

THE NOON BALLOON



The Official Publication of THE NAVAL AIRSHIP ASSOCIATION, INC.

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Obviously the nose is to the grindstone, on patrol for a good ear! Our thanks for these Lightship photos from Larry Gilbert, EAA Chapter 866, and Steve Adams, Van Wagner Group.



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ISSUE #107

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"Don't mess with old men, they didn't get old by being stupid." ☺

NAA annual membership is US \$30 (\$40 outside US) and can be obtained on-line at www.naval-airships.com via pay-pal. Membership may be also obtained or renewed by mailing the correct amount made out to "NAA" at NAA Membership Secretary, PO Box 700, Edgewater, FL 32132.



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EDITORIAL

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Your Editor has been on the road a lot this quarter promoting LTA and the NAA's efforts therein, hopefully (though not without doubts) expending his resources wisely in this pursuit. At the annual Sun N Fun airshow in Florida last April, I gave my presentation to a small general audience of show attendees. Can't say it inspired anyone to join NAA, but perhaps they came away with a better understanding of airships than they get on TV any given night. In June, the AIAA's giant weeklong AITO in Dallas scheduled one day of LTA papers and presentations. Volunteering as co-chair, I helped organize and choreograph presentations from attendees. My co-chairman Donald Horkimer and I overcame some minor challenges so our morning & afternoon sessions went on as scheduled. Papers were from US, India, China, Brazil and Belgium. New friends made, with promises to join NAA. Little LTA in a huge HTA gathering, the presentations at least at one time filled the room, and new friends parted company with great hopes for future developments. There was understandable grumbling about having to pay for the pricey full-week conference when we had but the one day, however all agreed to keep the LTA in AIAA by attending the next such conference, in Washington, DC, next year.

While in Dallas one must visit the Museum of Flight situated on the corner of Love Field. A hundred times the size it occupied on my previous visit in 2003, the MoF displays key items from the Rosendahl Collection – The ZR-3's radio, Zeppelin china, etc. We'll detail a report in a future issue.

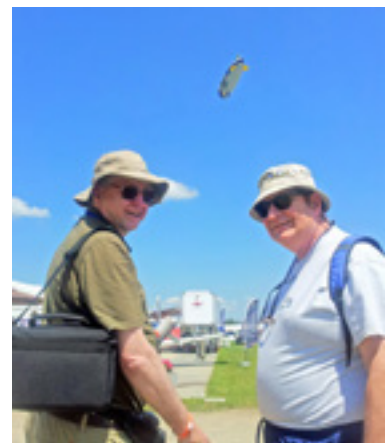
Our friends at UTD Library rolled out boxes I'd requested from the VADM C.E. Rosendahl collection. They protect his and others' priceless donations with safeguards similar to the National Archives, but happily share these treasures with interested researchers. My emphasis was on the ZRS program, but materials therein were boxed as such to be intertwined with blimps. They allowed me to work scanning and copying all day without complaint until my batteries were exhausted. With their permission, we'll be sharing many finds soon.

A chance meeting of my previously unknown cousin, retired USAF Colonel Ken Van Treuren, lead to an invitation I was able to accept by taking a detour

on the way to Oshkosh. Thanks to my cousin (and one of his students) devoting an afternoon's time, we were introduced to the kind folks at the Air Force Academy Library Special Collections.

For many years those with knowledge of same, have bemoaned the fact the Durand Committee Reports of 1936 were never widely available. A distinguished panel of the country's top aeronautical scientists were tasked by NACA to study the question of the airship. Their report fell not only on deaf ears, but it appears the Roosevelt administration ignored them to death. Thanks to our new friends at AFA, we are well on the way to bringing those long lost technical tomes to light. AFA have asked but one favor, to identify the man with the G-1 in the mystery photo on page 36. If you know his name, please contact me asap.

University of Akron was my next stop, where longtime activist member Eric Brothers (on left, at Oshkosh with publisher David Smith) had culled the finder's aide for our topic. Our friends in the basement Archives rolled out these requests from their Lockheed-Martin and other collections concerning ZRS/ZRCVs.



Last stop Oshkosh, where I gave my spiel in a forum as Goodyear's magnificent new Zeppelin NT operated for her first AirVenture. Hopefully a few people saved the NAA brochures we passed out. Meanwhile, there has been little interest or support for "A2C" from the Congressional Airship Caucus, Spaceport Florida, and even airship operators. With health problems precluding some herculean effort to nonetheless compose and conduct the Conference, we are forced to cancel it. Sadly, we just don't seem to have a handle on a way to introduce a new generation to the safe, efficient and earth-friendly world of airships.

– **Richard G. Van Treuren**

View From The Top: PRESIDENT'S MESSAGE

A lot has transpired since my last message. I spent three weeks of August in the hospital for tests and will return there soon as I write this. Seems like I need a new heart valve and that should be done by the time you read this. Much needs to be done regarding the May 2016 Reunion/Conference in Pensacola, but I am being ably helped by Mort Eckhouse. My sincerest thanks to Mort for his help. I hope we have a tremendous turnout for what should be an exciting event. More as plans are finalized.

Our proposed international LTA conference for January 2016 with Embry-Riddle Aeronautical University has been cancelled. I am very disappointed in the response. The U. S. Congress has formed a caucus on promoting cargo airships and we couldn't even get them to acknowledge our letters or emails seeking information and offering our assistance. Individual Representatives, some that created the caucus, also would not acknowledge our emails, letters or phone calls. Our NAA membership was not enthusiastic about the program and several airship companies and organizations we approached were taking a "wait-and-see" attitude toward support. That didn't help us with determining what facilities and services we would need. As I stated from the beginning, the NAA would need outside support to help us. We would not bear the brunt of the costs for this event alone.

Organizationally we were unable to maintain last year's total membership number. We are not alone in this. I have talked with some other similar organizations and they are experiencing a decline in the overall number of members. We will need to come up with some new ideas to attract new members. We have a lot to offer and the next few years look to be very exciting for the NAA as we have a number of activities planned and have been in contact with other similar mission veteran groups about some joint activities. More on this as things develop.

I am also very encouraged with the amount of renewals that included an extra donation. As a non-profit association we depend upon renewals and Small



Stores sales for our income. Our biggest expenses are The Noon Balloon and the Reunion/Conference. Donations, large and small, help us maintain our low membership fee, publish the finest airship magazine in the world and supplement our Reunion/Conference expenses. We are most grateful for all of you who donate.

As I mentioned previously, we are also embarking on a couple new initiatives. One is to expand the webpage on past presidents. Currently we have only a list of their names and dates served. We are in the process of adding a short biography of each and a photograph so that especially new members can read their LTA and Navy history and put a face to the name. Each past president will be contacted for approval of their bio and photo. Member Bo Watwood has done a great job in putting together some of the bios and pictures that will be posted soon on the webpage. Second, we have started the process to have an LTA Hall of Fame on the website. As the name indicates, we want to recognize those individuals that played a major role in establishing LTA. I will be posting info on this in upcoming Noon Balloons. The initial goal is to induct four to six people at the 2016 Reunion/Conference and two to four every year after that.

Thank you for your continued support.

– Fred Morin, President

TREASURER'S STRONGBOX

The past quarter has been interesting with several new members and some that forgot to send in their renewals. Welcome New Members and Welcome Back Returning Members.

We have also seen some sales in Small Stores. As you know, Dave Smith has generously taken over the Small Stores function and has added a new feature for facilitating sales. You may now use a MasterCard or Visa to pay for your Small Stores purchases. I might add that in light of escalating shipping costs from the post office, we have had to increase shipping fees. These nominal increases just cover the expense of shipping the beautiful logo wear we offer, the ceramic mugs and like items. To avoid disappointment later, be sure you get your end-of-year orders in early! Please include the proper shipping fees with your order! We run everything on a shoestring to keep costs manageable and still put out our beautiful quarterly magazine.

Our Strongbox is holding its own and our liquid assets are showing a balance of approximately \$28,019 combined savings and checking. Inventory of Small Stores adds a few hundred dollars. As of today's date, all expenses have been met. There are no outstanding invoices.

We have been offered a continuation of last year's price for our subscription/membership software. Fred Morin, our President, has decided to accept that offer for an annual savings of approximately 16%. We have to take advantage of these things when we can!

If you renewed your membership after May 31st you may not have received the summer Noon Balloon, #106, if not, please let me know, so I can make sure you get your copy.

Please be sure to mark your calendars for next May when the Naval Airship Association once again "puts on the dog" at Pensacola for our Annual Reunion. Registration Fees are being worked out and we have a few possibilities for a nice hotel on the beautiful white sand beach of the Gulf.

UP SHIP!

– Debbie Van Treuren, NAA Treasurer



PIGEON COTE

History chair Mark Lutz located an internet photo (below, at S. Weymouth) said to show some experimental antennas on a Nan ship, located at www.ll.mit.edu/about/History/earlywarningradars2:

MIT Lincoln Labs was working on AEW / DEW radar improvements. About 1952, they chose to drop down in frequency to UHF (425 MHz) for two reasons (by comparison, the AN/APS-20 radar used in the ZPG-2 was S band radar (2880 MHz)):

- 1) Higher power tubes available (about three times more power)
- 2) Less sea clutter at the lower frequency



Flight-testing started in March 1954, out of NAS South Weymouth NAS. Some of the UHF radar antenna testing was done by mounting it outboard of the prop nacelle of a ZPG-2 as shown in the photograph. The slow speed of the airship improved detection of airborne moving targets over that available with the same equipment in an airplane. This development lead to the AN/APS-70 radar, which was installed inside the ZPG-3W's envelope.

Al Robbins responded, "Never heard about the early flights, no pylon-mounted antenna showing in the photo. Our AN/APS-70 (XN-1) was built by Hazeltine. I don't know what company built the transmitter tubes, but they were huge, at least twice the weight of the APS20 magnetrons. We spent over a month (my second tech and myself Oct 56), working with the Hazeltine rep with the installation at Lakehurst, and learning how we were supposed to operate it. I never saw the LL or GE units. Don't know why they didn't install one in one of our WV-2s. The Low Frequency experimental radar was novel in several ways:

1) It used a rigid co-ax, running from the transmitter to the antenna's rotary joint. The outer coax was precision-milled 5-inch diameter copper pipe. The center conductor was positioned with plastic spacers.

2) The entire co-ax was charged with sulfur-hexafluoride, and allowed to continuously leak out of each of the dipoles on the antenna which was mounted in the standard belly radome (unlike the radomes on the P2 and WV2, the ZPG-2 radome had a flexible fabric bottom).

3) We carried a large 3000-psi bottle; supposedly it contained sufficient SF6 to last for an entire flight. The operator (me) had to charge the wave-guide, and then climb down into the radome (on a tether) to check and make sure gas was coming out of each dipole element. The Rep explained that any air or moisture in the waveguide would result in a catastrophic failure of the wave-guide when we turned on the radar, and (at least) the transmitter. Most of our flights that winter were conducted with at least one major assembly back at LL and the APS70 (less SP6 bottle) serving as fixed ballast on the *SNOWBIRD*.

We didn't have any test equipment, or spare parts for the system. When anything failed, they took it back to LL for repairs. Never saw the Hazeltine rep again after we returned to South Weymouth. The article continues the pretense that the APS-20A and the APS-20B/E had something in common other than frequency and manufacturer. One of our P2Vs had an APS-20A installed, the only one I ever saw. The indicators were mechanically swept, not electronically. No interchangeable assemblies.

The APS-20 B control box also had an AMTI ON/OFF switch, but there were no wires running to it. I reported to NADU in March 1956, uncrated and set-up the APS-20B/E shop. Initially assigned as radar tech on one of the two WV-2s; sent to Keesler AFB with another tech to learn to operate and maintain the Philco AN/APS-45, the top-mounted height-finder radar on the Connie. Nice duty while it lasted - frequent trips to Argentina, working on prototype air-intercept control device (gave course/speed/altitude instructions to USAF interceptors equipped with a modified TACAN indicator. Data transmitted using telephone tone codes.) Reassigned to LTA after they crashed my airplane that summer. First tech on the *SNOWBIRD*. **Ω** *Ed. note: Read of Ross Wood's experiences in the resulting radar picket airships beginning on page 20.*



New member Leandro Miranda, who had sent photos of the K-36 fragments at a local museum (above) and requested details for his search for the remains of K-36, e-mailed a message for members: "I am the newest member of the NAA: I am researching the accident that occurred with the K-36 blimp in Brazil on the date of January 17, 1944, when it crashed into the Cabo Frio Island.

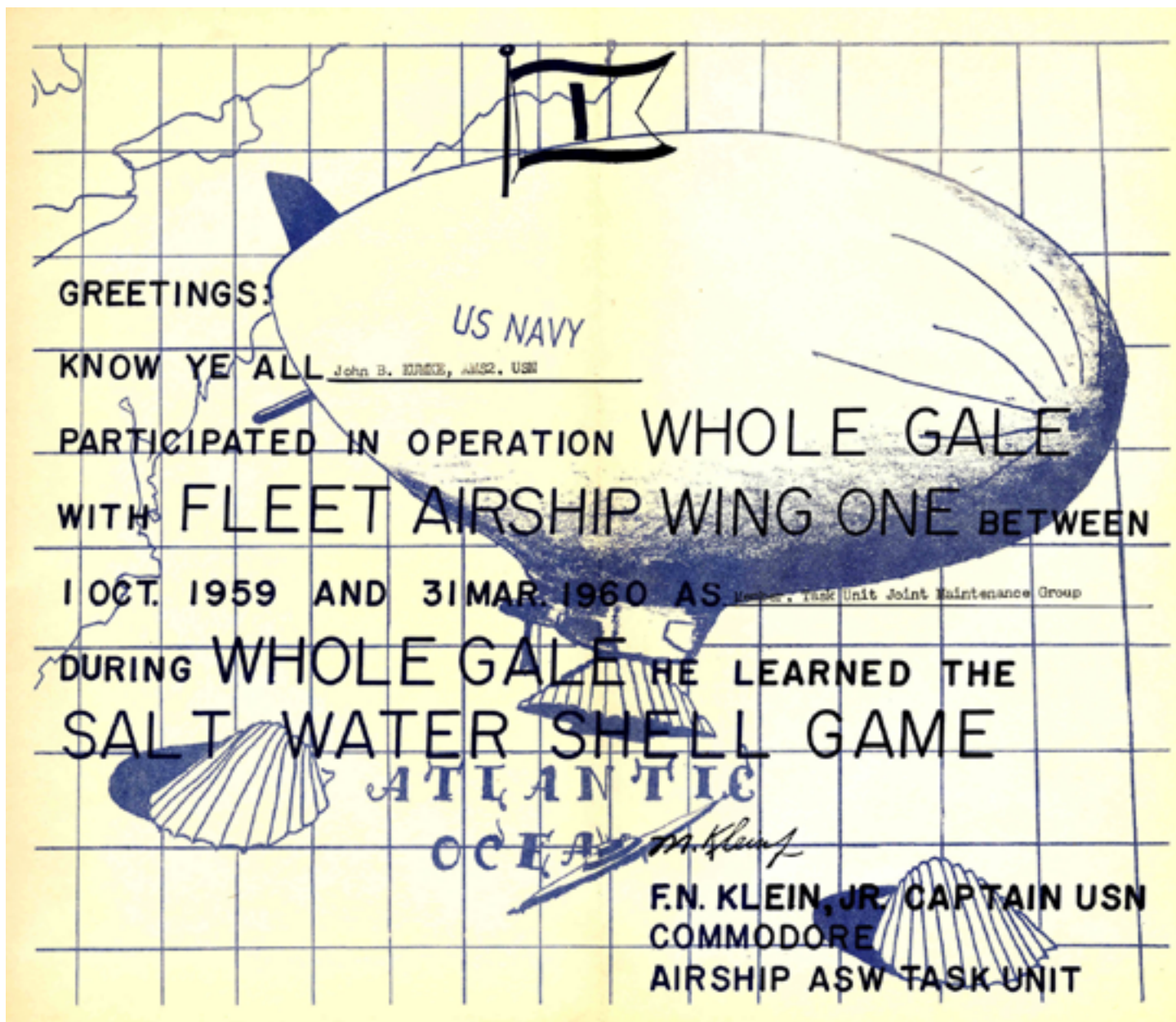
My goal in this research is to detail this interesting history that has been lost over time along with my city, and recounts her more minutiae possible. For this story with the help of members of the NAA that perhaps may have some relevant information as photo, crew on the day of the accident, or any other information about K-36.

