AAHS FLIGHTLINE

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After a 50-plus year run, Learjet sails off into history with the closure of production represented here by a Learjet 34B, N851JH. (Learjet photo from AAHS archives, AAHS-S052220)

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Learjet Production Ends

by Job Conger

The name that rivaled Clyde Cessna and Walter Beech for public recognition and legends aplenty is soon to fade to the land of "used to be" following Bombardier's closing of its Learjet facility in Wichita, Kan., and ending production of the Learjet line of business jets. The reduction in force will see the loss of 1,600 jobs, including 250 in Wichita. Travails suffered during the Covid 19 pandemic are cited for the cause for the decision. The company will continue to support Learjets "well into the future."

More than 3,000 Learjets of all models have been manufactured since the first Lear Jet Model 23 rolled off the assembly line in 1963. "However given the increasingly challenging market dynamics, we have made this difficult decision to end Learjet production," explained Eric Martel, Prsident and Chief Executive Officer, Bombardier, Inc. The company will focus on the more profitable Challenger and Global business jets and accelerate expansion of its customer services business.

Starting from a 1950s Swiss ground-attack fighter aircraft design, William Lear formed the Swiss American Aircraft Corp., to develop one of the very first business jets. The company moved to Wichita, Kan., in 1962 and began assembly of the first Learjet 23 on February 7, 1963. Renamed Lear Jet Corp. the same year, the company delivered the first production model in October 1964. The Model 24 and Model 25 quickly followed, making their first flights in 1966. The company was renamed Lear Jet Industries, Inc. in 1966.

Bill Lear sold his majority share in Lear Jet to Gates Rubber Co. in early 1967 and the merged company was renamed Gates Learjet Corp in 1969. In 1971 the first Model 25 powered by a Garrett TFE731-2 turbofan engine was

1966 saw the introduction of the first Learjet, the Model 23, represented here by N721JB, c/n 23-005. (Photo from the AAHS archives, AAHS-S052253

The Learjet 35 represented an upgrade of the 20-series with the engines being replaced with Garrett TFE731-2 turbofans, enhancing the range and service ceiling of the design. This model also saw service with the USAF designated as C-21A. (AAHS archives, AAHS-S052491)

flown. This aircraft configuration later became the successful Model 35. By 1974 the worldwide Learjet fleet had exceeded one million flight hours and in 1975 the company produced its 500th business jet, both industry firsts. Production rate increased to 10 a month by late 1976.

The prototype Model 54/55/56 made its first flight on April 19, 1979, and on July 7, 1983, a production Model 55 set six new time-to-climb records for its weight class.

In 1987, Gates Learjet was acquired by Integrated Acquisitions and renamed Learjet Corp. the following year. In 1990, Canadian Bombardier Aerospace purchased Learjet Corp., and marketed the line as the "Bombardier Learjet Family." Under their management, the Learjet 60 mid-sized business jet was introduced making its first flight on October 10, 1990. The Learjet 45 made its first appearance on October 7, 1995.

The final design, the Model 70/75, was issued its type certificate from the FAA on November 14, 2013. Certified to the more rigorous Part 25 standards (airline equivalent), this model was one of the first business jets certified to this standard. It featured a glass cockpit powered by a Garmin 5000 avionics package that features touch-screen controls.

After a 58 year run, Learjet passes into history as a corporation, though the fleet it built will continue flying for a number of years with Bombardier's continued support. Of all the business jets flying today, the name Learjet still holds probably the most recognized product name. ✈

The Learjet 31 was a combination of the series 35 fuselage mated with the series 55 wings. Fitted with a glass cockpit and improved stability provided by the aft fuselage Delta-Fins offered higher performance with a maximum cruise altitude of 51,000 feet, rare even in today's market. (AAHS archives, AAHS-S052485)

The Learjet 55 series was a step up in size and range, capable of seating up to 10 passengers plus the crew of two. This model introduced the "Longhorn" winglets that would be incorporated on other models. Seen here is N3497C, c/n 55-028. (Learjet photo from AAHS archives, AAHS-S-52432)

The mid-sized Learjet Model 60 was introduced in 1990. The example seen here, N638LJ, c/n 60-038, was displayed at the 1998 NBAA convention.

