for airships, or for any aircraft, in extreme weather conditions; but with these more recent advances in the science of meteorology and with the enlarged information now available from more numerous sources and points of observation, it would seem that there should be no serious difficulty in avoiding such extreme hazards. Here again, the six-year experience of the "*Graf Zeppelin*" seems to furnish proper ground for this general conclusion.

On the whole, therefore, and with special reference to airships of the larger sizes, we believe that it is practicable to design, construct, and operate such airships with a reasonable assurance of safety and with a presumptive life which should serve to permit of a demonstration of their capacity for useful service, whether commercial or military (naval).

RECOMMENDATIONS AS TO FUTURE CONSTRUCTION

It has been already pointed out that the experience with large airships in the United States has not as yet been sufficient to give ground for a wholly settled opinion as to the character and extent of their potential usefulness, either commercial or naval.

THE DURAND COMMITTEE

Appointed at the Request of Secretary of the Navy Swanson, in March, 1935, "to Review and Analyze the Past and Present Situation as to the Design and Construction of Airships and to Make Recommendations as to Their Future." On January 16, 1936, the Committee Recommended that the Navy Continue with a Carefully Considered Program of Airship Construction to the Point of Furnishing Ground for Definite Conclusions Regarding the Capacity for Useful Naval Service of Constructions of This Character.

Reading from Left: Stephen Timoshenko, R. A. Millikan, William F. Durand, Theodor von Karman, Alfred V. de Forest, and William Hovgaard

In view, therefore, of our expressed opinion as to the practicability of the design, construction and operation of such airships with a reasonable margin of safety and with the presumption of capacity for useful service, it is the unanimous opinion of this committee that the best interests of the services in which airships give promise of useful and effective service both commercial and naval, require a continuing program of construction and use.

And in pursuance of this opinion it is our recommendation that the Navy Department should continue with a positive, carefully considered program of airship construction, including nonrigids and rigid ships of small or moderate size as service requirements might indicate, and extending to a ship or ships of large size, to the point, at least for the latter, of furnishing ground for definite conclusions regarding the capacity for useful naval service of constructions of this character.

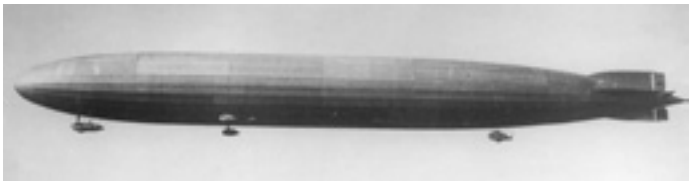
We further recommend most strongly that the first large airship built under such a program should, at least for a time, be considered not an adjunct to the Fleet but rather a flying laboratory or flying training ship, not only for extensive technical observations of the structure under operating conditions, but also for enlarging our knowledge regarding the best conditions of service for such vessels, and, as well, for giving opportunity for the training of officers and crew in the technique of handling airships under all conditions of weather and service.

In a subsequent report or reports we shall, with suitable recommendations and supporting documents, present in some detail material more fully and directly responsive to the technical phases of your letter of instructions.

Respectfully submitted,

A. V. DE FOREST
WILLIAM HOVGAARD
FRANK B. JEWETT
TH. V. KARMAN
CHARLES F. KETTERING
R. A. MILLIKAN
STEPHEN TIMOSHENKO
W. F. DURAND, Chairman,
SPECIAL COMMITTEE ON AIRSHIPS **Ω**

Ed. Note: Report #2 will appear in TNB #112



The Historians' Letters (Part IX)

By Roy Schickedanz

Returning to Blackburn College in January 1968 in the second semester, I began active correspondence with Dr. Douglas H. Robinson, writing on June 17, 1969:

"I know about "Rutland of Jutland" and have been looking out for it, but have not seen a copy yet. He served also at Great Yarmouth, which place I hold in affection because of my late friend (if I may presume a little) Sir Egbert Cadbury served there too, and because of the fine book written about the air station by Snowden Gamble. Also some weird stuff too I understand about Rutland acting as a Jap spy in WWII. It would be worth having.