My grandfather took part in the rescue of the crew and the wreckage and no longer with us. I have a cousin of my father today 90 years old who is lucid and participated in the rescue of K-36 at the time. I took him to a nearest point on the island and he showed me the place of the fall, soon I want to make a foray to the location to try to find something. It will not be an easy task since the terrain is rugged and dense forest. I am waiting for new information..."

Ed.: attempted to answer some of his questions, with the help of History Chair Mark Lutz:

Leandro: "...came to confirm that he had some doubts about the casualty number is confirmed that they were two, HE Jones and RW Widdicombe. [Had also found J. Bartolf & C. Lomdon aboard] I wonder what the function of each of the blimp?"

Ed.: Yes, both men were slightly injured. Widdicombe went on to a distinguished career in Navy and Goodyear airships; he passed away a few years ago. Both were pilots; the airship flew with several pilots so they could rotate watches. **Ω**



John Kumke shared a scan of his “Whole Gale” participation certificate. The exercise, the last major demonstration of USN LTA capabilities, was structured in order to challenge the airshipmen and supposedly reveal the technology’s shortcomings. Instead, the men and ships of Fleet Airship Wing One turned the tables on their evaluators, giving an effective demonstration of what could be accomplished by experienced crews operating well designed and built airships. Described by *All Hands* magazine, “...five airships manned an AEW station continuously for 10 days... ...Weather was the area’s worst in years, with combinations and variations of ice, snow, rain, fog and 60-knot winds...”

Conclusion: “Blimps could relieve each other on station during a period when weather had grounded [all] other types of military and commercial aircraft.” The outstanding performance was set-aside in senior leadership’s determination to limit Naval aviation to carrier-based aircraft. Of course, “Don’t confuse us with the facts” was no stranger to LTA assessments in previous decades. One of the lesser-known fact burials has been the object of NAA volunteers, attempting to locate and bring to light the so-called Durand Committee reports released in January of 1936. They hope to have a status on the progress of this effort in the next issue of *The Noon Balloon*, perhaps serializing them in future issues. Ω

Our volunteer team effort to translate and publish the LTA technology text book slowly proceeds, with Juergen Bock e-mailing, "... As a retired development engineer in the LTA and space industry I am used to requirement analyses which dictate the system engineering design concept. These requirements eliminate lots of traditional [LTA] concepts due to the boundary conditions and call - in essence - for two different types of LTA carriers:

- (a) a VTOL system for cramped landing sites
- (b) a STOL hybrid system for heavy cargo

The outcome is that none of present design concepts meets these basic requirements! The first statement is that the advertising airship has deteriorated the airship technology insofar as all experiences and practical developments made by the US Navy had been ignored for being completely superfluous. For instance, the ABC airships reduced their concept to the "bare necessities" of efficient advertising. The Skyship development suffered from the beginning for being too small. A larger car for up to 20 passengers may have been the answer for economical operation. The same mistake was made in the case of NT Zeppelin. It was originally planned for only 5,000 m³; but grudgingly the advice of HAPAG-Lloyd (and a belly-acher unpaid consultant) was accepted and the ship was at least enlarged to 7,000 m³. Later they found out that it was still too small and had to be elongated while being already under construction.

Nobody recalled that Count Zeppelin started commercial operation with a minimum of 14,000 m³ size (*Victoria Luise*, *Hansa*, etc.) and the first useful U.S. Navy blimp for tactical operation in WWII was of the same magnitude. Instead, the belief in super-strong and light-weight materials created dream boats. The designers, Arnstein & Schutte rotated in their graves when they learned that a 100 percent (or even more) silver-tongued layman succeeded in raising hundreds of millions for the construction of a super-blimp for long distance heavy cargo haul. Still today it is acknowledged fact that airships exceeding a certain design magnitude must be of rigid construction. Besides, a thorough requirements analysis would have shown that a combination of short-range LTA

carriers with sea-going freighters would have been the economical solution..."

Fellow worker Alastair Reid agreed, emailing: "Excellent stuff Juergen - well said. The great value of the past lessons lies in preventing future repetitions or wasted effort, but we also cannot know how future LTA design will be reshaped by material and technological advances.

The original Skyship 600 design did have 20 seats (photo below) but these lightweight 'Aeroform' seats did not get certification approval and had to be replaced by much heavier, bulkier seats for full



Passenger Transport certification. The number of seats allowed was cut to 8 then increased to 12, but the economics did not work without advertising sponsorship. There was a plan to cut the gondola in half lengthways and add another meter or so to be able to fit 20 CAA-approved seats, but the company went bust before this could happen.

George Spyrou proposed a similar improvement but did not have a large enough financial reserve to fund another six-year certification program.

The problems caused by certification contributed to the death of Airship Industries, and the failure of commercial airship progress in the UK, USA, Switzerland and Japan." Ω



Donald P. Horkheimer wrote of the Dallas AIAA AITO, “I sat in on a paper Friday morning in a session called ‘Aeronautic Discipline Considerations in Aircraft Design’ entitled “Feasibility Studies on a High Altitude Captive Lighter-Than-Air Platform System” by K. Chiba, et. al. The paper probably should have been within our LTA sessions. It was about a design trade study being formed on a captive high altitude aerostat (>20km) used surveillance and telecommunications. It was sponsored by JAXA who is ultimately interested in using the aerostat for launching rockets. It seems the authors favored a design for a hybrid shaped aerostat and described plans for moving payloads up to the aerostat while already flying. JAXA apparently has a long term goal of being able to launch large (100 ton) rockets from such an aerostat.” Ω

ASW discussion continued with Al Robbins e-mailing, “The telescoping optical periscope provided limited navigational aid while submerged, and provided quick-look capability prior to surfacing. Submarines had to surface in order to charge their batteries - and also to determine where they were. The U-boats introduced the Schnorkel late in World War II, which permitted them to operate their diesels, charge their batteries and proceed at high speed while submerged.

If today’s submariners were actually fearful that a modern periscope could betray a submarines presence, or force it into uncomfortable near-surface operations, they have many alternative solutions, some would require the submarine to operate at low speed, none would require it to operate within 100 feet of the surface.

Primarily trusting the numbers supplied by Wikipedia, since the start of the Cold War, the Navy has purchased and deployed several thousand new ASW aircraft:

- 268 Seaplanes (P-5A and P-5B)
- 1,372 Carrier-based aircraft (S-2 and S-3)
- 1,288 Land-based aircraft (P2V-2S, P2V-4, P2V-5, P2V-7, P-3A, P-3B, P-3C and P-8A)
- 598 Ship-based ASW helicopters
- 48 Airships (ZSG-4, ZSG-5, and ZPG-2)

Most airships were retired before the introduction of SOSUS, Very Low Frequency Communications

Systems, Inertial Navigation Systems, Global Positioning systems, Satellites (in the sky) or modern avionics systems employing: Solid State devices, Airborne digital computers, LASERS (particularly blue light LASERS), Ambient Temperature Infrared Systems, Fiber Optics, Multi-spectral imaging systems, or secure communications equipment. Curiously, only the current MH-60R claims to have a periscope detecting radar, the AN/APS-153 a multi-mode radar with Automatic Radar Periscope detection and Discrimination capability. Hopefully it will also be capable of detecting semi-submersible smuggling craft. The airship demonstrated several unique advantages:

- It was the only platform that didn’t require multiple prototype and preproduction models.
- The ships we bought had lots of space for installing and testing a multitude of systems; including several scientists and technicians.
- They could safely operate low and slow for extended periods, while providing the best environment for sensitive equipment.
- They could have launched and recovered small boats, huge directional sonobuoys or drifting acoustic arrays, something only the latest generation of Helicopters might do.

We had essentially the same sensor suites as the fixed wing aircraft of the time: APS-20 radar, Sonobuoys, Julie/Jezebel, SNIFFER, and MAD. SNIFFERS were nearly useless, every merchant ship and fishing vessel spewed diesel fumes. Most of our sonobuoy frequencies were useless, frequencies cluttered with taxi-fleet and meteorological transmissions. MAD, when it functioned, provided a very narrow-swept band, the limited effective detection range a function of the height of the MAD head above sea-level, the depth of the submarine, and how effectively the sub had been degaussed. We didn’t have any procedure for mapping sunken ships and other common magnetic anomalies. Unfortunately, the ZPGs never got the opportunity to dance with the submarines, or cooperate with the fleet in developing a viable ASW approach. It’s a shame, a few airships could have been extremely useful in maintaining a close watch over a spread out task force, and would have been enormously popular during extended port visits. Ω

SHORE ESTABLISHMENTS:

MOFFETT



West Coast Liaison William Wissel recently visited Moffett's northernmost outlying mast base, near the city of Eureka but actually located on the strip of land dubbed "Somoa." When Ed. had visited there decades ago, the area was home to huge industrial logging operations. The former airship mast base had become a Mom & Pop-type Bed and Breakfast, though the mooring circles (seen below in a shot taken in its heyday) were still quite prominent. Local pilots could fly in, using the runway once home to heavy K-ships' rolling-start takeoffs, enjoying what's commonly known as the "\$400 hamburger" - i.e., I have an airplane, now what do I do with it.

Bill found the site mostly abandoned, the former base barracks shuttered and overgrown. Evidently the locals now use the runway for automotive pastimes. Ω



RICHMOND

The NAS Richmond project continues to go forward. As the back cover photo shows, the exterior restoration is complete and the building is truly majestic in stature. We hope you all like the landscaping. The sidewalk is extra wide so that vans bringing visitors from the VA Hospital can pull right up to the ADA-compliant ramp. All veterans are a key constituency of the project. The internal build out is on-going in several aspects. The plumbing "stub in" has been completed. Next the original 1942 bathroom fixtures which were salvaged (the sinks, urinals and mirrors are all date-stamped 1942) will be connected to the new plumbing system. Tying-in to the existing fresh water and waste water systems will then occur. The Fire-Sprinkler system is also going in. The HVAC (High Volume Air Conditioning) System is being installed simultaneously, as is the electrical system of conduits. The last systems will be the drywall and floors. All of this work is occurring on the ground floor of the building. For now the Second Floor remains an unimproved shell and will be addressed later.

Saturday morning July 18th we hosted an Observance of the battle between the U.S. Navy K-74 and the German U-134 that occurred off the Florida Keys on July 18, 1943 (photo below, the Admin building hosting a bond drive). The Miami-Dade County Police Force provided a Color Guard and the VFW Chaplain read Scripture. Anthony Atwood spoke concerning Aviation Machinist Mate 2nd Class Isadore Stessel, the bombardier of the K-74, who gave his life in the battle. He was piped ashore and our bugler played Taps in Remembrance. In September the NAS Richmond project will host an observance of the commissioning and decommissioning of the base. Ω



AKRON

On August 1, The Lighter-Than-Air Society hosted a program in the Auditorium of the Main Library in Akron titled Heroes of the *Shenandoah*.

Judi Tarowski, a professional storyteller, recounted the events of the night of September 2, 1925, and the early hours of the third when the USS *Shenandoah* crashed in Noble County, Ohio. She narrated the events in the context of the actions and observations of different crew members, all Heroes of the *Shenandoah*. The Heroes also included residents in Ava and Sharon who came to the rescue of the occupants of the airship.



Photo: Alvaro Bellon

Finally she also included as Heroes the individuals and organizations committed to conserving the history



Photo: Alvaro Bellon

and memory of the tragic event. Among these are Bryan and Theresa Rayner who maintain a USS *Shenandoah* museum in Ava and their leadership in holding ceremonies commemorating the event on Labor Day weekend every fifth anniversary. She also mentioned Aaron Keirns, author of America's Forgotten Airship Disaster – The Crash of the USS *Shenandoah*, as well as the Naval Airship Association and The Lighter-Than-Air Society as the two organizations worked together to install new signage at the three crash sites.

During the question and answer period, NAA's David Smith who was in attendance, said that Ms Tarowski was also a Hero as she kept the memories alive through her vivid narration of the events of September 1925. Ω

A group of LTAS and Helium Heads members enjoyed a tour of the Wingfoot Lake Blimp Base on August 12. The event hosted by Eddie Ogden, Airship PR Specialist and Historian included a tour of the hangar where the second LZ N07-101 is being assembled. Also, the *Spirit*



Photo: Alvaro Bellon

of *Innovation* was in the hangar undergoing regular maintenance while awaiting the Carson, California, blimp base crew that would fly it out to the West Coast. The group also had the opportunity to walk to the mooring circle outside the hangar where *Wingfoot One* was tethered to its truck-mounted mooring mast. Ω

During the week of August 24, Lockheed Martin flew one of its tethered aerostats outside the Akron Airdock. The flights were part of a series of tests LM was conducting. The Aerostat flew at altitudes between 500 and 800 feet. Ω

Photo: Ron Syroid



August 26 marked the departure of Goodyear's *Spirit of Innovation* from the Blimp Base at Wingfoot Lake near Akron as it began its journey to Carson, California, where it will make its home until it retires in 2016. This marked the last flight of a GZ-20A blimp out of Akron as Goodyear continues assembly of the second semi-rigid LZ N07-101 airship.

During the week preceding the departure of the *Spirit of Innovation* it made several tandem flights with the new *Wingfoot One* over Northeast Ohio as a farewell. Ω

On August 29 a group of LTAS members drove to Ava to install the new sign marking USS *Shenandoah* Crash Site 2. The new and larger sign (12 ft. wide by 8 ft. high) was placed so that it is more readily visible from the southbound lanes of I-77.

The new signs were provided by NAA and printed by Airship International Press. LTAS provided the installation of the signs. Note the old sign in the background. L to R, Eric Brothers, Wayne Buchanan, Nikolas Buchanan, John Cunningham and Dave Wertz. Ω



Photo: Eric Brothers

The AIAA LTA TC volunteered two session chairmen, R.G. Van Treuren and Donald P. Horkheimer, (authors of this summary) who rode herd on morning and afternoon (respectively) sessions in which the LTA technical papers were presented. The attendance waxed and waned but through many of the papers, the room was about at capacity with about 35 listeners. First off was Dr. Chen Li, Associate Professor, Institute of Aerospace Science and Technology, Shanghai Jiao Tong University, presenting “Design and Control of a Multi-Vectored Thrust Airship.” The illustrations showed an examination of several types of airship shapes, including their own ellipsoid model outwardly resembling a super-pressure balloon.

From Belgium’s Vrije University in Brussels came Prof. Dr. Ir. Dean Vucinic, who presented one of his student’s papers, “Numerical Feasibility Analysis of the Extra-lightweight Structure Tensairity on Large Airships.” A novel approach to forming a structure for a rigid airship - wire-reinforced inflated structural members - is the basis for an equally unique concept of large cycling airships following a fixed route with passengers and or cargo being taken up to, and brought down from, using smaller dockable taxi airships.

“Computational Modeling of Aerodynamic Characteristics of Airships in Arbitrary Motion” was presented by Akshay Kanoria. His team’s work was illustrated with computer-generated graphics which gave 3-D testimony to the data on the graphs as the model airship entered a vertical gust field.

A young graduate student from Beijing’s Bei Hang University, Keyu Yan, overcame some technical challenges and presented “Disturbance Rejection Based Path Following Control for a Stratospheric Airship with Actuator Saturation.” Her team’s study also dealt with a new, unconventional airship in examination of control redundancy.

W. Stewart King, Jr., a grad student at the University of Alabama in Huntsville, next presented “A Long-Endurance, Highly Maneuverable, Collaborative, Unmanned Airborne System,” a video-rich

program showing his teams’ development of a modern if miniature “Flying Carrier!” A quadcopter-drone was rebuilt to carry a “docking ball.” A small indoor-advertising airship was configured with a cone-shaped receptacle with flytrap-style capture mechanism, and the team successfully docked and undocked their drone using the airship’s unique “anti-thrusters” to compensate for the drone’s weight.