The cockpit of the Learjet 75 – certified to Part 25 standards, it features two independent Garmin 5000 flight control systems (pilot and copilot) with cross-over redundancies. (Photo by Hayden Hamilton)

Best of the Best - 2020

At the end of each year the Society asks its members to select the best article and best painting published in the *AAHS Journal* that year. It never ceases to amaze us at the level of participation you show in voting for your favorites. It is not uncommon for over a third of the active membership to submit ballots, and this year was no different.

On some occasions the selection of the best article and best painting boils down to a photo finish between two items. On others, there is often a clear winner by a large margin. This year was no different. In the Best Article category, we had a clear winner that received almost twice the number of votes as the next closest vote getter. The member-selected Best Article in 2020 was David Stringer's multi-part article on "Non-Skeds: The Story of America's Supplemental Airlines, Parts II & III." Hopefully Mr. Stringer will consider publishing a book on this topic, bringing together the *AAHS Journal* pieces with additional information.

Relative to the Best Painting for 2020 – we had a photo finish between two of the works. In this case, it is a shame that we can't give two awards because both these renderings are outstanding. But, after careful review, our members chose Jim Caiella's rendering of the *USS Shenandoah* approaching the mooring mast on the *USS Pakota* as the Best Painting for 2020. ✈

A reminder to the reader – you can enjoy over 50 years of aviation art on the AAHS website – membership not required. You can get selections displayed randomly, by era, by type or by artist. Take a look and enjoy. Simply go to: https://www.aahs-online.org/avart.php

An editor's comment to all you artists out there. We are constantly looking for aviation related artwork to feature on the covers of the *AAHS Journal*. While you have been generous in the past, contributions in this area have fallen to the point that we may have to drop this important feature of our publication.

Charles Elwood "Chuck" Yeager, 1923-2020

By Job Conger

A personal connection: Several years ago I spoke with Charles Yeager when he was guest of the Larry King radio show, promoting his autobiography. Years before I had seen a picture of him in the cockpit of an F-100 when he was commanding the 1st Fighter Day Squadron at Moron Air Base, Spain. In our friendly, brief chat, I shared my surprise that the pioneer who had "broken the sound barrier" stayed on duty as a fighter jockey, flying the airplane that was arguably the first production fighter to break Mach in military service. Yeager seemed grateful that a distant fan knew of his subsequent career in uniform. I'd like to report that I didn't wash my right ear for a week after he touched me with his voice. . . but at least I savored the memory.

Brig. Gen. Charles Elwood "Chuck" Yeager, USAF (Retired)

When I decided to write a short biography for FlightLine following his death last December I stumbled on another historical anomaly that some might not have noticed. I thought his death, coinciding with December 7, 2020, was unique and ironically appropriate for the exemplary warrior who rode wings and who downed five German aircraft on one mission, thus earning "ace in a day" recognition. His total score was 11 plus half a kill for a victory shared with a squadron mate. His postwar service life was equally awesome. His television commercials featuring him promoting Northrop's F-5G, later redesignated F-20 Tigershark, were eminently credible. What set his place particularly above other test pilots was the fact he remained close to the main stream of his profession. Instead of retiring soon after October 14, 1947, he remained involved with high-risk research; case in point his flights with the rocket boosted NF-104 and his teaching new practitioners of a dangerous craft.

As I began reading of his demise I was puzzled by the statement in one notice that Charles Yeager's death was "reported December 7, 2020. Was it possible that he had died earlier than that auspicious day and that official was delayed in order to coincide with 12/7? The Wikipedia report, edited February 7, 2020 seems to have removed all doubt. Charles Elwood Yeager was admitted to "a Los Angeles hospital" where he died the afternoon of December 7, 2020. Today, in memory, he remains the hero we knew so well in better times. ✈

Awards and Recognitions

Personal Decorations

Air Force Distinguished Service Medal (retirement award in 1975)

Distinguished Service Medal (Army design awarded in 1954)

Silver Star with bronze oak leaf cluster (for shooting down five Messerschmitt Bf 109s in one day)

Legion of Merit with bronze oak leaf cluster

Distinguished Flying Cross with two bronze oak leaf clusters (for a Messerschmitt Me 262 kill and first to break the sound barrier)