Actually I thought the second letter was needling me about the first, which I should have answered sooner. I can provide you with the photo of Eckener in 1924 as commander of the LZ-126. I am quite ignorant about radio matters and have never been interested in radio technology; will see what I can abstract about the matter from the books I have. No photos. The antennas were rather interestingly arranged and not a single wire as you would expect. Easy to give the dope on Peter Strasser; last August I was at Nordholz for the ceremony commemorating the 50th anniversary of this death, put on jointly by the Marine-Liftshciffer-Kameradscht and the "*Graf Zeppelin*" Geschwader of the Bundesmarine (Brequet Atlantic ASW aircraft), and the program contains an appropriate biographer of Strasser. (I note that friend Kurt Puzicha, the archivist of the Kameradschaft, is no more able than I to name that date on which he was made Kommandeur of the Naval Airship Division.) I have very little info on the Experimental Command, none of their papers nor the War Diaries of the ships stationed in Juterbog (L-25, L-35) were to be found in the archives, barring an extensive conference protocol on fighter aircraft to be carried under airships, and test with a D III Albatros hung under the L-35.

Which class of airship would you want the diagram of? I can provide a good photo stat copy of drawings of wither L-30, L-59 or L-70 class, measuring about 13 x 35 in. You might have a preference.

Not much on bomb development. I can give you a copy of the bomb photo in my book."

Next letter from Dr. Robinson was dated July 2, 1969:

"Am sending separately the two drawings of the L-59 and L-70 class airships, also a 5 x 7 enlargement of Dr. Eckener at the time of the *Los Angeles* flight. Expenses were $3.03 for the Photostat positives, and .85 cents for the enlargement, say $4.00 including postage. I don't believe you will find any surprises in the drawings. The rearrangement of the gondolas of L-59 after the winter 1917-18 reconstruction in Friedrichshafen was decisively confirmed in an interesting way: knowing in advance of one of the expeditions to Washington to dig into the German Navy archives on the airships that I would be going through the L-59 War Diary. I had made up a rough ballast sheet of the ship on which to record the figures for the Naples raid of Mar. 10, 1918. On seeing the actual ballast sheet I was astonished to find the gondolas rearranged as here. I have never seem a photo of the L-59 after her reconstruction, and Kurt Puzicha, the archivist of the Marine-Luftsh ifferKameradshaft, has not found one of her either. Recently I have bene thinking that she must have been painted black beneath before returning to Jamboli to make raids, but this pure speculation.

You asked about Strasser and the biographical sketch to which to which I referred previously says: Born April 1, 1876, in Hannover, son of an architect. Entered German Navy as a cadet in 1894, training in school ships "Stein" and "Moltke." Attended naval school in his third year of cadet training, then in special service ships "Mars" and "Blucher." Lieutnant zur See 1897. 1904-06 adjutant to II Dockyard Division. After 1906, gunnery officer aboard battleships "Mecklenburg" and "Westfalen." 1911-13, Korvettenkapitan and in the Armaments Division of the Admiralty in Berlin. One of these sketches gives exact date on which Strasser joined the Naval Airship Division, tho implying that it was before the loss of the L-2. I have never found out this date either.

Hope all this is helpful. I don't think could do much for you on the other matter you brought up."

(To be continued) **Ω**

MEDIA WATCH

Book Review:

Advanced Airship Technologies and Design Approaches

By Philip V. Hunt

Reviewed by Grant Carichner, Lockheed Martin Airship Designer (Ret) and Professor of Aeronautics, Cal Poly Pomona

When I read the title of the book I wasn't sure that the topic would be of general interest. However, as I got into it I realized that a lot of activity had occurred over the last couple of decades and was worthy of documentation. The title disguises the fact that it is primarily a historical accounting of airship efforts which go back over 100 years. If you enjoy all of the nitty-gritty details of airship design over the last century, then this book is for you.

This is not just a review but also a critique where necessary. Where opinions are conveyed as fact I will present my view in contrast. I hope my opinions don't get in the way. My first comments are on matters of form, the writing style is awkward in spots and reflects both British syntax and an esoteric vocabulary. Most people would need a dictionary to decipher these words and phrases: - bete noire, bespoke, sic erat scriptum, execrable, hangarage, fulsome, palliate, palimpsestic, and taxonomy. Often the black and white figures are obviously copies of a colored original and the contrast is lost making it hard to read. Usually the fonts are too small to read comfortably.