Following a break for lunch, the first paper was “Lab-Scale Characterization of a Lighter-Than-Air Wind Energy System – Close the Loop” by Joseph Deese, et. al. Joseph is a senior undergraduate student at UNC Charlotte and did some excellent work testing scale models of an aerostat mounted wind turbine. Tests were performed under open-loop and closed-loop control of the aerostats dynamics. Joseph’s paper probably generated most of the session’s questions. The second paper was “The 12M Tethered Aerostat System: Rapid Tactical Deployment of Surveillance Missions” by John Krausman and D. Miller of TCOM LP. John provided an overview of TCOM’s latest and smallest aerostat with a lot of interesting insights into operational challenges and typical missions associated with TCOM’s aerostats.

Next, “Design and Flight Testing of Autonomous Airship” by Jonatos Santos, et. al. was then presented. Jonatos gave an excellent summary aerostat controller work being pursued in Brazil and India. He shared several flight videos and provided a good description of the flight controller algorithm and electronics. It also sounds like one of the supporters of this paper, ALTAVE Ltda., has won a contract from the Brazilian government to develop several surveillance aerostats for the 2016 Summer Olympics in Brazil. Finally, “Diaphragm Testing of Fabric Components & Correlation to Analysis” authored by K. Cromer and S. Petersen was presented by John Krausman, on TCOM’s efforts to validate analytical predictions of non-rigid aerostat hull and hull attachments strength against empirical testing. John described TCOM’s development of a large diameter test rig that could hold a circular sample of fabric material and simultaneously be able to apply hydrostatic pressure loads across the test sample and point loads/distributed point loads. Deflections of the material under test was then measured using photogrammetry. Ω

COVER STORY



Goodyear's New *Wingfoot One* Airship Makes Its EAA AirVenture Oshkosh Debut

The Goodyear Tire & Rubber Company's newest airship, *Wingfoot One*, continued a long tradition of Oshkosh Goodyear appearances with its inaugural visit to EAA AirVenture Oshkosh 2015, the 63rd annual Experimental Aircraft Association fly-in, at Wittman Regional Airport in Oshkosh. NAA members in attendance were allowed a very up-close and personal examination of the ship. The crew took time from their service chores to answer questions about operations, and members watched the operation of raising an engine service platform.

The ship delighted the airshow crowd opening several of the days' flying performances with awesome demonstrations of its vectored-thrust precision maneuvering. During most of the rest of the show the airship made majestic loops floating over the crowded venues, its spacious passenger gondola providing an enhanced in-flight experience with its sweeping, panoramic windows.

Pilot Derick Ried and company rep Eddie Ogden gave presentations about Goodyear LTA and their new ship to a forum assembly, and the pilots also signed autographs in one of the venue's booths. In this writer's observation, with this assertive deployment far from home for such a new ship, the company boldly demonstrated its firm commitment to this design and technology.



Wingfoot One is scheduled to arrive at its Pampano, Florida, base in the fall, as hangar renovations are already underway there. Meanwhile, the second airship's semi-rigid framework is taking shape back at Wingfoot Lake, Ohio. Ω



LOCKHEED ANNOUNCEMENT



Orlando Carvalho (left) and Rob Binns signed ceremonial certificates to symbolize the strategic alliance between Lockheed Martin and Hybrid Enterprises wherein Hybrid Enterprises is chosen to be the exclusive, authorized reseller of Lockheed Martin's Hybrid Airships.

Hybrid Airship Venture Floated Here

Paul Jackson, Show News (Paris Airshow)

Not your typical "Zeppelin" this new-technology airship has some novel features. After 20 years of development, first order now sought.

Lockheed Martin is not the first to be enthused by the possibilities of the giant cargo airship for transportation off the beaten track. But it thinks it can succeed where many predecessors have failed. Accordingly, at Paris Air Show, it announced a partnership with Hybrid Enterprises to sell the 20-ton payload LMH-1 tri-lobe craft on the civil market. The venture builds on 20 years of work, most recently with the smaller P-791 technology demonstrator. A LMH-1 could be certified in 2017 and delivered the following year, although no prototype will be constructed until a firm order is secured. Cementing the new partnership in the Show ceremony were Orlando Carvalho, EVP

Lockheed Martin Aeronautics; and Rob Binns, CEO of Hybrid Enterprises. The latter company is staffed by professionals experienced in sales and marketing of cargo aircraft and exclusively committed to the LMH-1 and any larger versions to follow. When fully laden, a helium-filled LMH-1 generates 80% of its lift from gas displacement and the remainder by dynamic means from its wing-type shape. But when unladen, it is buoyant.

"Landing gear" is best described as a couple of air cushion vehicles on the underside. Once taxiing is complete, they are reversed into "suck" mode and the craft anchors itself to the ground. No more mooring masts. **Ω**

Get ready for airship hybrids

By Linda Ball

To help address the problem of bringing heavy equipment into regions with poor infrastructure, Lockheed Martin Aeronautics has been working on developing a hybrid airship for more than 20 years. This week, they have announced a breakthrough. Hybrid Enterprises, LLC, acting on Lockheed Martin's behalf, announced at the Paris Air Show that it will be taking orders for this new class of aircraft with delivery as soon as early 2018.

More than two-thirds of the world's land area and more than half the world's population have no direct access to paved roads. The airships would be the answer for affordable and safe delivery of cargo and personnel anywhere, weather permitting, with little or no infrastructure. "Lockheed Martin's Hybrid Airships will significantly reduce the cost and environmental impact of remote operations, making it possible to reach locations previously thought inaccessible," said Rob Binns, CEO of Hybrid Enterprises. Burning less than one-tenth the fuel of a helicopter per ton, the hybrid airship will be much more sustainable. The technologies required for hybrid airships are already mature and have been demonstrated in-flight by Lockheed Martin's P-791, a fully functional, manned flight demonstrator. Orlando Carvalho, executive vice-president of Lockheed Martin, said all required planning steps for FAA certification of a new class of aircraft are completed, and the company is ready to start building its first commercial model. **Ω**

HISTORY

My (Brief) Blimp Experience

By Joseph H. L. Garrison, LCDR, USNR (Ret)

On 7 DEC 1941 I was a seaman at Pearl Harbor when the Japanese blew hell out of the place. Later I requested pilot training and was selected and completed the training. Since I had hoped to eventually fly for an airline, I had selected heavy aircraft and anti-sub warfare training. At the time I was advised that the Navy was recalling me to active duty, which was in November of 1952, I was attached to the American Embassy, Paris, France. I was travelling as a US diplomatic courier accompanying diplomatic correspondence across international borders worldwide and was preparing for home leave in the US. The state department advised me that I was key personnel and they would block the recall if I wished. I told them the recall was okay. When I arrived in the States, there was a registered letter recalling me to active duty at NAS Atlanta, GA, for one month. I was recalled as a LT (jg) but the personnel officer there said, "with that file number you can't be a LT (jg)." Two weeks later I was sworn in as a senior grade Lieutenant.

One month later I reported to NAS Norfolk where I was assigned to mobile FASRON 121, at NAS Oceana. There they were developing the concept of a mobile naval air station, and ascertaining the rank/rate and number of personnel and the equipment that would be required for such. We deployed to the Caribbean several times to develop the concept. After two years with mobile FARSON 121, I requested helicopter training. I was advised that they would not give me helicopter training but instead would give me blimp pilot training in anti-sub detection, as I had been previously trained in HTA during WWII. Upon completion of my blimp pilot training in June 1955, I was assigned to ZP-1 at Weeksville, NC. I was only involved with blimps a short time, but was involved in some unusual events during that time.

In the fall of 1955 I was wearing headphones when the CO called Harrisburg radio for clearance on the airway west to Akron on a hurricane evacuation flight as we approached Harrisburg, PA.

ZP-1 CO: "Harrisburg radio, this is 1 Peacemaker with

five blimps for clearance on your airway west to Akron."

Harrisburg radio: "1 P, you have five what! ?!"

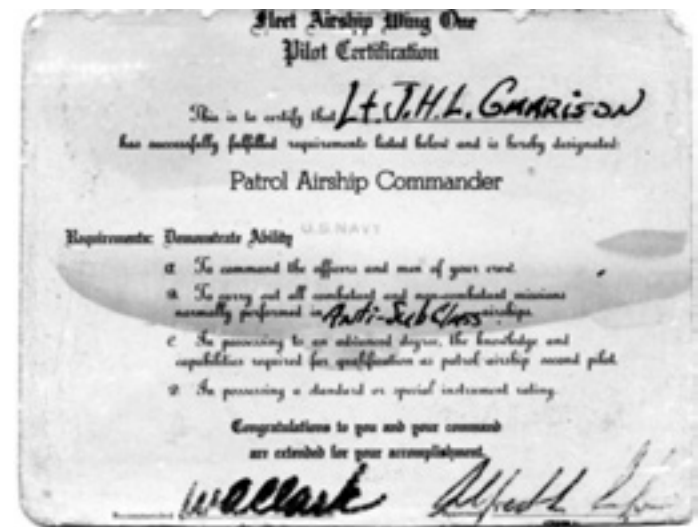
ZP-1 CO: "I have five navy airships for clearance to Akron on a hurricane evacuation from Weeksville, North Carolina to Akron, Ohio."

Harrisburg radio: "1 Peacemaker, have your airships climb to 9,000 feet to proceed west."

ZP-1 CO: "My airships can't climb to 9,000 feet."

Harrisburg radio: "1 Peacemaker -- then your airships cannot go west."

ZP-1 CO: "All airships are equipped with radar. We will maintain our own clearance and separation... Please advise aircraft traveling overhead that there will be navy blimps below. Out."



During ZP-1 deployments to Guantanamo Bay, Cuba, I participated in both the 1956 and 1957 deployments. Customarily the return from Cuba was an overnight stay in Glynco, GA, but on the 1956 trip, one blimp commander decided to fly up the 75th parallel of longitude from Guantanamo Bay to Weeksville, NC, he invited me along for the ride. The flight was uneventful and as I recall took 33 hours. The only exception was that about 500 miles off the Carolina coast the port engine coughed a few times. The command pilot said, "Cough you s.o.b. not another drop."

In January of 1957, I flew as co-pilot on the blimp that filmed Eisenhower's 2nd inauguration. The Department Of Defense photographer kept saying, "Get lower!" but we had to tell him that the secret service told us that they would shoot us down if we went below 1,000 feet over Washington. We would make a touch and go landing at Anacostia for him to throw out the film reels. We never saw any of the

photos taken because the 11 o'clock news was over by the time we got home.

In the spring of 1957 I was designated as a command pilot, and later that spring the whole squadron worked with the *Nautilus* off Lakehurst, NJ. The exercise was cancelled one day early and some of the blimps had excess gasoline aboard for the trip back to Weeksville. I was flying Peacemaker 6 and shortly after takeoff I heard: "Any or all Peacemaker airships. This is Peacemaker 2. Come in please." Since none of the other airships responded, I said, "This 6 Peacemaker. Go ahead 2 Peacemaker." 2 Peacemaker said, "On takeoff I think I broke my right rudder cable." My response was: "2 Peacemaker what is your current location?" 2 Peacemaker responded: "I am approaching Cape May, NJ." I responded: "I have excess gasoline aboard and will accelerate to catch up." About 20 minutes later we were a few miles behind 2 Peacemaker nearing Lewes, Delaware. We approached 2 Peacemaker at a higher altitude and could see his right rudder cable streaming aft. "2 Peacemaker, this is 6 Peacemaker. The 'notice to airman' today says that the coastal firing range that you are approaching is active today. Do you intend entering that firing zone?" "6 Peacemaker this is 2 Peacemaker, I don't have any choice. This airship is uncontrollable and constantly making turns to the left. My right engine is idling while my left engine is operating in the redline which is the only control I have." "2 Peacemaker, this is 6 Peacemaker. Forget about the redline. If the engine doesn't blow up they can change it when you get back to Weeksville. I will call coast artillery and ask them to hold fire until we clear their zone." "Coast artillery this is Navy Airship 6 Peacemaker, is your firing zone active today?" "Navy Airship 6 Peacemaker, affirmative." "Coast artillery, this is 6 Peacemaker. I am escorting a disabled airship with a broken right rudder cable who is consistently making turns to the left. Please hold your fire for another 30 minutes until we clear your firing zone." "6 Peacemaker this is coast artillery. Wilco."

As we came abreast of navy Chincoteague, 2 Peacemaker made an uncontrollable turn to the left and headed out to sea. A crewman came to the cockpit and said: "Do we have to stay with that blimp all the way to Weeksville?" I knew that we had been gone a

week, so I asked the man to look at that blimp (then about 3 miles off shore) and tell me if he would want us to stay if he were aboard that blimp. He walked away without answering. Then, I called Norfolk Air-Sea Rescue and asked them to stand by. They asked how many men were in the water. I advised them, none; the airship was still airborne about 3 miles off Navy Chincoteague.

We approached Navy Oceana, where jets were involved in night flights. I requested they close the field until we passed, because 2 Peacemaker was making uncontrollable turns to the left because of a broken rudder cable. Navy Oceana told all jets the field was closed for landings, and for emergencies to land at Navy Norfolk.

The landing at Weeksville was uneventful. The surprising part about this flight is that with four other blimps in the air, none of them heard any of the radio communication with either 2 or 6 Peacemaker during this flight. Not hearing 2 Peacemaker was understandable because he was traveling at 200 feet, expecting to ditch at any time, but 6 Peacemaker was using VHF and traveling at 500 or 600 feet altitude.

On 1 July 1957 ZP-1 was decommissioned and the blimps were later returned to boxes. I was released to inactive duty. On 1 Sept. 1957, I was promoted to LCDR. Ω

Ed. caption: A "4K" (ZSG-4) airship on station. The approximate positions of the interior ballonets are illustrated with dotted lines.



The Aërial Battleship

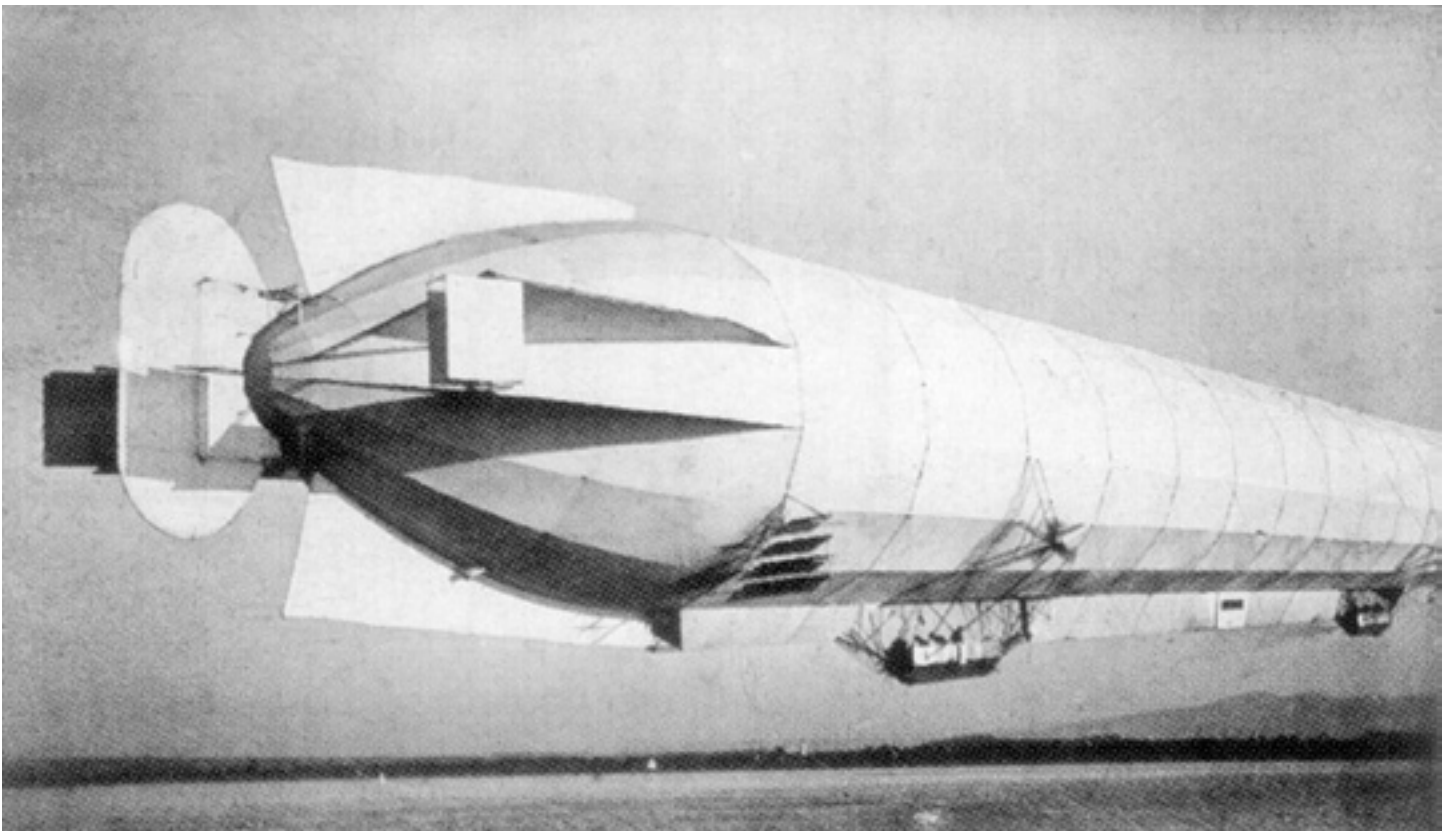
Research and drawings by Herman Van Dyk

The early years of the 20th century were years of armaments races by the great powers in Europe. Tensions between the countries were continually rising and preparations for war were made by most countries. Experimental airships were built in England, France and especially in Germany. Each new airship was an improvement over its predecessor; most went to the military forces. Airships, at that time, were not really considered to be very vulnerable to any fire hazards. (*Hindenburg* was still far in the future.) Airships were not yet threatened by enemy forces; antiaircraft guns did not exist, and airplanes did not have the necessary performance to engage airships in flight. Small arms fire could put bullet holes in the gas chambers, but it would take many hours to have an effect on the airship's performance. Carl Dienstbach and Thomas MacMechen had come to the conclusion that a well-equipped airship might be the deciding factor in any military conflict, like a battleship of the Navy might be at sea. Dienstbach was a journalist from Baltimore and well known as an expert on airships. MacMechen was the president of the Aeronautic Society of America and founder of the "American Aeronaut."