Bronze Star Medal with bronze valor device (for helping rescue a fellow airman from Occupied France)

Purple Heart

Air Medal with two silver oak leaf clusters

A young Chuck Yeager poses with the Bell X-1 that he broke the sound barrier in on October 14, 1947. (USAF photo)

Chuck Yeager , at 89, celebrated the 65th anniversary his breaking the sound barrier on October 14, 2012, by doing it again in an McDonnell Douglas F-15E. (USAF photo)

Air Force Commendation Medal
Presidential Medal of Freedom

Unit awards

Presidential Unit Citation with bronze oak leaf cluster
Air Force Outstanding Unit Award

Campaign and service medals

American Defense Service Medal
American Campaign Medal
European-African-Middle Eastern Campaign Medal with silver and three bronze service stars
World War II Victory Medal
Army of Occupation Medal with "Germany" clasp
National Defense Service Medal with star
Armed Forces Expeditionary Medal
Vietnam Service Medal with two campaign stars
Air Force Longevity Service Ribbon with one silver and one bronze oak leaf clusters
Air Force Small Arms Expert Marksmanship Ribbon
Republic of Vietnam Campaign Medal

Other Awards

1940–1949 – Harmon Trophy: Citation of Honorable Mention
1947 – Collier Trophy and Mackay Trophy, for breaking the sound barrier for the first time
1953 – Harmon Trophy
1976 – Congressional Silver Medal

Not a Member of the AAHS?

Here is what you missed in the last issue of the AAHS Journal, Vol 65, No. 4, Winter 2020.

- Selecting the Space Shuttle Carrier Aircraft - *Eric Pearson*
- Deep in the Heart of Texas; The Texas Aero Corporation Temple Monoplane - *Dan Hagedorn*
- NON-SKEDS: The Story of America's Supplemental Airlines, Part III - *David H. Stringe*r
- Darkest of Days, 113th WING on 9/11 - *Stephen Chapi*s
- D-Day+1: "Hat Jane's" Fall and Renaissance from the Loire Valley - *Gregory Pons and Bruno Chapelle, edited and translated the French by David A. Reid*
- Breakfast with Theodore von Karman & Laurance Rockefeller - *Dr. Allen E. Fuhs, With Input by Dr. John Erdos*
- The Shoot Down of Sun Valley 56-0528 - *Steve Wolff*
- Long Island's Aviation Heritage - *Robert G. Waldvogel*
- Forum of Flight - *Tim Williams*
- President's Message - *Jerri Bergen*

It's not too late to join!

Almost all the articles published in the AAHS Journal since 1956 are available online - FREE - to members. And membership costs as little as $29/year for an e-Membership (electronic only). The ONLY requirement for membership is an interest in American aviation history!

Simply fill out and mail, along with payment, a copy of the membership application found on the last page of this newsletter, or go to:

https://www.aahs-online.org/membership.php

and signup online!

USAF Begins Drawing Down Rockwell B-1B Fleet

On February 17, 2021, the first of a planned 17 B-1B Lancers was flown from Ellsworth AFB, S.D., to Davis-Monthan AFB, Ariz., the "boneyard" site of the 309th Aerospace Maintenance and Regeneration Group. The goal of this "divestment" is to allow maximum operational efficiency by jettisoning high-time aircraft and spending funds to maintain younger birds with more hours left on their life cycle. The USAF press release says the result will be "an even more lethal, agile and sustainable force with greater competitive edge in todays' fight."

Following completion of the 17 aircraft divestiture, 45 B-1Bs will remain in the active fleet. Four of the jettisoned aircraft will remain in reclaimable condition, similar to the status of some B-52s sharing the same status. Completion of most of the retirement process is expected before September 30, 2021.

After a false start, significant redesign, and political games that continue to plague the Rockwell B-1 program, the USAF placed an order for 100 B-1Bs in 1982 with the first production aircraft being delivered in 1984. The final, 100th, B-1B was delivered to the USAF in 1988.