There is a complete lack of references and credit for figures and statements which were prepared by others but are instead presented as though they came from the author. In fact, it seems clear that most of the material and figures/photos have been lifted from various contractor reports of programs to which the author had access. For example, I personally know that the author's knowledge of the Square-Cube Law as it applies to airship design was first presented by Lockheed Martin during the Walrus Program in 2005. There are likely numerous other occurrences of which I am not aware. With respect to content, the book thoroughly discusses all of the technologies and design approaches which have been studied over the last 100 years. Where appropriate the lessons learned are used to help discuss and understand recent programs and failed efforts. The book mostly gets this right but depends more on old design strategies and adages than I am comfortable with. The author suggests that technology is not ready, has too much risk, and is still holding new airship programs back. The author did correctly discuss multiple structural concepts (rigid, semi-rigid and non-rigid) without favoring one over the other. This is as it should be. No single solution is right for every mission.

A good deal of time is spent discussing the various issues related to using an airship for Intelligence/ Surveillance/Reconnaissance (ISR) missions. This is certainly the most challenging mission for an airship or even a balloon for that matter. Although significant progress has been made in these designs, long operating times near 60,000 ft are still a long way off. The ISIS program solved most engineering problems but the one issue that was never solved was helium leakage. There was no way of enduring several years' worth of diurnal cycles and still maintain the helium mass. The impermeable materials just don't exist yet.

The author claims that there is still much work to be done in advancing technology for modern airships. While technology improvements are always welcome they are not necessary to build a modest hybrid airship that transports 20-40 tons over 1,000 miles. This design is achievable now. Taking the 'crawl before walking' approach should prove to investors and maybe some military types that hybrid airships can be efficient, reliable, and low cost.

Since design is the other main topic in the book's title it is important to recognize how airship designs are influenced by their specific missions. Designers should not fall into the trap of comparing their performance to existing aircraft. Instead airships should be designed for those missions where it has a major advantage over any other solution.

Today's airship designers should pay attention to historical data but should not be guided by it. Too many of yesterday's decisions were based on incomplete information using rudimentary analytical tools. Modern designers have very sophisticated analytical tools on their desktop and can evaluate design variations quickly and accurately. Test data is also more accurate, even though the author laments that full scale Reynolds Numbers cannot realistically be achieved. In my 48 years as an aerodynamicist I was never able to test a model at full scale Reynolds Number. This was never an issue because extrapolating skin friction and to some extent pressure drag from test to full scale is relatively straightforward with very acceptable results. Additional

shape modifications are very accurately evaluated using standard Computational Fluid Dynamic (CFD) codes.

Often the most important design parameter is empty weight. It is the most difficult to predict and has as much impact on an air vehicle's success as any other. The author draws attention to this issue when discussing what is called 'weight growth factor' (WGF). This is the takeoff weight increase when the empty weight has been changed by one pound. Design experience has shown that various airplane types have differing WGFs. Transports have WGF of 2-3 and a fighter WGF is 4-5. Without any data the book suggests that airships are likely to have WGFs of around 6-7. There is no validity to this number at all. In fact, the WGF for hybrid airships is 1.5-2.0 based on the analysis in AIAA 2013-1340 page 5. Remembering the Square-Cube Law and the fact that buoyant vehicles benefit from this principle, it makes sense that airships would have a lower WGF than airplanes.

Another mistake modern airship designers make is to pay too little attention to flight architecture and control laws. Modern airships tend to have higher speeds than in the past and strict gust design criteria. The behavior of an inherently unstable vehicle in pitch and yaw coupled with its pendulum resistance and large inertia creates a challenge for the flight control designer. Add to this the 'added mass' terms which are sadly neglected in many designs it becomes even more complicated. Analyses have shown that added mass can increase control sizes by as much as 20-30%. This is not trivial!

There are discussions comparing controlling buoyancy (e.g. compressing lifting gas) vs. the more standard ballast control approach. The author implies that helium compression is an obvious choice over ballast replacement. This is no doubt due to the author's involvement in Walrus [at right] and its follow up programs. But let's set the record straight. Yes, helium compression has been demonstrated using large volume light-weight pressure vessels. This system was even tested in the Pelican program. However, results are VERY modest at this point. There is no further data that suggests this system can be scaled to a vehicle that can transport 20-40 tons or more and that its system design is flight weight. Furthermore, VTOL operations are unique (and have a certain wow factor) but have not been proven to have economic value. Neither is there any evidence that compressing helium to change lift is more economical than generating lift aerodynamically. All VTOL aircraft designs are less efficient than their takeoff and landing cousins. Why would airships be any different?

There is a thorough discussion of the various gasses than have been studied over the years. For the airship neophyte these discussions are detailed and complete. However, any suggestion that lifting gas alternatives to helium have a place in future airship designs is misleading. The three gasses which make sense to the modern airship designer are helium, helium, and helium!