Dienstbach and MacMechen had decided to design this "Aerial Battleship" at the end of 1908, early 1909. They based their design on the world's largest and most modern rigid airship, Zeppelin II (LZ5). It had a length of 472 ft., a diameter of 42.6 ft. and a volume of 529,650 ft³. (*Photo below: LZ-5, August 1908, shown with its late-added rudder.*)

The construction of the "Aerial Battleship" followed Zeppelin practice and consisted of an aluminum framework of 16 longitudinal girders and an external keel, all interconnected by transverse frames. The keel, which ran from bow to stern, was equipped with three almost identical cars. The forward, as well as the rearward car both carried one of the two engines. The propellers were placed high on both sides of the envelope and were driven by long drive-shaft's, which ran on the exterior of the envelope to the engines in the cars.

On both sides of the envelope, close to the stern, were two large parallel planes called "stabilisers" for horizontal flight. In between them were a number of small vertical planes which served as rudders. Between the stabilizers and the rear propeller was a set of small elevators, similar to the rudders.



On both sides of the envelope, between forward car and bow, on top and in the center of the envelope, were a machine gun and an electric searchlight. They were accessible from the center car through an airshaft. The shaft, leading up from the center car, also gave access to the antenna of the wireless telegraph. On each corner of all three cars were machine gun sponsons. Between the center and the rearward car, and also between the center car and the forward ones, were an additional four open machine gun positions in the keel.

The bow and the stern were each equipped with electric driven gun turrets. A vertical slot in the turret allowed the gun to be elevated or lowered. A small open platform on top and in the center of the envelope allowed for the installation of another machine gun and an electric searchlight, also accessible from the airshaft from the center car.

A second electric searchlight could be lowered from the front car. It was suspended from a wire and built into some sort of a "cloud car" equipped with a large vertical plane which prevented any spinning by the slipstream. The individual gas chambers were suspended by netting which transferred the lifting forces of the hydrogen to the aluminum framework. Wires attached to many points of the transverse frames and running to the opposite points formed a separation of the different gas cells. The center car was also equipped with a small set of signal flags. (It is not really clear why, or what kind of message the Aerial Battleship would pose to the enemy far below: "Give yourself up or I drop a bomb?")

In addition to the 19 guns carried by the Battleship, there were a few air torpedoes. These were to make up for the lack of large bore ammunition. The recoil of a large caliber gun could damage the light framework, while the large exhaust would pose a fire hazard for a Hydrogen filled airship.

Air torpedoes were a new weapon. They were fired from a tube and driven by compressed air. The tube would bring the projectile in a spinning motion to improve chances of a straight flight. (Not much became known about this weapon.)

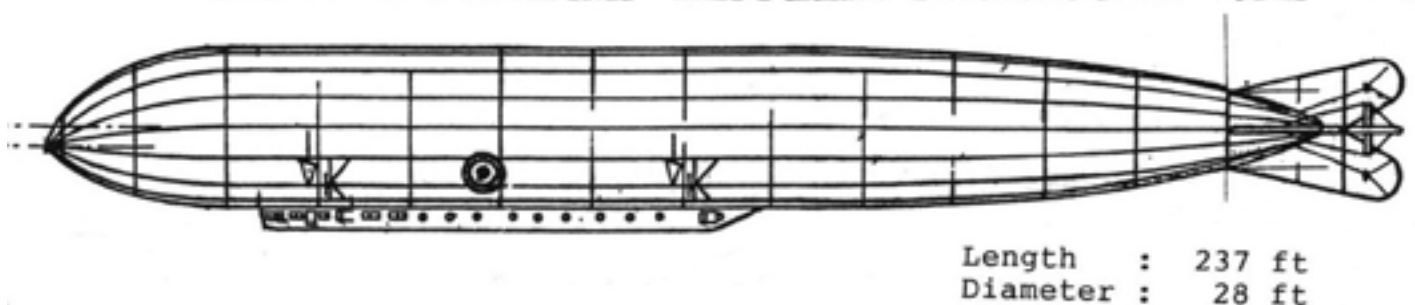
All service centers in the airship were accessible by the keel, such as: engines; fuel tanks; water ballast bags; bomb load; 19 guns with their ammunition; air torpedoes; and, an electricity generator powering the searchlights and the electric gun turrets. It seems to be a very big load to be moved by only two engines.

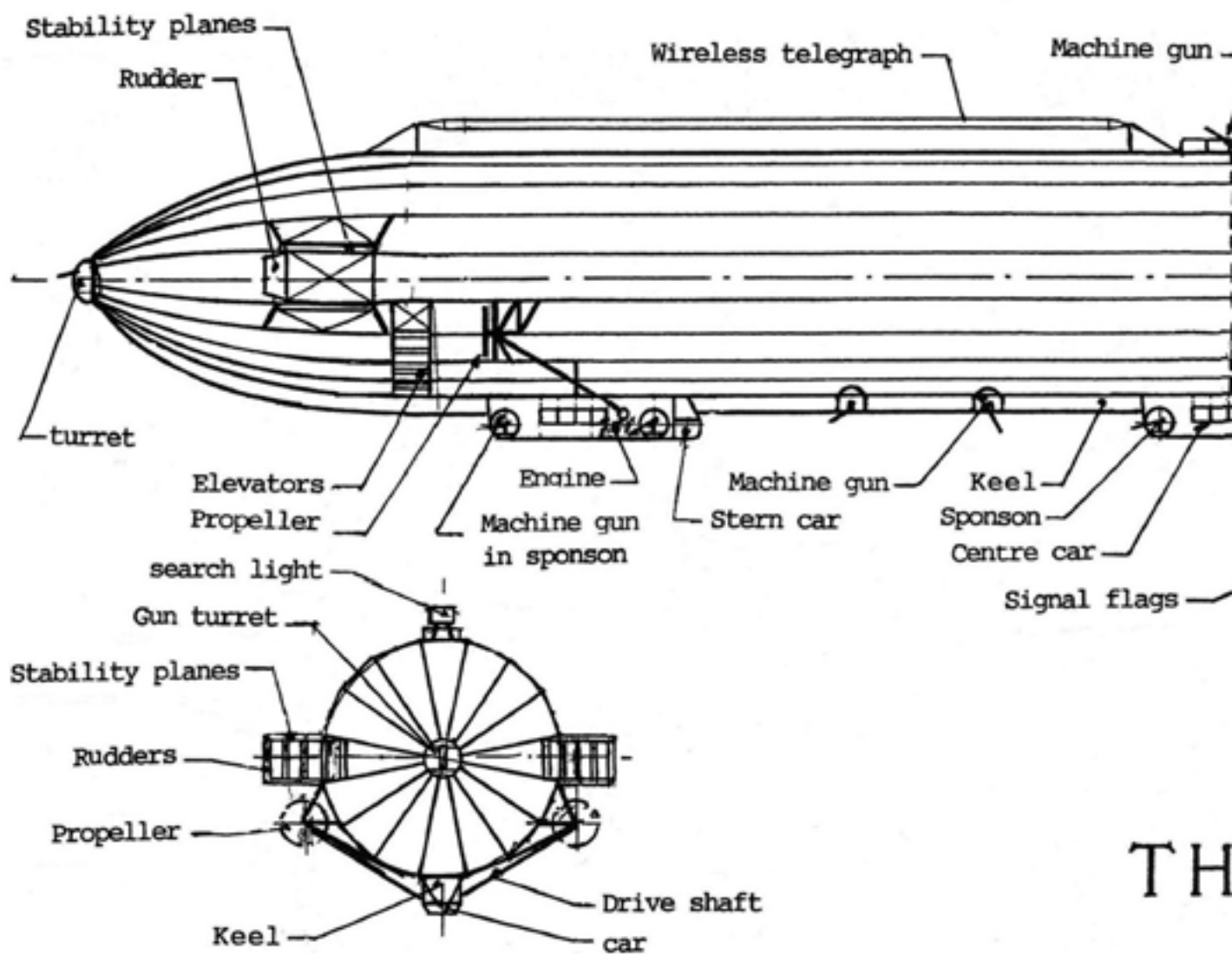
The Aerial Battleship was never built, but it was not the end of MacMechen's interest in airships, as we will see.

WWI broke out in 1914 and the performance of fighter airplanes in speed and altitude was far below of airships. However, another two years later this situation had reversed. Also, anti-aircraft guns had tremendously improved and were a real threat. An Aerial Battleship would no longer make any sense. However, MacMechen, with a new partner, Walter Kamp, an engineer, were in England negotiating the construction of another new kind of airship. It was the opposite of the Battleship, being a small, fast and very maneuverable airship fighter. It could fly up to an enemy airship, over it, under it, or around it like a bee around a sunflower, firing its machine guns from close quarters. MacMechen called this creation a "Zeppelin Destroyer." Erection of a building shed started in 1914, followed by the construction of the first "Destroyer." It had a length of 237 ft. and diameter of 28 ft. (shown below; for a full-sized drawing, see *The Noon Balloon* No. 80, Winter 2008, for "The Zeppelin Destroyer" by Herman Van Dyk.)

It is rather intriguing to consider what might have happened if the "Battleship" and the "Destroyer" would have met in battle! Ω

MACMECHEN-KAMP ZEPPELIN DESTROYER 1915

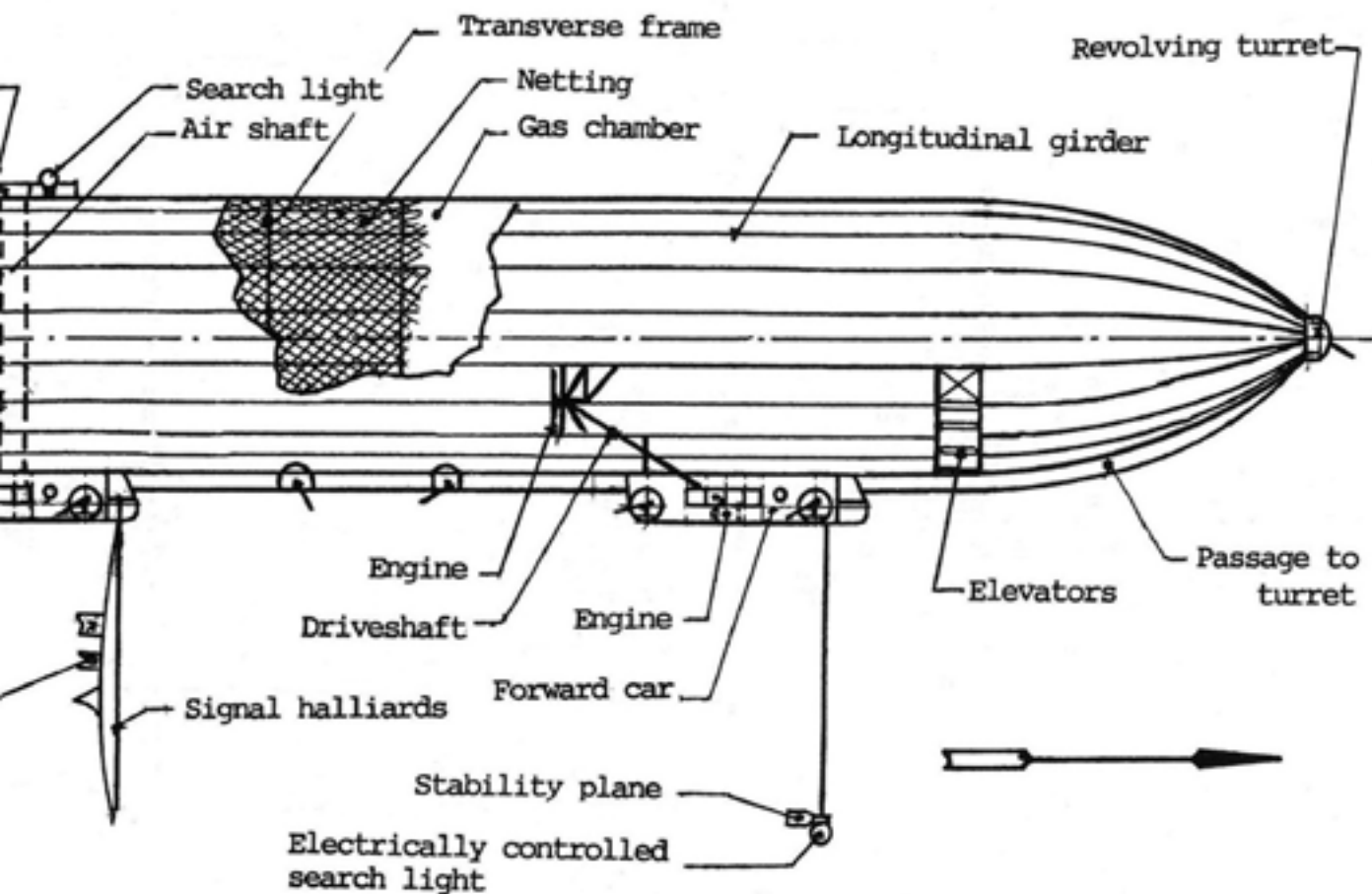




TH

CARL

The original drawing was made by G.A. Coffin in 1909.
It was redrawn for clarity by H. Van Dyk in April 2014.



THE AËRIAL BATTLESHIP

BY

L. DIENSTBACH AND T. R. MACMECHEN, 1909



Naval Airship Airborne Early Warning Squadron One (ZW-1) By Ross Wood

I have been asked to remember 57 years ago, early Jan. 1958, when I reported for duty at ZW-1, Naval Airship Airborne Early Warning Squadron One, NAS Lakehurst, New Jersey. A year & a half earlier, in June 1956, I entered flight training at Pensacola, Florida, as a Naval Aviation Cadet (NavCad). Half way through a multi-engine program, flying the SNB, twin engine Beechcraft, I was assigned to NAS Glynco, GA, for the final phase of fixed wing training. Upon completion I received my officer's commission, and my Navy "Wings," and also married my college sweetheart, Ileana - all on the same day! I immediately began Airship training, flying a K-ship, some 450,000 cu. ft. in size. From my first flight I enjoyed the airship. Prior to entering the Navy, I was an avid sailor, sailing a variety of sailboats, as skipper and crew, in the Seattle, Washington, area. Airships, to me, combined many attributes of sailing and flying.