With changing priorities, perceived threats and vulnerabilities, and cost saving the USAF began to lobby to reduce the B-1B fleet in 2000, which was met with opposition. It wasn't until 2003 that they were able to mothball 33 of the older, high time ships. This left the USAF with 62 operational B-1Bs

The latest move comes with the USAF balancing its service requirements between the remaining B-52s, B-2s and B-1Bs. "Beginning to retire legacy bombers, to make way for the B-21 Raider, is something we have been working toward for some time," said Gen. Tim Ray, Air Force Global Strike Command commander, in a news release. "Due to the wear and tear placed on the B-1 fleet over the past two decades, maintaining these bombers would cost tens of millions of dollars per aircraft to get back to status quo, and that's just to fix the problems we know about. We're just accelerating planned retirements," Ray said.

The Air Force is anticipating deliveries of the Northrop-Grumman B-21 Raider to begin in the 2025-2026 timeframe. As this date approaches and becomes more firm, we can expect to see additional B-1Bs being retired. Once the B-1Bs are retired, the USAF bomber fleet will once again be a sub-sonic one. ✈

North American Rockwell B-1B in fly-past at Oshkosh, Wis., July 2017. (Photo by Hayden Hamilton)

B-1B at an unidentified location and date. (Photo by Job Conger)

B-1B at an unidentified location and date. (Photo by Job Conger)

B-1B, 86-0111, and an unidentified partner at an unidentified location and date. (Photo by Job Conger)

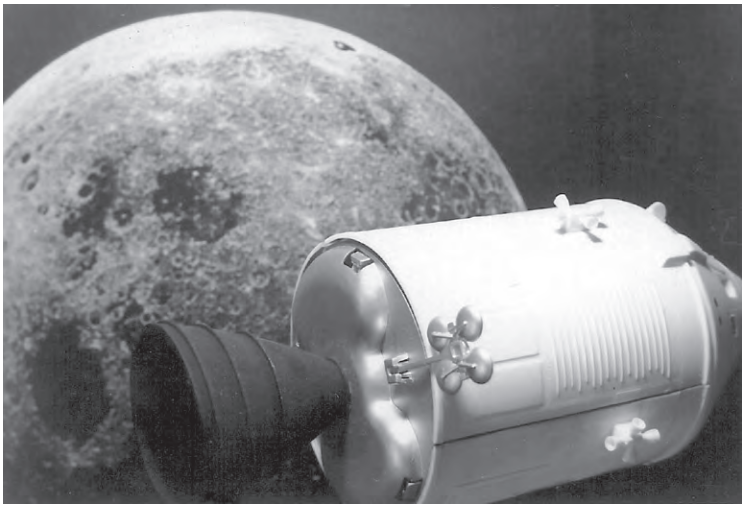
PLASTIC WINGS
by Job Conger

Edward Wahl's father worked for a company that supplied parts that were used by aircraft: Wright, P&W, and others. While his friends were reading comics, he recalls his Dad's subscription to *Aviation Week* was absolutely essential reading." He also discovered early plastic model airplane kits, "The hobby of a lifetime," he says. One thing led to another. "I wanted pictures of my models doing something rather than sitting on a shelf or table.

As a high school student cadet in Civil Air Patrol, during a field strip to Chanute AFB, I watched the first F-104A delivered for the maintenance training school. Soon after, a friend and I set up a large, clean storm window and he snapped picture of me looking "up" at it with Dad's WWII-era Kodak camera in natural light.

The Revell model of the Boeing B-52 with the North American X-15 attached. The bright sunlight and distant clouds combined for a realistic view of the combination.

By 1969, the astronauts were bringing home awesome pictures published in *LIFE Magazine*. Revell quickly produced kits of the Apollo spacecraft. I posed the command/service module on top of the large magazine page lying on top of our kitchen table and directed a sensor light off camera to simulate



the reflected light of the sun. The challenge was to keep the vehicle's shadow out of the view. I was very happy with the result.

The notion of a moonscape and Bell X-2 was dramatic but unrealistic; certainly, a combo that helped manufacturers Craft Industries sell kits, sorry to say, probably not many. It was purchased for $1.89 at Edwards Air Force Base about 1957 by Malcolm L. Gougon, Leatherwood St., Lancaster, California. He was looking to trade slides of ex-military aircraft. He worked on F-4s at Edwards. If I had not responded to his advert in Volume 5 Number 1 of the original *Air Combat* (1939– 1945), I would not be editor of FlightLine. He offered to trade plastic models of kits for my Kodachromes, and the X-2 came early in the course of our rewarding years of correspondence. He was fast in appreciating what I was doing with my camera, and our early dealings led to many more correspondents and photo trading. I've not built the kit, because it's more important to me in its box than built and on a shelf.