There are many discussions on airship operations and missions. It is good to read someone else saying that there is no helium supply issue. As the author says, helium is there for the taking from gas and oil extraction. This extraction is simply not needed at this point. It is also pointed out that weather plays a major role in airship operations and has been responsible for numerous accidents in the past. This issue will go away using modern sensors such as onboard weather RADAR and LIDAR for detecting turbulence. This information will all be fused with weather updates from the National Weather Service. This onboard weather information will allow the airship to hold, outrun, or go around any weather event.

The author also intimates that rolling takeoffs and landings are inferior for airships and uses Burgess' claims as a reason. In fact, hybrid airships can take off and land like an airplane and this has been conclusively demonstrated by the test flights of Lockheed Martin's P-791 vehicle.

There is much written on past, present, and future roles of the military vis-à-vis airships. As mentioned earlier the military has had recent opportunities to integrate airships into their inventory but have consistently failed. The author states that the military should be the leader for future airship development. I disagree. It will be too long before any serious airship program is sponsored by the military. In the meantime, it will be smaller commercial ventures in the 20-40 ton payload range that will be built and operated in niche markets. Once these operations have become routine maybe there will be more interest in the 100 ton and 200 ton versions.

The book concludes by suggesting that the government has performed badly by not recognizing the obvious value an airship can have for both military and commercial applications. I agree. However, the author goes on to say that the government still needs to be involved in technology risk reduction and design development. Here, I disagree. The government had its chance and failed to see the potential in airships. A government program would take another 10 years which would be a waste of time. We don't need any more demonstrator programs. It is time to build real vehicles that fly the types of legitimate missions that only airships can handle. Then we can evaluate the performance and cost and decide if airships are truly a paradigm shift. The technology is there, the customers are there, and the missions are there. It is time to move ahead without the government.

If you are a helium head, then this book belongs on your bookshelf. **Ω**

Airship Carriers Could Extend Smaller UAS Capabilities by Graham Warwick, Aviation Week & Space Technologies Jul 22, 2016

The capability of small unmanned aircraft systems (UAS) continues to increase, as payloads become even smaller yet more powerful. But these aircraft have one disadvantage - range. "With the ranges we are looking at in the Pacific Theater, how do we get our small UAS to the fight?" asked DARPA Deputy Director Steve Walker at a recent conference in Washington. DARPA's answer is its Gremlins program, which seeks to develop a means of using existing large aircraft, transports or bombers, to launch and recover swarms of small UAS that would then cooperate to perform missions in contested airspace.

Another concept, presented by Science Applications International Corp. (SAIC) and ArcXeon at the American Institute of Aeronautics and Astronautics (AIAA) Aviation 2016 conference in Washington in June, is the AirStation, an airship that acts as an airborne carrier for UAS. In addition to military missions, the developers say the concept could support commercial package delivery operations. Small military UAS capability is increasing, but range is limited DARPA's Gremlins pursuing air launch/recovery with large aircraft SAIC/ArcXeon proposing AirStation airship UAS carrier airship could operate where UAS land or sea bases are denied. The flying aircraft carrier concept harks back to the large airships, the USS *Akron* and *Macon*, flown by the U.S. Navy in the early 1930s. The 785-ft.-long *Macon* could stay aloft for three days carrying three [sic] Curtiss F9C *Sparrowhawk* scout aircraft in its internal hangar. The biplane fighters were launched and recovered using a deployable trapeze, the airship's cruise speed of 60 kt. being just above the aircraft's 55-kt. stall speed. Using only two of its scouts, the USS *Macon* could sweep 165,000 mi.^{2} of ocean in 12 hr., says Ron Hochstetler, SAIC senior aerospace engineer.

Akron and *Macon* were built to refine the scouting capabilities of the airship/aircraft combination, and a larger carrier airship was proposed by Goodyear toward the end of the 1930s. But advances in long-range, land-based surveillance aircraft provided a more cost-effective solution, he says.