At the completion of airship training I was assigned to ZW-1 at NAS Lakehurst, NJ. The airship training ended in mid-Dec. 1957. I was to report to ZW-1 the first week of Jan. 1958. Ileana & I took a two-week vacation - a belated "honeymoon," and in our new 1958 Volkswagen Bus, drove to Mexico City and back, a great trip. Upon our return to Brunswick, Georgia, we packed all our belongings in the VW bus. The morning of our departure we awoke to find two inches of snow on the ground - unheard of in southern coastal Georgia. Thus began an agonizing trip north. This was one of the biggest snowstorms, in history, to hit the eastern seaboard. What should have been a fairly easy two-day drive to Lakehurst,

turned out to be a three-day marathon. To complicate things, Ileana came down with the flu the day we departed. I made a makeshift bed for her on top of all our belongings in the main part of the "Bus." At the start of the second day, I was able to find an M.D.'s office in a small town. Ileana got a shot and some pills and began to recover. Just one story, tells you how bad this storm was. A fully loaded Greyhound Bus had to stop at a Howard Johnson Restaurant because driving conditions were so bad. They did not leave for 48 hours & felt fortunate to be where they had food, restrooms, and booths to sleep on. The trip from Washington, D.C., to Baltimore, normally takes about 45 minutes. It took us 10 hours. Cars in the Baltimore tunnel could not move forward or back, and simply idled their engines, for warmth, until they ran out of gas. A fully loaded VW Bus is a great snow vehicle. I pulled off the Interstate and drove on back roads until we were clear of Baltimore. We were fortunate to find a motel for the second night. On the third day we finally arrived at NAS Lakehurst. At the Main Gate, I received instructions from the Marine guard as to finding ZW-1. ZW-1 was in Hangar 5. I walked in the door and saw a site of total chaos. There were three or four ZPG-2s in the hangar, as well as many fire trucks and other emergency vehicles. One of the ZPG-2s belonging to ZW-1's sister squadron ZP-3, had collapsed on the hangar deck. During the height of the blizzard, snow had come through the ventilation louvers in the overhead, and accumulated on top of the airship. A decision was made to try and wash the snow load off, with fire hoses. The water froze on top of the envelope, creating more weight, and eventually the envelope ruptured, the landing gear collapsed, and the ship was on the hangar deck, never to fly again. As the storm frontal system passed Lakehurst, the temperature dropped sharply. All the water that was pumped through the fire hoses froze on the hangar deck. I found the ZW-1 Squadron Duty Officer, and tried to check in. The SDO asked if I was married. He then said, "I'll log you in, but try and find a place to live, and check back here in 3 days." It sounded like a reasonable suggestion, so Ileana and I began to navigate around Toms River, New Jersey, to see what was available. The snow was a foot and a half deep. We found a two-bedroom house in a wooded

area, at reasonable rent, and got unloaded. The big military commissary was at Fort Dix, 25 miles west of Toms River. With the current conditions it would have taken us several hours to make the trip. We bought the necessities at the local supermarket. The next morning I reported for duty.

Before beginning my story at ZW-1, I would be remiss if I didn't relate, briefly, the history of ZW-1, beginning in Jan. 1956. ZW-1 was the first USN early warning aircraft unit comprised of airships. The first C.O. was Commander Lawrence Mack. The squadron had 8 officers and 45 enlisted men. The men were specifically trained to accomplish an essential mission – detecting enemy aircraft & submarines by electronic measures and providing the Atlantic Fleet and shore services with all-weather early warning services. I would interject here, a personal opinion, that performing AEW, airborne early warning and anti-submarine surveillance were not compatible. Which is why we had a sister squadron, ZP-3, whose sole mission was ASW – anti-submarine warfare.

Commander Mack was relieved by Commander William Hartman in March 1957. ZW-1 became operational in July 1957 and was assigned the mission of manning an AEW & Control Picket Station in the Eastern Air Defense Force contiguous radar barrier system. Initially this command alternated this station with U.S. Air Force AEW Forces, flying Lockheed C-121WV's. ZW-1's station was approximately 200 miles east of the N.J. coastline at an altitude of 1,500 feet. The Air Force C-121WV's were another 100 miles out, at an altitude of 7,500 feet. On occasion, SAC, would fly low-level attack missions, in B-47's, from the Azores, toward New York. For some atmospheric reason, the Navy Airship, at 200 miles out and 1,500 feet, would pick up a radar return on the B-47's, before the Air Force "Willy Victors" would pick up the target.

On October 18, 1957, ZW-1 was authorized an allowance of 62 officers and 302 enlisted men. The operation and maintenance of airships calls for special skills on the part of the Navy's aviation specialists, pilots, controllers and men of ZW-1. The pilots, besides having to be checked out in all phases of lighter-than-air flying and ground handling, must also maintain proficiency in heavier-than-air aircraft.

To that end, during my time at ZW-1 we always had a minimum of four Beechcraft SNB's on the flight line and most of the time, a Douglas R4D transport was available, more about that later.

The Naval Aviation Observer, NAO, (Controllers) are officers who have been qualified in Navy and Air Force controlling procedures for fighter interceptors. They also command the Airborne Combat Information Center – CIC – aboard the airship. This is really the "heart" of the AEW platform. Our controllers were trained at NAS Glynco and an Air Force School at Yuma, Arizona, using F-86's and F-89's. F-101's & F102's were used in the NY Air Defense area.



The Aviation Structural Mechanic is trained specifically to work on the helium "envelope" itself. The ACW is an Air Controlman who is trained specifically in airborne early warning procedures. The remaining members of the airship are comprised of Aviation Electronic Technicians, Radiomen, and Aviation Machinist Mates.

CDR Hartman was relieved as CO in March of 1958 by CDR Charles A. Mills. In December 1958, ZW-1 was visited by Vice Admiral W.L. Rees, Commander Naval Air Force, U.S. Atlantic Fleet, who commended the squadron for its outstanding accomplishment of meeting its commitment to NORAD since its date of commissioning. The squadron holds the distinction of being the only naval aviation organization that works in conjunction with the U.S. Air Force's SAGE (Semi-Automatic-Ground-Environment) Centers. CDR Mills was relieved

in March 1959 by CDR Benjamin B. King. The squadron then boasted a compliment of more than 80 officers and 300 enlisted men. In 1958 the squadron won safety awards CNO, COMNAVAIRLANT, and COMFAIRSHIPWING ONE for an aviation accident free record for fiscal year 1959.



The ZPG-2W, a 340-foot, one million cubic foot airship, was the principle “weapon” of ZW-1. Built by the Goodyear Rubber Company, it proved to be a stable and reliable platform for the airborne electronics used aboard the AEW aircraft. The squadron accepted the first of four new ZPG-3W airships on December 18, 1959.

The ZPG-3W flew its first operational early warning barrier flight on 20 February 1960. The 3W had a volume of 1,516,000 cubic feet, almost half again larger than the airship it replaced. Its electronics equipment was far superior to the older 2W airship. CDR B.B. King was relieved on April 1, 1960, by CDR Clement G. Williams.

ZW-1’s mission, pure and simple, was to keep an airborne radar platform, on station, some 200 miles east of the New Jersey coastline, at an approximate altitude of 1,500 feet, 24 hours a day, 7 days a week. We were an essential part of the New York Air Defense system. As shown above our radarscope watchers, in the CIC compartment, would track all inbound air traffic to the New York – New Jersey area. We had controllers in CIC who were trained to run intercepts with F-101’s and F-102’s from Air Force bases in New York and New Jersey.

As a Junior Officer and Pilot, my initial task was to get as much flight time as possible in the ZPG-2W

airship. With 80 officers in ZW-1 there were a lot of people to meet and names to memorize. It’s not fair for me to single out ZW-1 as a squadron with a large variety of personalities, career paths, and attitudes, but it’s hard to deny it, either. We had people who loved to fly, who hated to fly, who had been in the Navy early in their life, and gotten out, and then came back, who didn’t like airships, or were so dedicated to them, that it impeded their career. I have a quote hanging in my den, from Richard Van Treuren, Editor of the “Noon Balloon”, the outstanding quarterly publication of the Naval Airship Association. It refers to the NAA Membership and says “We have plenty of sensitive egos and abrasive personalities, so we are right in line with LTA History, itself.” But, having made these observations, I loved being in ZW-1, and made many lifetime friends while I was there. People that you went out of your way to avoid, were few in number. The Navy was not going to be my career, but I loved to fly, and couldn’t believe my good fortune in having a Twin Engine Beechcraft that virtually had my name on it, as well as flying the largest non-rigid airships that had ever been built. To this day, when I explain to folks what I did in the Navy, I say, “you know the blimps you see over a golf match, well they are about 180,000 cubic feet in size. The ships I flew were 1 and a half million cubic feet”. This always gets their attention.



Following a “barrier flight” the crew had four days rest. Being one of the married crew, I always looked forward to spending time with my wife, going up to New York for a day or two, etc., but the lure of flying the SNB twin engine Beechcraft, was hard to resist. All of our Squadron C.O.’s had the same message. Fly the SNB whenever you can, go where you want, but stay east of the Mississippi River. Wow! Interestingly enough, there were quite a few pilots in the Squadron, who really had little interest in HTA flying. My collateral duty, in addition to being a PAC, was Assistant Flight Officer, which meant that I needed to round up any officer who did not have his four hours of HTA flight time, in a given month, and get him into the right seat of an SNB for those four hours. It usually involved flying somewhere two hours away, landing, having coffee and a burger, and flying back to Lakehurst. Fortunately, there were several LTJGs like myself who loved to fly and we would pair up for flights to Miami, New Orleans, Memphis, Jacksonville, Orlando, Buffalo, Detroit, etc. There was also the squadron lobster flight. About every two months we would announce a lobster run, collect orders from anyone in ZW-1, fly to Brunswick, Maine, buy all the lobsters and assorted seafood requested, return to Lakehurst, and distribute same, at the end of the day. We also had a R4D assigned to the Lakehurst base, which was available to qualified pilots. One of the avid pilots in ZW-1, LT. Tom Ray, with a lot of time in the R4D, use to take me along, in the right seat, for local flights. I accumulated about 40 hours.



Anyway, back to the main subject. Keeping a ship on station 24/7 was a major task. When I arrived at ZW-1 we had four ZPG-2W’s. Our standard “barrier” flight was 36 hours, roughly six hours to our station, 24 hours on station, and six hours back. From a practical point, we were usually on station within four hours after takeoff. We did not leave station until our replacement ship was on station. Takeoff time was at 1000 hours. In order to get to the takeoff point, on time, the crew had to assemble in the Ready Room by 0600. On my flight day, I was up at 0400 and at the base by 0530. Every member of the crew had certain responsibilities. In good weather, pre-flight was fairly easy. In the dead of winter, in N.J., life could be a bear. The winter flight suit and boots we were issued became essential. I won’t say that we never missed a scheduled departure, but there were a few times when the “wheels came off” and we had to salvage what we could of the schedule. Shortly after I qualified as PAC – Patrol Aircraft Commander- I had an accident occur on station that required immediate return to Base.

Our crew the AD-1, Machinist Mate 1st Class, the man who kept the engines running, had one engine shut down, which was not unusual, and had the gear box associated with that engine, open for inspection. On the 2W, with one engine shut down the remaining engine could run the gearboxes, generators, etc. for both engines. Somehow, he got sucked into the gearbox, when his flight suit got caught. He suffered some serious damage to his abdominal wall, was losing blood and in considerable



pain. Other crew members closed the gearbox and restarted the engine. As I was instructing our radio operator to advise the Squadron that we were leaving station, I was going to maximum continuous power on both engines. CIC also advised NY Air Defense of our departure. We typically would pick up seawater, in a 1,000 lb. neoprene bag, at the end of a high-speed winch wire, pumped into special tanks, before heading for home. This allowed us to arrive at Lakehurst 1,500 lbs. heavy – the perfect landing weight. With no time for that, I had to violate a cardinal airship rule – never valve helium overboard. Had no choice but to valve helium for a full minute to get to a barely heavy condition. The landing party was ready for us, and my AD1 was rushed to the hospital at Fort Dix, where he survived & was able to return to flight status in a few weeks. As we were returning to Base, the Squadron was scrambling to get a replacement ship and crew airborne. This was an unusual event, but it illustrates one of the extreme conditions that could occur.

As a follow on to what I just related, this would be a good time to discuss normal takeoff and landing procedure. Starting with the Pre-Flight crew meeting, we would go about our preparations for a 1000 takeoff. The assigned ZPG-2W would be on the mast at a mooring circle. The ship would be fueled for a 56-hour flight, even though our standard “barrier” flight was 36 hours. A fully fueled ZPG-2W would have 3,000 gal. of 91-96 octane fuel, weighing close to 18,000 lbs. Factoring in the other provisions and crew weight, minus the lift of 1 million cubic feet of helium, would put the ship at approximately 10,000 lbs. heavy at takeoff. We would provision the ship’s galley for 56 hours for a 21-man crew. This was the responsibility of the crew “rigger” who also served as our cook. As PAC I would often accompany the rigger to mess hall to assist in getting the meals requested. The galley of the 2W was on the second deck of the car, about midway in the ship. There was seating for six and the galley was equipped with a decent stove and refrigeration.

The rigger of a flight crew does many things. Besides knowing the structure of the ship, he also runs the high-speed cable winch at the aft end of the car, used for seawater pickup to re-ballast the ship as

fuel is burned off. Prior to leaving the mooring circle, the engines are started and checked out by the AD1 Machinist Mate. All electronic and electrical systems are checked by the AT’s. The CIC Compartment with all the radarscopes and equipment is checked and running. All members of the crew are on board when the ship leaves the mooring circle, on the mast, towed by tractor, to the appropriate location on the mat. The mat is a round asphalt circle, seemingly a mile in diameter. Regardless of wind direction, the ship will be placed at the edge of the mat, giving maximum takeoff roll into the wind. Once the mast is in position, the long lines are carried out from the nose to a pair of “mules”, one on each side of the nose. The mules are large truck-like vehicles, with a large winch mounted just aft of the driver and winch operator. These were built by the Euclid Division of General Motors. They are used for both takeoffs and landings. Once the mast is taken away, the mules are the final stabilizing force, before the takeoff roll is started. The mule crew is highly trained to deal with any emergency. The long lines are actual rope lines, but the mule winches are loaded up with wire cables. In an emergency the winch operator can fire a guillotine that severs the cable. The firing mechanism is powered by a .45 caliber cartridge. A worse case situation, is for one mule to release the long line and the other mule unable to do so. I should also comment on the “top man” at the top of the mast. This is another job performed by a rigger – not the one in the ship, but one who is not flying that day. It is a demanding job, requiring skill and fortitude! With the ship in position, the Command pilot would signal the ground crew commander to release the nose cone from the mast and remove the mast. Once the mast was gone, takeoff clearance would be requested from Lakehurst tower, and at the pilot’s command, the AD1, kneeling before the cockpit instrument console, would start to bring the power up on both engines. At this point the long lines were tripped away from the mules and the takeoff roll commenced. With the engines at maximum power the ship accelerated across the mat, directly into the wind. At 45 kts. indicated airspeed the pilot rotated the nose and the ship would be airborne. Once airborne, the ship continued straight ahead to an altitude of at least 500 feet, at

which point a slow turn to port was initiated. An airship, just like a fixed wing aircraft can be stalled if the turn is too steep, particularly when you are 10,000 lbs. heavy. The initial turn would put us on a heading to the N.J. coast and on toward our offshore station. A standard departure procedure would take us over Toms River, N.J., and Barnegat Bay. The C.O. of ZW-1, CDR Charlie Mills, instructed the airship P.A.C.'s to fly east over Barnegat Bay, leaving ADM. C.E. Rosendahl's home to port. ADM Rosendahl was the overall Commander of the Fleet Airship Wings during World War II and was considered the most important LTA figure of the 1930s and 40s. The Admiral had a beautiful home on the north shore of Barnegat Bay. Charlie Mills was a personal favorite of ADM Rosendahl. Once we were clear of the N.J. coast, the entire crew concentrated on the mission, which was to come on station, relieving the off-going airship, and establish contact with the various controlling agencies. From a pilot standpoint, we stayed in a 50-mile diameter circle, roughly 200 miles at sea. Weather was always important, particularly in the winter months. The ZPG-2W was amazingly stabile, even in severe weather. On rare occasion, a big cold front out of the northwest could produce winds of 30 to 40 knots, or higher. Returning to Lakehurst could become questionable. Bermuda was set up with an airship mast, and as a last resort the airship could land there, at Kindley AFB. There was a Navy Base at the south end of Bermuda, but no airfield, so men and equipment would be brought up to Kindley to assist in the landing. No ship that I flew had to make the trip to Bermuda, but I was involved in a ground handling party that flew to Bermuda, to recover a ZPG-2, with a ZW-1 P.A.C., LCDR Claude Makin. He was airborne for 75 hours, requiring ground to air refueling & provisions, once over Bermuda, but with winds still too high to land on arrival. A story in itself.

Returning to the description of a typical "barrier flight", as the time approached to return to Lakehurst, it was necessary to pick up sea water and re-ballast the ship for the proper landing weight. As mentioned before, the ideal landing weight was 1,500 pounds heavy. It was necessary to calculate the weight of the ship, on station, and what the fuel

burn rate would be on the return to Lakehurst. The seawater pick-up could be fairly easy, or difficult, depending primarily on the winds at flight altitude. The rigger would, once again, be a key member of this event. Working from the rear of the car, at the clamshell doors, he would lower the 1,000 lb. capacity neoprene bag, on a high-speed winch, loaded with wire cable. The top of the bag, was held open by a titanium cross tree, which also was what the wire cable clipped into. The airship altitude was typically about 700 feet above the water. Assuming that the ship was fairly light, close to 1,000 lbs. heavy, and the wind was 15 to 20 knots, the rigger could drop the bag into the water, with an over



the water speed of 15 to 20 knots. The bag would typically "snag" a wave top, and pick up some water. At the next wave top it would be heavy enough to get a good amount of water.

With 700 to 800 lbs. of water the rigger would run the bag back up to the clamshell doors and with a two inch diameter hose and high volume pump, pump the sea water into ballast tanks. The process would then be repeated, which would usually give us sufficient ballast for the run to home base. Assuming that our replacement ship was on station, we would make the four-hour run back to Lakehurst.

Shortly before entering the pattern at Lakehurst we would do an in-flight weigh off of the ship. This simply involved reducing power and slowing the ship down to the point of a stall, typically around 30 knots indicated. Our final approach, typically from N.E to S.W would be at 35 knots. Approaching the border of the landing mat, I would reduce power to idle, touching down at 27-28 knots on the main landing gear, and allowing the nose to drop on the nose gear. The landing party would be off to starboard, several hundred yards ahead. The “mules” would be about 200 feet on each side of the car, moving at our speed. Two sailors, chosen for their ability to run, would sprint out and grab a long line, attached to the nose, and dragging on the mat. They would run the line out to their respective mule and hook up to the mule winch. While this was going on I would be bringing the throttles into reverse thrust and slowly applying power. Once stationary the Landing Officer would signal the mast to be brought into position and the nose pendent would be threaded into the nose cup. Using a small winch on the mast top, the mast rigger would bring the nose ball into the cup and lock it. At this point an APU – Aux. power unit would be hung under the nose of the car and the ship’s engines would be shut down. The flight crew would then disembark and all flight reports would be completed.

Everything I have discussed thus far relates to the ZPG-2W. It wasn’t until early 1960 that I began to fly the 3W. I was fortunate to receive my PAC rating in the 3W in March of 1960. In my opinion the 3W was an amazing ship. More of everything, power, lift, endurance. Takeoffs and landings were outstanding. I loved flying the 3W!

At this point I would like to comment about the politics of LTA in the late 50s and early 60s. The mission that ZW-1 performed, Airborne Early Warning, in the New York Air Defense sector was very successful. The problem was, the U.S. Air Force was getting the benefit and the Navy was paying the bill. ZW-1 was a very expensive squadron, with 80 officers and over 300 men. The ZPG -2W’s and particularly the 3W’s were not inexpensive. The “Carrier Admirals” in Washington were not that happy with the situation. Our sister squadron,

ZP-3, had even greater problems. With the advent of the nuclear sub, it became obvious that Anti-Submarine Warfare was entering a whole new era, and airships were not going to be part of it. There was a general sense, that if a ship was lost, it was not going to be replaced.

In mid June of 1960, my four-year commitment to the Navy was over with. I carefully considered all my options. I flew down to Washington and spent an hour with an Assignment Officer who tried to persuade me to stay in. He offered me an assignment in an Air Sea Rescue Squadron, NAS Barbers Point, Oahu, Hawaii, with helicopter training, and Grumman Albatross training, prior to reporting to the ASR Squadron. It was tempting, but my lifelong ambition was to be a stockbroker, with a major investment firm. As it turned out, I stayed in the Naval Reserve and ended up going back to Pensacola, Ellyson Field, for helicopter training, before ending up in an ASW Helicopter Squadron in Seattle, WA.

I was getting ready to leave ZW-1 at the end of June. I had been taken off the regular “Barrier flight” rotation. In my last week, one of the PAC’s, LT. Joe Saniuk, went on two weeks leave. C.O. Clem Williams called me in and asked if I would do one last barrier flight with Joe’s Air Crew 104. I, of course agreed, and it was a routine flight. Ileana & I & our first son, Tyson, left Toms River the 1st of July and drove to my parent’s home in Seal Beach, California. Walking past a newsstand on the morning of July 7, I saw the headline on a copy of the Los Angeles Times, saying, “Navy Airship Crashes, 18 Dead”. I was stunned and devastated by the news & immediately called friends at the Squadron who could tell me what happened. It was Joe Saniuk and his crew, the ones I had just flown with. It was one of the worst days in my life.

Much was written about the disaster, with Lundy Moore, doing the best writing in his section of the book, “The Airship Experience.” It was not only the death of 18 crewmembers, it was also the beginning of the end for ZW-1 and the Navy LTA program. Thanks to former Nan ship PAC and also NAA Past Pres. Herm Spahr for many of the unpublished photos accompanying Ross’s article. **Ω**

US Navy Airship Boundary Layer Control And Propulsion Improvement Work: 1959-1961

By Mark Lutz

Unexpected results of some internet searching led me to some reports, which reminded me of the photo below, of a ZS2G-1, bomb-bay-doors open, as seen in *Noon Balloon* 86, Summer 2010, page 30.



Our editor commented: “(The ship) ... was obviously streamlined, with smoothing fabric covering the nose battens...” Compare to below’s non-streamlined Glynco ZS2G-1 141567, photo taken in Bermuda on 14 Feb 1958.



Back in 2010, there was no known report on this streamlining work. Now, five years later, we have *several* reports! Sometimes an “information request” in *The Noon Balloon* eventually pays off.

Streamlining was part of a multiple phase improvement effort, possibly planned as early as 1954. Captain Marion H. Eppes, eventually Commander of NAS Lakehurst, was very enthusiastic about that streamlined ZS2G-1, and associated wake recovery propulsion work. He wrote the following to the Chief of Naval Operations in a now declassified memo dated 11 September 1959:

“At this moment.... there is in progress, a research project which has promise of providing a breakthrough in airship design which could be of

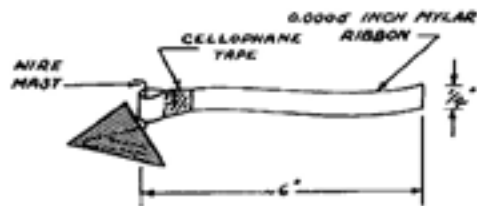
great significance to the Navy. This is an investigation of boundary layer controls, being prosecuted under ONR contract by Dr. August Raspert, Mississippi State University, the results of which have already indicated the practicability of a relatively simple “wake recovery” system that could dramatically increase speed, range, and maneuverability of an airship. This project offers the potential of a marked increase in the Navy’s ASW capability at a very cheap price. My purpose in mentioning it, is to recommend most urgently, that this development be given the fullest T&D support, even if other phases of the (LTA) program should suffer thereby.”

Dr. Raspert was a renowned authority on slow flight and boundary layer control. Raspert was hired by Mississippi State to start the new Department of Aerophysics and improve the school’s image. Raspert set up a flight lab there in 1948. Among other things, Dr. Raspert pioneered the use of suction to delay separation of boundary layers from aircraft surfaces. Raspert died on April 27, 1960, age 45, in the crash of an experimental light plane he was piloting. The airship streamlining work was still in progress. Raspert’s students carried on the airship work. They also continued his light airplane work, culminating in the mid 1960s in the US Army XV-11A, an STOL plane with active suction control of its boundary layer, and a ducted propeller driven by a turbine engine. Mississippi State University’s Flight Research Lab is now called the Raspert Lab.

The 1959-1961 Airship Boundary Layer work was done for the Office of Naval Research in a number of phases, resulting in a number of separate reports. Mississippi State Aerophysics Dept., AT&D at Lakehurst, and Goodyear, each did part of the work. The streamlined ZS2G-1 was also the only ZS2G-1 still flying in 1960. It was available when Princeton Prof Hazen proposed flying wind tunnel work, and was used for this work until a larger ZPG-2 became available. Flying wind-tunnel work got the streamlined ZS2G-1’s photo into “Aerospace Engineering”.

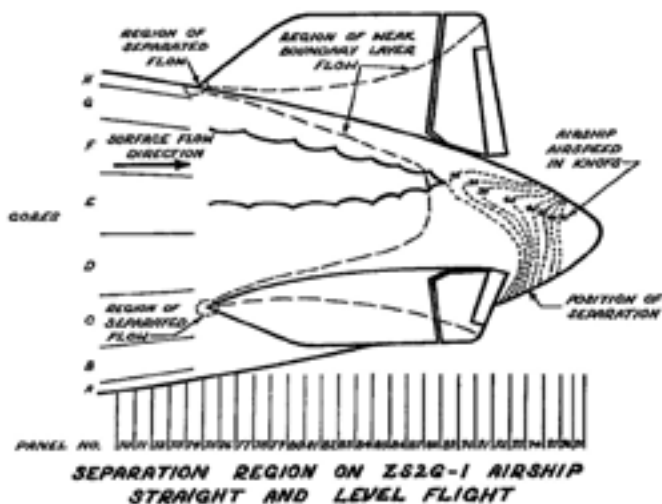
PHASE-1 of the streamlining work was a survey of the airflow around the gas bag, rear fins, and rudder, done by attaching 2,200 Mylar “tufts”. The “tufted” airship was photographed in flight from a helicopter; and the photographs examined to determine where

the boundary layer was separating, and get an idea of its thickness. This work was reported in MS State Aerophysics Dept. Research Note 6, 10 June 1959. Parts of Note 6 appear in another report (ref 1).



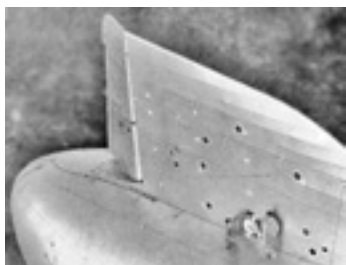
SKETCH OF TUFT DEVELOPED FOR AIRSHIP BOUNDARY LAYER RESEARCH

Analysis of the photos of the “tufts” on the flying airship resulted in the drawing below, of areas of flow separation, in the tail. Airspeed ranges L-R from 25 to 70 kts., in 5 kt. increments. Panels are 70 to 97.



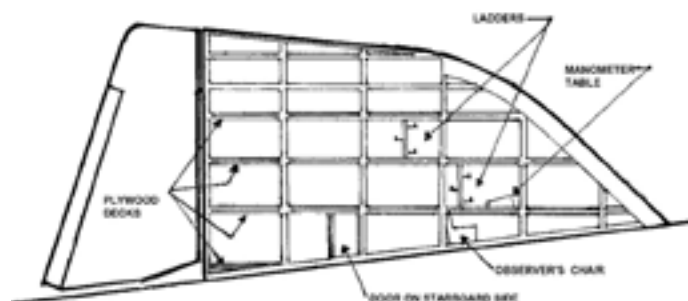
PHASE-2: Measurement of the air speed and pressure in the boundary layer of the flying ZS2G-1, by pressure rakes extending up to 10 feet out from the envelope, equipped with 15 total head probes, and 5 static pressure probes. Measurements were taken along the length of the envelope, approximately 30 degrees from the top, at (panels?) 10, 20, 30, 40, 50, 60, 70, 80, 90, 96 and speeds 35, 40, 50, 60, 70.

PHASE-3: The ZS2G-1 upper vertical fin was modified to accommodate two observers in flight. The boundary layer was explored at various



points along the fin with a pitot-static wand, which was calibrated to give distance out from the fin surface. I think this explains the photo from page 30 of Summer 2010 Noon Balloon 86. In 2010, no one had a copy of the report on this instrumented fin. Five years later, we do. I suspect the fin was modified at Goodyear, in Akron, and photographed there with all the test ports for the pitot-static wand open. In testing, I think all the ports would have been closed (from the inside) except the one in use.

ZS2G-1 VERTICAL FIN MODIFICATIONS FOR BOUNDARY LAYER RESEARCH



Above is a drawing of the inside of the fin from Research Report #28, 18 Jan 1960 of the MS State U Aerophysics Dept. (ref 1): A Goodyear report, which may be for this same work, says “the (ZS2G-1) vertical fin was instrumented with approximately 150 pressure sensing ports that fed into suitable pressure transducers. Pressure data were recorded on 50-channel oscillographs during various flight maneuvers. The data was analyzed using an IBM 650 computer, and plotted, providing stability and control information.”

PHASE 4: payoff! ZS2G-1 drag reduced 22% by the following:

1. Nose battens covered- faired with fabric.
2. ECM antennae and mountings removed.
3. Man-line along top of bag removed.
4. Navigation light cabling flush mounted.
5. AN/APS-38 radome removed and opening covered and faired.
6. Fuel and ballast dump faired in.
7. External hinges on car bottom made flush.
8. Jack pads removed.
9. APU air intake scoop removed.
10. Anti-collision light moved to top of upper vertical fin.
11. All finger patches faired with aircraft fabric.

12. All external catenary cables faired with aircraft fabric.
13. Fin brace cable attachments enclosed with Fiberglas fairings.
14. ART-13, ARR-15, and APN-70 antennae removed.
15. Sonar fish well covered and faired.
16. Shark fin antenna removed.



This close-up view of the battens on a US Navy airship with no faring fabric gives a feeling for their aerodynamic roughness. 24 test flights of the streamlined ship of 45 minutes each, completed the measurements on the reduced-drag ZS2G-1. The result: the modified airship had 78% of the original drag. No wonder Lakehurst Officers told Flying Wind Tunnel's Princeton Prof Hazen this was a "sports model" airship! Suppose a service ZS2G-1 were streamlined – say by making the various antennas protrude into the envelope, instead of sticking out from it. Plastic or fiberglass "bubble" antenna housings sticking into the envelope could be flush with the envelope. Rough estimates are: Endurance at cruising speed would scale with 1/drag, thus increasing by 28%. Maximum airspeed would scale with 1/(third root of drag), so the ZS2G-1 maximum airspeed would increase from 73 to 79 kt. (An aeronautical engineer would probably do a more complete analysis.)

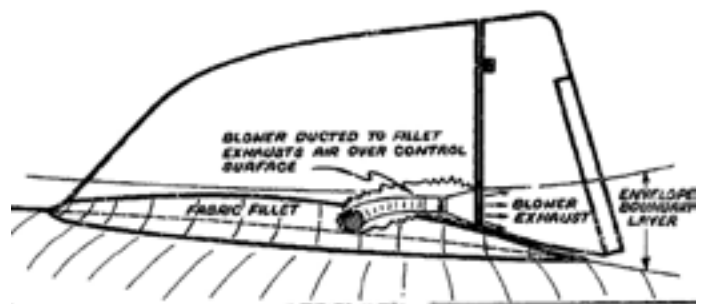
PHASE-5: Improve the separated (turbulent) flow at the intersection of the tail fins with the

envelope, again using the streamlined ZS2G-1 Airship. This is reported in MS State U Aerophysics Dept. Research Note #12, 1 November, 1960. (ref 3)

A fiberglass fillet fairing was designed which filled the sharp-angled 90-degree joint of the tail fin to the envelope, with a concave curve. Pressure readings were taken from a panel with 24 pressure gauges. Preston-type shear meters measured the frictional drag on the fillet surfaces. A 22-inch long "rake" with 19 total pressure tubes and 5 static pressure tubes was hinged to the fuselage and could be rotated within the wake.