Airships themselves have been proposed as long-endurance surveillance platforms, but U.S. Army and Air Force programs started during the wars in Iraq and Afghanistan were ultimately canceled. Instead, says Hochstetler, the trend has been toward a more distributed, multiplatform, multisensor capability using small- and medium-size UAS. But conventional UAS require support infrastructure and "their ground- and ship-based launch sites cannot be quickly relocated as needed, and are often unable to operate on land or ocean areas due to political sensitivities," Hochstetler argues. "For UAS operations to fully reach their maximum capability, they require the mobility and geographical independence of an airborne support platform dedicated to UAS launch and recovery operations," he says. DARPA's Gremlins will (sic) use a legacy aircraft, most likely a Lockheed Martin C-130 airlifter, but these have less endurance than an airship and have their own ground support requirements. The speed mismatch between small UAS and a large turboprop aircraft is also a challenge, says Hochstetler. "A purpose-built platform is needed that can easily accommodate the performance envelopes of large swarms of small- and medium-size UAS," he says. "This special UAS carrier would provide high persistence in most airspace, and do so at acceptable sustainment cost." A carrier airship would be able to automatically launch, recover, refuel and relaunch UAS, potentially using a robotic arm with computer vision. Once launched, the airship would provide an over-the-horizon communications relay between the UAS and their operators on the ground.

The airship itself could be refueled in flight, the concept's developers say, either by hoisting up a fuel bladder floating on the ocean-as demonstrated in the

1950s and again in the 1990s-or by modifying an aircraft, manned or unmanned, able to dock with and refuel the airship.

"The preeminent value of the UAS carrier airship is to enable long-duration access to an area sufficient to allow UAS to be inserted into airspace to conduct operations for as long as required," says Hochstetler. "The UAS carrier can station-keep in a relatively safe standoff location [away] from airspace that is contested or congested, but still close enough to control, refuel or replace the UAS engaged in their tasks."

Smaller nonrigid airship carries two Insitu ScanEagle UAS in this concept. Credit: SAIC/ArcXeon

SAIC, and its Leidos spinoff, have past experience developing and supporting the Skybus 30K and 80K unmanned airships, the latter and larger of which was built for the Army and flown primarily for payload development testing.

Several companies are developing large commercial airships, including Lockheed Martin and the U.K.'s Hybrid Air Vehicles, and the AirStation concept's developers say these designs could be adapted to produce a UAS carrier with up to a 40-ton payload.

"By equipping a viable large commercial airship with tested UAS launch and recovery systems, a UAS carrier variant could be developed and made ready for flight trials with a range of UAS for civilian/commercial and military applications," Hochstetler says. **Ω**

Alastair Reid e-mailed, "I have now finished my latest translation of Dr. Fritz Strahlmann's 1926 anthology, 'Memories of Ahlhorn.'" It is available at: http://www. lulu. com/ spotlight/alastair_reid **Ω**

Given the nature of the Chinese state-run media, it's unlikely much in the way of leaks about aerospace development reach the West - unless such "leaks" are

planned. All that has come out in the way of real photos (to our knowledge, at press time) are two images which don't actually show an inflated envelope. Granted it would be hard for a photo to be taken of an airship at 60,000 feet, and as Mark Lutz showed in his stern prop article, it probably doesn't look very aerodynamic near the ground. We'll stay tuned. **Ω**

We received Marc Frattasio's massive tome on South Weymouth in seemingly plenty of time for a review, but there are so many rich, previously unseen photos and tons of information, we're still reading it. We'll review it for you next issue. Bravo Zulu to Marc for this Herculean effort. The book is found at http://www.lulu.com/us/en/shop/marc-frattasio/nas-south-weymouth-the-defender-of-freedom/paperback/product-22782471.html **Ω**

BLACK BLIMP

Charles A. Tuffield
Survived by…Everyone Who Hears His Story
by Jackie Lewis

When I read the Noon Balloon, my heart always skips a beat and I get a tear in my eye when I read the Black Blimp articles. The faces looking back from the page represent a history that can never be repeated. They represent honor and commitment. Normally the last lines of the Black Blimp articles end by telling you who has survived the individual. I am a daughter that is a survivor of a Black Blimp Member.

My father, Charles Tuffield, was very proud of his naval service and his participation in Lighter than Air. He served at the Tillamook Air Station. Yes, my dad and all the honorable men listed in the Black Blimp are gone but they are not forgotten nor is their Legacy. They will stay alive as long as those of us listed as survivors continue to tell their stories.