In a second test, on a different fillet, made of fabric, a powered vacuum was applied behind the fabric, and the vacuum-exhaust air blown out toward the rudder's hinge (to improve control). The vacuum pump was a centrifugal aircraft supercharger driven by a two-cycle gasoline engine. Suction power required was considered high for the drag reduction measured. In addition vacuum conduction along the fillet was poor due to its narrow width. Vacuum testing was discontinued when a third fillet, an improved fiberglass fillet, showed good results.

In fact, the initial fiberglass fillet fairing actually had increased drag – a counter-productive result. The successful, re-designed fiberglass fillet fairing had a reduced leading edge radius, and tapered to a broad flattened trailing edge. Maximum drag reduction for the fin (not the entire airship) was 49%. This fin-to-envelope joint radius fairing was the last work with the full size operational airship. (ref 3)



PHASE-6: TWO PARTS: A) Wake-recovery propulsion propeller behind the tail, operating in the wake. B) A really radical suggestion: Completely remove the tail fins to eliminate their drag! The production tail fins contributed about 20% of the drag on the ZS2G-1. Of course something else would have to provide airship direction control, since the

rudders/elevators would be gone. These ideas were tested on models – never on a full sized airship.

PHASE-6A: Wake recovery. How might wake propulsion help? Here is an attempt at a simple explanation. Some of the air the airship flies through attaches to the airship and is pulled along with it; this is known as the boundary layer or slipstream. The air right next to the airship travels with it, but as you go out from the ship further into the air, that air travels less and less fast, until at some point, sometimes as much as 10 feet away from the side of the ship, the air is no longer affected by the airship's movement. To an observer in the ship, the partially moving air close to the airship appears to be flowing along the ship to the tail, where it leaves, flowing out behind the airship, and importantly, taking with it energy put into it by the engines. Can we take advantage of this energy leaving the ship in the wake?

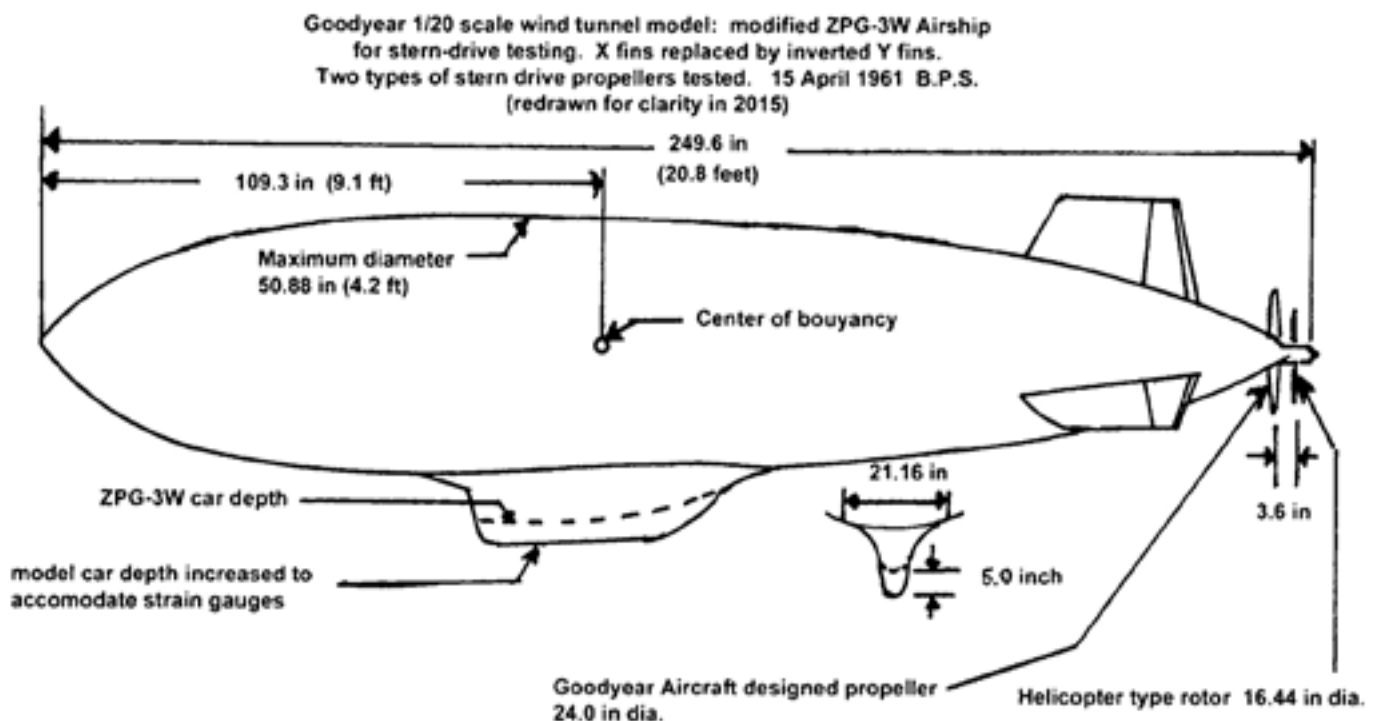
A conventionally mounted propeller, attached to the car, is operating in air some distance from that envelope – thus not in the boundary layer traveling with the airship. This car-mounted propeller has to first accelerate the air up to the speed of the airship, which takes power, but provides no propulsive force. Once the air is at airship speed, the propeller further accelerates it. This additional power then provides the propulsive force. A propeller operating in the stern, in the wake, is operating in air already accelerated up to

something approaching airship speed. Thus it doesn't waste energy just accelerating air up to the speed of the airship. That's a simple explanation, and where I'll stop. Of course an aeronautical engineer would consider a number of other variables in a complete mathematical analysis. One more point, though: wake recovery provides little efficiency gain at low airspeeds because there's very little energy in the wake. It becomes more beneficial as the airspeed increases.

PHASE-6B: Eliminate the tail fins to eliminate their drag (and the more difficult part – still control the airship's direction.)

The initial idea was to mount a helicopter type propeller behind the tail, and further to have the mount pivot – much like today's Osprey aircraft propellers. This should provide thrust in any direction, so as to achieve control without fins (and without the rudders / elevators on the fins).

By combining stern drive propulsion with drag reduction by fin removal, Cornish and Boatwright of Mississippi State's Aerophysics Lab calculated (theoretically) that the ZS2G-1 Airship would operate as if it had an effective drag just 42% of that of the production ship – an astonishing improvement. Perhaps this calculation was partly behind Captain Eppes' memo asking that Dr. Raspet's work be given full T&D support, even at the expense of any other phase of LTA.



PHASE-6 TEST: Goodyear built a 1/20 scale model of a ZPG-3W (20.8 feet long) with two different operational stern-drive propellers, and a “Y” tail. One propeller was a “Goodyear Aircraft” (conventional) propeller, and the other the tilting helicopter propeller. Report was issued 15 April 1961 (ref 4), the model was tested in the NASA full-scale wind-tunnel at Langley Field, Virginia.

The tilting helicopter rotor was designed by General Development Corporation, which handed off the design to Transcendental Aircraft Corporation. Transcendental employees approved the design of the scaled-down rotor Goodyear tested. Transcendental was formed by ex-Sikorsky Helicopter employees in order to engineer, build, and test a V/STOL aircraft very much like today’s Osprey. In wind tunnel tests on the stern-drive ZPG-3W model, the Transcendental rotor did not provide adequate thrust at its specified 17-degree blade angle and 5,000 RPM. Goodyear tried blade angles of 20, then 25, then 30 degrees, and also increased rotor speed to 8,000 RPM in an effort to develop the expected (and needed) thrust – no combination was adequate.

Goodyear’s stern mounted propeller, on the other hand, *did* increase propulsion efficiency 30% over that of a ZPG-3W with car mounted propellers. Goodyear said this would give a 30% improvement in endurance, and a 10% improvement in maximum speed, taking the ZPG-3W’s 82 knot max up to 90 knots. Endurance of 69 hours (at 45 knots) would go to at least 90 hours.

Goodyear suggested the stern propeller could use two production ZPG-3W engines geared together, or a single engine having twice the power.

Goodyear expected better crew performance due to reduced vibration and noise with the remote propeller and engine location. Goodyear car-mounted ballonet airscoops would no longer sit in the propeller blast, and would have to be replaced – perhaps by a continuously operating auxiliary blower.

PHASE-7: Try to improve no-fin airship control. Since the hinged helicopter-type stern propeller was not providing adequate control thrust, Donald Boatwright of Mississippi State’s Aerophysics lab proposed adding inflatable bumps or spoilers near the nose of the Airship. The Airship would be

fully streamlined until control was needed; then the “bump” would be inflated just as long as necessary.

Tests were made with a 13 foot long fiberglass model of a no-fin ZS2G-1 (1 to 22.3 scale) The model was tested by flying it mounted on top of the lab’s 1942 Beech AT-11. (An AT-11 is a 2-engine WW2 trainer for bomber pilots – the bomber’s equivalent of an L-ship) The test bump-outs were made of plywood, and attached or removed as required. (Please refer to photos.)



In this second photograph, I’ve drawn the (small looking) bump in its approximate size and location near the nose, per Boatwright’s report. You can kind of make out the mylar tufts or ribbons on the tail of the airship model, which give an indication of the slipstream back there. (This AT-11, N6251C, now belongs to Mike Allen of Sport Air LLC, in Star, North Carolina, and still flies. Beech restoration enthusiasts call it the “Blimp Beech.”)

As sometimes happens in R&D, the bump idea did not provide enough additional control, to the point that Boatwright wrote a no-fin ZS2G-1 with tilting helicopter tail rotor *and* inflatable control bumps would still be “uncontrollable” above 30 knots! (Ref 5)

COMMENTS

So far, I believe no one has built an operational airship with [only] stern propulsion, though it has been proposed a number of times in the 50 plus years since this Navy work was done. Goodyear's tests on their model ZPG-3W (modified) suggest both lower and higher speed efficiency improvements. At lower speeds, elimination of the drag of the car-mounted propellers and pylons helped. At higher speeds, there was also improved efficiency due to wake energy recapture. In 1979, Goodyear proposed a "ZP3G" (ZPG-2 sized) for "Maritime Patrol" by the Coast Guard or the Navy. It appears to have had three engines and propellers – with just one of the three mounted in the tail. It would be interesting to know why stern drive appears never to have made it into an airship. I've wondered how difficult tail mounting a large engine and propeller might be, for example.

Removing the airship's tail fins seems to me like the Flying Wing and the Avrocar "flying saucer" – all 1950s – 1960s ambitious attempts to remove drag, all with excessive control difficulties. Today's Zeppelin NT seems to have the best demonstrated controllability, with three pivoting engines mounted well apart, yet still has tail fins with rudders/elevators. I have the impression rudders and elevators are required to get adequate control authority at higher airship speeds.

In 1961, just as years of work on streamlining and stern propulsion lead to a promising design, the entire US Navy Airship program was cancelled, and top management ordered everything scrapped, making it

very expensive for a following manager to even consider reviving it. Very frustrating!

The recent LEMV and M1400-Blue-Devil 2 situation feels very similar – new design airships costing hundreds of millions dollars were completed, then ordered packed away or scrapped just as they became ready for flight testing. I think just 10% more expenditure for testing would have told us if the designs work to spec. Now we know as little as if they had never been built.

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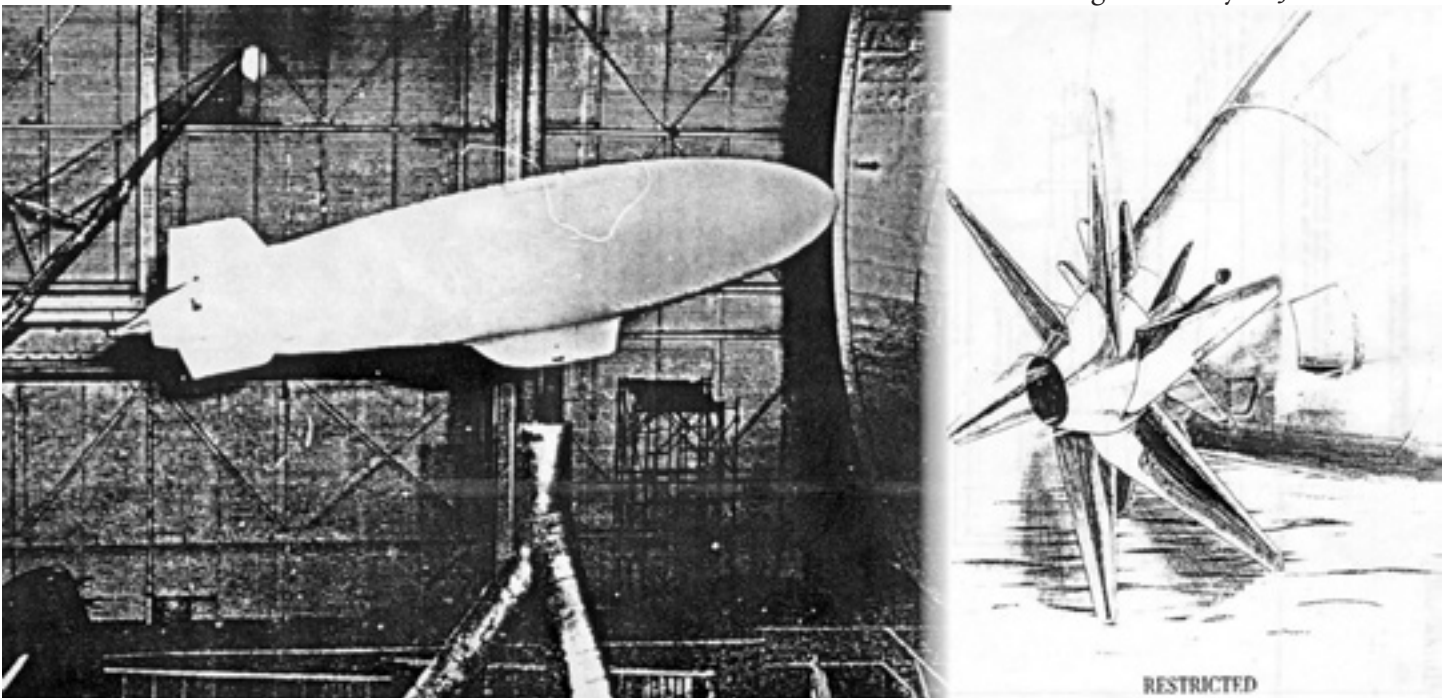
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These two images courtesy of Jeff Cook.



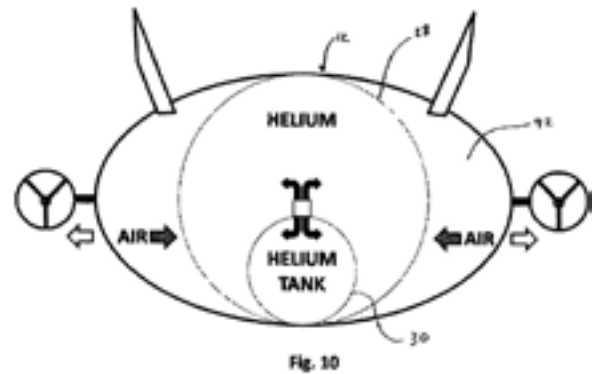
SHORT LINES

PUCA Calls For Development Of Unmanned Cargo Planes Loadstar (5/26, Lennane) reports that over 30 European organizations, working under the name Platform for Unmanned Cargo Aircraft (PUCA), are pushing for the development of unmanned cargo planes (UCAs), which they believe will be “cheaper and more efficient” than using manned planes in regions with “thin traffic routes,” such as Wales or Eastern Europe. Hans Heerkens, chairman of PUCA, said that the “basic technology” for these types of vehicles exists today, but more work is needed to address safety issues. Ω

NASA Recovers Super Pressure Balloon The Warwick (AU) Daily News (5/28) reports that NASA officials arrived at Bulloo Downs Station to recover the “super pressure balloon the size of a football field,” which was forced down after suffering “a leak 32 days after leaving New Zealand.” The whole situation, and NASA’s involvement, created “a buzz” in the region, according to the article. Ω

Study Finds 3D-Printed Parts Could Have Significant Savings For Aircraft The EE Times Europe (6/5) reports that researchers at Northwestern University have found that the use of 3D-printed metal parts in aircraft “could offer significant savings in fuel, materials and other resources.” According to the study, “widespread adoption” of 3D printing, also known as additive manufacturing, “to print lighter and higher-performance aircraft parts could significantly reduce manufacturing waste and the weight of the airplane.” The study found a number of benefits from the use of 3D printing: reduced fuel usage, lower carbon emissions, and lower energy costs to produce parts. Ω

New OpenPod Sensor System Can Be Used On Various Aircraft And Helicopters Defense News (6/2, Clevenger) reports that Northrop Grumman has developed the modular OpenPod sensor system that can be used on “a variety of aircraft, and potentially helicopters.” James Mocarski, vice president of Northrop Grumman’s Airborne Tactical Sensors business unit, claimed that it would only take minutes to reconfigure each module for a different mission. Ω



Mark Lutz found the layout of the “Helium Compressing System” in the patent for the Aeros “Dragon Dream,” issued April 2015. The patent says it is important that the pressures used be “low,” so that:

- 1) the volumes involved move quickly (high flow at low pressures)
- 2) the compressor and storage “tanks” are lightweight
- 3) to avoid heating the gas via compression. Ω

Initial Flight Tests Show New Coating Reduces Bug Residue By 40% The Washington Post (6/1, Feltman) “Speaking of Science” blog reports that NASA and Boeing have conducted “a pretty preliminary test” of coatings designed to reduce the amount of bug matter that will stick to a plane’s surface, thus reducing drag and improving fuel efficiency. (Also) New Aviation Coatings Based Off Of Lotus Leaves Kelsey Campbell-Dollaghan at Gizmodo (6/2) continues coverage of NASA’s recent flight tests to examine which plane coating would resist the most insect residue. He notes that Mia Siochi, senior materials scientist at NASA, said that the coatings were “partially borrowed from the microscopic structure of lotus leaves.” He comments that it was “interesting” that NASA, which has “some of the smartest people in the world,” still turns to nature for solutions to problems. Ω

Stitched Composite Structure Outperforms Design Goals During Test Aviation Week (6/8, Warwick), in an article titled “Stitched Composite Structure Tests Confirm Damage Resistance,” reports that a “scaled center-section of a future hybrid wing-body (HWB) transport” developed using stitching “and other features to improve damage tolerance and reduce weight” has performed better than the designated design goals during testing. Ω

MEDIA WATCH

Spring FOUNDATION (36/1) carries CDR Mike Stock's "Sixty Seconds of Terror," his first-person account of the fatal flight of the Piasecki Heli-Stat. From Ed.'s understanding of the project gleaned from discussions with survivor and NAA past President Lou Prost, and other NAA members including Ron



Hochstetler who had worked on the project, CDR Stock's account is complete, fair and balanced, and the article is well illustrated. The FOUNDATION Editorial team incorrectly assumed Stock was the wreck's last survivor, an error we corrected them on. Ron Hochstetler e-mailed, "Mike's account brought back forgotten memories of my first experience in the lighter-than-air world working as an assembler on the Helistat effort. He aptly captures the mixed feelings of excited anticipation and foreboding that surrounded the program. His praise for the pilot who perished is very honoring of an excellent man who died before his time. It's a tragedy that the ship was not constructed with the same integrity as the brave men who took her up on her first, and last flight." Ω

"Hindenburg: The Untold Story" is a TV program recently made available to regular cable customers following Smithsonian Channel's move to the non-premium packages of many providers. For most of us, it would have only been viewable recently, as if new. Made several years ago, this is certainly the biggest-budget, most elaborate video produced on the subject since the 1975 Universal motion picture "Hindenburg" directed by Robert Wise and starring George C. Scott. The TV shows press release invites, "Who or what brought history's most famous airship burning to the ground? Through detailed reconstruction of the events, eyewitness testimony, the memories of living survivors, and the interpretation of modern day experts, we recount this disaster and the investigation that

followed." One could add to that, reconstruction of hardware. This fat-budget show was made for HDTV, so no simple replaying of public domain footage in black and white, then trying to make 4:3 look like 16:9 aspect ratio. Actors were hired to play principals, and the two then-living survivors were newly interviewed.

Given this lavish toolbox, the producers elected to follow the well-traveled course common to such shows before the landmark BBC episode of their series "Secrets of the Dead" devoted to the subject. Assessing that well-traveled road, it seemed to them the safest way to make money from this lucrative disaster was not to rattle any cages. So the script is ripe with lines like "The moment he saw hydrogen fire," supposedly Hugo Eckener grouching about Americans being stingy with helium in 1936, (not '37) etc. etc. ad nauseam. While disappointing, this is just another in a long line that goes back at least as far as Robert Wise questioning the entertainment value of static electricity.

In one of Ed.'s first writings for the LTAS' newsletter *Buoyant Flight*, I lamented the fact that as the movie's camera came in for a close-up on the bomb hidden in the cell, one could not help but notice the girder section had been assembled with "pop" rivets. (The entire era of the rigid airship came and went before the perfection of the blind rivet, which is food for thought as well.) Ed. had urged his B.F. readers to consider purchasing the highbrow LaserVision Disk of the 1975 Universal movie, which offered the film in its original Panavision glory, then called "letterbox," so the viewer could see the modestly accurate model of the cigar-shaped craft, now hanging in the NASM. This Smithsonian show avoided pop rivets; the burned-out structure re-creation looks more like it was constructed of 2 X 4s. In fact, there is a surprising lack of quality in the re-creations, and even the CGI. The 'atmosphere' folks hired to play ground crew must have depleted the costume supplier's stock of Navy garb. The sailors are wearing a mix of whites, blues, and dungarees, as if no one ever reviewed footage to check the uniform of the day. However, by far the most surprising are the goofy costumes clothing the principles. "Commander Rosendahl," without scrambled eggs on his crumpled cap's visor, instead has gold sleeve braids - on his khakis! Having a big budget and all the HDTV tools, unhappily, doesn't come with research tools. This show is untrue to its title - this version of the story has been *repeatedly* told. Ω

The EAA magazine SPORT AVIATION had recently featured an article on the Goodyear blimp. Then the June issue (64/6) featured Jeff Skiles' article "Zeppelin NT, A New Kind of Dirigible." In about two pages the article gives a quick airship history and shares the experience of a ride aboard Airship Venture's *Eureka* when it visited Oshkosh in 2013. The article is accurate and upbeat. NAA Treasurer Debbie Van Treuren has a bit part in the July issue, her EAA chapter (866) hosting a "One Week Wonder" visit. Ω



The July 2015 AIR & SPACE SMITHSONIAN carries the article "See the World from 100,000 Feet" by Mark Betancourt, which covers the current balloon-based efforts competing with near-space rocket tourism. A photo showing crews rolling out the polyethylene balloon is captioned "Early balloons used explosive hydrogen," as if the reader is supposed to believe these vehicles carried 16% air contamination making them susceptible to an ignition source. Oddly, in a sidebar entitled "Winning the Stratobowl," the text reads, "All three narrowly escaped... just as the remaining hydrogen burst into flame." That author, one Roger A. Mola, does not state his reference, and in fact the actual evidence showed there was no fire - but there was an explosion! The improperly packed, then torn balloon formed a parachute-like top that retained hydrogen, while the craft's downward plummet packed in air to mix with it. Most likely as the contamination reached the explosive percentage, it blew. The blast force blast would be directed upward, bursting the balloon top, but missing the aeronauts below. They hit the silk and landed safely. The follow-up flight with a new "...balloon lifted with the much safer helium" set a new altitude record. Space (if not perceived correctness) did not allow the magazine's mention of another stratosphere attempt that was set back a season when that balloon suddenly ruptured and all the helium the sponsors could afford and had obtained disappeared in an instant. Meanwhile,

POPULAR SCIENCE for August devotes its cover and six graphic-rich pages to the space balloon concept. Ω

Author Kalee Thompson avoids the lift gas issue altogether, tongue-in-cheek calling helium "fuel," not mentioning H_2 even when comparing the gentle balloon ride to the fiery ascent of rocket-boosted tourist near-space experiences. Ed. suggests we must get ready for some tear-jerking editorials claiming some underprivileged government health-care recipients' cancer was not detected early enough owing to no helium for the MRI machine. This while a few dewar's worth of the pricey gas is vented by martini-swissling multi-millionaires (yes, they stress a bar will be on board) after taking a selfie in near - space. Ω

New Museum Los Gatos is displaying a special exhibit titled "Giants in the Sky - The Rise and Fall of Airships" through September 27. "In the early 20th Century airships became both a promising technology and an exclusive mode of luxury travel, but this lasted just one generation... San Francisco artists Jenny Robinson and Stacey Carter illustrate the scale and grandeur of these superstructures, and contributions from private collections of ephemera, photographs and objects will provide historical context. The multimedia, interactive exposition will include contemporary artwork, vintage photographs, artifacts, memorabilia and video..." Ω

On August 1, 2015, NAA member Cheryl Ganz, Curator Emeritus of The Smithsonian Philately Museum, presented "Come Take a Ride on the *Hindenburg*" at Museum Los Gatos. The press release reads in part: "...*Hindenburg's* legacy is more than its disastrous end. Learn about life aboard the famous zeppelin and imagine yourself enjoying a transatlantic voyage during the heyday of airship travel." Ω

This was the 177th Anniversary of Count Zeppelin's birthday and the 25th Anniversary of the Exhibit, 'Zeppelin, The First Airliners,' at the Mitchell Gallery of Flight Museum, General Mitchell International Airport, Milwaukee, Wisconsin. Ω



Commemorating the 90th Anniversary of the Crash of the USS Shenandoah

On Sunday, September 6 Ava, Ohio, held a special event to commemorate the crash of the USS *Shenandoah*, the first rigid airship built in the United States. It was designed in the United States based on plans made available to the Allies after the German Zeppelin L49 was captured in France in 1917.

The structure of the ZR-1 was manufactured by the Naval Aircraft Factory in Philadelphia. The airship was assembled in the new airship hangar that had been built at Lakehurst, New Jersey.

The *Shenandoah* embarked on a goodwill tour of Midwest States coinciding with the annual state fairs to be held in 1925. In the pre-dawn hours of September 3rd as she was flying over Noble County, she encountered severe thunderstorms with severe updrafts that carried her above pressure height, eventually causing structural failure. The ship was torn apart with major parts falling in three different locations.

The ceremony, organized by a group of Ava volunteers led by Theresa Rayner began with the Shenandoah High School Marching Band playing the National Anthem. Later in the program they played Taps.

Aaron Keirns, author of *America's Forgotten Airship Disaster – The Crash of the USS Shenandoah*, was the master of ceremonies. After an opening prayer by the Rev. Rogers, professional storyteller Judi Tarowsky recited her *Heroes of the Shenandoah*, a stirring narration of the events of the tragic night. During her story she recounted the events as they were experienced by different crewmembers and people in Noble County, many of whom came to the aid of the crew of the stricken ship. As her story drew to a close, she emphasized that even today there are “Heroes of the *Shenandoah*”, people who work to keep the history of the events alive. She mentioned Theresa Rayner and members of the Rayner family who organize the commemoration every five years and maintain a museum of artifacts and memorabilia relating to the crash.

The Naval Airship Association and The Lighter-Than-Air Society were recognized for the new signage that has been erected at the three crash sites. The two organizations also provided docents who explained the items that are in the museum to the visitors. After the laying of a wreath



at the Memorial erected in the center of Ava, and a gun salute by the Noble County Color Guard, the ceremony drew to a close with a final prayer by the Rev. Rogers. Ω

Theresa Rayner and daughter Emily opened the *Shenandoah* commemoration on September 6, with the presentation of a new flag pole and plaque dedicating it to her late husband Bryan. Bryan and Theresa have spent much of their lives sharing the *Shenandoah* and Ava story by volunteering as “tour guides” of the Noble County area crash sites. They also owned and operated an Airstream travel trailer which has been equipped as a traveling *Shenandoah* museum containing hundreds of artifacts and photos of the construction on the *Shenandoah* and its loss at the three different sites in Noble County.



Wick Elderkin left, grandson of Lt. A.H. Houghton and Lanny Hunt right, Grandson of Cmd. Zachary Lansdowne, present a wreath at the Shenandoah Memorial site in Ava. Both of their grandfathers lost their lives on the *Shenandoah* the night of Sept. 3, 1925, near Ava.



Julie Hunt, right, granddaughter of Zachary Lansdowne, presents a framed photo collection to Theresa Rayner, left, in appreciation of Bryan and Theresa's life-long dedication to keeping the *Shenandoah's* story alive in Noble County, Ohio.

The descendants of USS *Shenandoah* captain Cmd. Zachary Lansdowne pose for a family group picture after the commemoration service in Ava on Sept. 6, 2015.



Front row left to right; Lansdowne (Lanny) Hunt, Elizabeth (Betsy) Hunt, Robyn Hunt, and Julia Hunt, all grandchildren of Zachery and Elizabeth Lansdowne. Second row, left to right, Ethel Hunt, wife of Lanny, Sicily Stanton, Betsy Hunt's granddaughter, Zachery Stanton, Betsy Hunt's grandson, (who looks strikingly like Cmd. Lansdowne himself) and Suzanne Stanton, Betsy's daughter and Sicily and Zachery Stanton's mother.

Goodyear Blimp 'Pilgrim', Flight on June 3, 1925

After having experimented with a series of small Pony blimps in the early 1920s, The Goodyear Tire and Rubber Company designed the first blimp to be inflated with helium. P. W. Litchfield as President of the Goodyear Tire and Rubber Co., committed to using blimps as "Aerial Ambassadors" for the company. The *Pilgrim* (designated as an AD type airship) was completed on May 25, 1925, and made its maiden flight on June 3. For the first flights the airship was inflated with hydrogen. After six weeks, on July 18, the *Pilgrim* was inflated with helium and christened by the wife of Goodyear president, P. W. Litchfield.



Above, the maiden flight of the *Pilgrim* on June 3, 1925.

Right the gondola on display at the Smithsonian's, Steven F. Udvar-Hazy Center in Chantilly, VA. Photo courtesy of Smithsonian Institute.



The *Pilgrim* was designed by, and built under the supervision of Herman Theodore Kraft, Goodyear's Chief Aeronautical Engineer. It had a magnesium-coated steel-tube framework. The envelope was made of 2-ply, rubberized fabric coated with aluminum. The envelope initially had a 47,400 cu. ft. (1,340 m³) capacity. It was later replaced by a 55,000 cu. ft. (1,560 m³) envelope. It was powered by a single 3- cylinder Lawrence air-cooled engine with a 4-bladed Reed push propeller. A 40 gallon fuel tank gave it a 525 mile range (at 40 mph, 60 km/h). At half speed it had an endurance of 13 hours. The gondola could seat 1 pilot and 2 passengers. The dimensions of the *Pilgrim* were:

	Original configuration (1925-26)	Revised configuration (1927-31)
• Length:	105 ft. (32 m)	110 ft. (33.5 m)
• Width:	31 ft. (9.5 m)	32 ft. (9.8 m)
• Height:	39 ft. (11.9 m)	40 ft. (12.2 m)
• Volume:	47,700 cu. ft. (1,351 m ³)	55,000 cu. ft. (557 m ³)

The *Pilgrim* last flew on December 10, 1931. In 4,765 flights it carried 5,355 passengers, logged 2,880 hrs, and flew 94,974 miles (152,845 km.). It was dismantled in 1932. All photos from the collection of The Lighter-Than-Air Society, unless otherwise indicated.



We have been asked to figure out the identity of the man in this picture with G-1. If you have any idea what his name might be, please contact the Editor. NAA owes a huge favor to the library folks who would like to i.d. him, having released to us priceless and unique information from their archives. Ω

READY ROOM

"Airships to the Caribbean" Conference has been canceled. Ω

Naval Airship Association Reunion, May 2016, Pensacola, Florida. Details to be announced in the next issue of NOON BALLOON. Ω

The restored beauty of the former NAS Richmond, Florida, administration building gives stark contrast to its appearance of a few short years ago. See “Shore Establishments” inside.