I can fill a book (and probably should) with all the stories my dad told me. I have made it my responsibility to repeat those stories as often as possible and to as many people as I possibly can. I want to encourage all of those survivors listed in the Black Blimp articles to do the same. I started carrying out my promise to tell his story at my dad's funeral during his eulogy. I told of the number of flights flown during WWII and the safety of our fleet insured by their mission. I told his story of waving his navy cap from the blimp to let my mom know he was coming home. He told me about the day that a blimp went down near Tillamook. No one knew which blimp had crashed and who had been on board. My mom was already the mother of a one year old and was 8 months pregnant with my sister. He was so proud when he spoke about how the wives in their navy housing "visited" my mom throughout the day to keep her away from the news of the crash. My dad was a square dance caller, a musician, a bricklayer, a mailman, a father, a grandfather, a neighbor, and a friend. Each of those phases of his life was represented by numerous people at his funeral services. I told them about the history of the Navy blimps and the dedication of the men who flew them.

I flew on the Goodyear blimp *Columbia* with my dad and my sister Bobby. So I have first-hand stories I can share. The ride itself was a thrill. But the look on my dad's face will be what remains in my mind and my heart forever. It was as if he had returned to find his former self within that blimp.

Then I flew on the Goodyear blimp *Eagle* with my dad and my sister Terry. This time the thrill was in how he beamed with pride as he shared the experience with us. We talked about the uncertainty of climbing aboard a blimp tethered to the ground by only a handful of men holding the lines. We flew over the ocean and he laughed when I thought I had spotted a whale--only to realize later, it was the shadow of the blimp I was in.

All of my seven brothers and sisters have visited the Tillamook Air Museum with our dad. The Blimp Gene is in our DNA. There we were able to see the past in photos and the present in the hangar still standing. As we walked through the museum and hangar, he shared stories of his flights, his log book, the basketball hoop on the hangar door, his crew, life at the air station, Navy housing, and most importantly his friends.

I scan the Black Blimp articles looking at men who shared a connection with him during this critical time in his life and in this country's history. Whether they served in Tillamook or not, they have so much in common--mutual experiences and now share the same rewards in heaven.

My dad is honored at the Tillamook Air Museum with a plaque outside the Helium Room. He is also honored at Fort Logan National Cemetery. He is honored by his family. It is my commitment to keep alive with a new generation and future generations the importance of his honor and the Loyalty and Purpose of the Men of Lighter than Air. Survivors, please join me in keeping their story alive. I wanted to share with you a picture of my dad's gravestone at Fort Logan. My family is very proud of the last line on the stone:

God took him home in a Navy Blimp. **Ω**

Richard M. Shively, Jr., 94, passed 28 Apr. A native of Columbus, Ohio, Shively was USNA class of '45 and served aboard USS Savannah, which escorted President Roosevelt to the Yalta conference. He took LTA training in '46 with assignment to Santa Ana and Weeksville. Postgraduate studies at Annapolis and UCLA lead to M.S. degrees in aeronautical and aerospace engineering. Shively left the Navy in 1956, retiring from Lockheed Missiles & Space in 1988. Richard is survived by his wife of 54 years, Maravillas deC. Shively, and numerous nieces, nephews and cousins. Ω

Charles R. Plyler, 93, passed 6 May. Bob joined the Navy in 1941 and served most of his Navy career in LTA, then on the USS Midway. Retiring in 1963 at Moffett Field, as a Chief Petty Officer, 1963 Pyler went to work for NASA until he retired in 1980. Pyler is survived by 2 daughters, 5 grandchildren & 11 great-grandchildren. Ω

Charles M. Eckert, 85, passed 16 June following an illness that prevented him from attending the Pensacola Reunion. Son of a WWI veteran and rigid airshipman on the refueling crew the night of the LZ-129 fire, Charlie was a longtime LTA supporter. He often said being present for the Zeppelin NT christening on July 2, 2000, the Zeppelin 100th anniversary, was the best birthday party he ever had. Charlie is survived by his loving companion of 33 years, Patricia L. Curran, a son and daughter, as well as grand and great-grandchildren. Ω

LIGHTER SIDE

William Faulkner said of Ernest Hemingway, "He has never been known to use a word that might send a reader to the dictionary." ☺

A high school student was asked to explain one of the processes by which water can be made safe to drink. His answer: "Flirtation makes water safe to drink because it removes large pollutants like grit, sand, sheep and canoeists." ☺

A woman once advised, "Men have but two motivations: hunger and hanky-panky, and they can't tell them apart. If you see a gleam in his eyes, make him a sandwich." ☺

All of us could take a lesson from the weather. It pays no attention to criticism. ☺

Brian Corbin Photo

Concept of the proposed UAV carrier - see the report on AIAA's AITO and "Media Watch" inside. SAIC graphic by Faisal Ali and Pat Rawlings.