From such beginnings a lifetime commitment to sharing and collecting aviation has come. I wonder how many readers of this remembrance knew him. If you knew Mal, please share your memories with Job Conger via FlightLine. ✈

Book Reports

Salvation from the Sky, Cdr. David D. Bruhn, USN (Retired) and Stephen Ekholm. Heritage Books, 5810 Ruatan Street, Berwyn Heights, MD 20740, 2020. ISBN 978-1-55613-032-8, 9"x6". 332 pages, numerous B&W photos and tables. Appendix, Bibliography/ Notes, Index,. $35.00

The authors have focused on a very important and relatively undocumented part of WWII aviation – Air-Sea Rescue. In particular this work looks at the activities of the U.S. Navy, Royal Australian Air Force and Royal New Zealand Air Force during this period. As important as these services were, the U.S. Navy didn't formalize specialty air-sea rescue units until 1944, instead relying on a more ad-hoc approach using patrol and bomber squadrons to perform this work. The author's look at both organizational and equipment used by all five services involved in air-sea recovery – U.S. Navy, U.S. Air Force, Coast Guard and the Royal Australian and Royal New Zealand Air Forces.

A large part of the book tells the stories of specific air-sea rescue incidents involving the recovery of downed airmen and survivors from boats sunk by enemy action. The lead off story relates the experiences of an aircrew from the U.S. Navy VPB-23 that set their PBY-5A Catalina down in heavy seas in order to rescue survivor from the *USS Indianapolis*. Focusing on the injured, the crew picked up 56 survivors, far too many to attempt a takeoff even if the sea conditions would have allowed it. They ended up transferring these men to the *USS Cecil J. Doyle*, but the plane was further damaged in the process and had to be abandoned and later sunk by gunfire from the *Doyle*.

The authors don't just focus on air-sea rescue events, but provide information about operations and equipment assigned to the tasks as well. Each region of the Western Pacific is represented with the details of the units, training, equipment, aircraft, vessels and bases described.

If you are interested in air-sea activities during WWII, this is an excellent book.

Ace of Aces, The Dick Bong Story, Mike O'Connor. Splash 5 Publishing, LLC, 2019 Revised Edition. ISBN 978-1-7331504-0-8. 8.5"x11", 156 pages, numerous B&W photos, maps and drawings. $29.95

O'Connor wrote the original, definitive work on Richard Ira Bong's life in 1985. This work includes corrections and updates based on information obtained over the years following that publication. The work includes extensive research and interviews with individuals associated with Dick Bong through his Air Force career. It also draws heavily on personal letters and information retained by the Bong family to which the author was granted access.

The book is well written and illustrated taking you through the various stages of Bong's life, training, combat, and eventual death during an acceptance test flight of a Lockheed P-80. It brings out relevant aspects of how certain events played pivotal roles in shaping Bong's career, such as his "alleged" flight in a P-38 under the Golden Gate Bridge in San Francisco, which ended up putting him before Gen. George C. Kenney. This brought Bong to General Kenney's attention and resulted in Kenney selecting him as one of the first 50 P-38 fighter pilots to be assigned to his command in Australia.

The book is easy reading and, if not already in your book collection, would be an excellent addition.

Vigilante! A Pilot's Story, Cdr. Robert R. "Boom" Powell, USN(Ret.). Specialty Press, 518 Lake Street South, Forest Lake, MN 55025, 2019. ISBN: 978-1-58007-261-8, 10.25"x10.25", hardcover, 192 pages, numerous color and B&W photos and drawings, Biographies, Glossary, Notes and Index. $33.71

The author has over 1,200 hours logged in the A3J/A-5 and is one of only 115 crewmembers that logged more than 1000 hours in Vigilantes. In writing the book, he assembled along with the factual history of the Vigilante's development and operational

history vignettes from the men that flew them. The result is an interesting and educational read about the service life of the Vigilante – from its earliest development, through deployment with the USN including challenges in locating and training crews to man it.

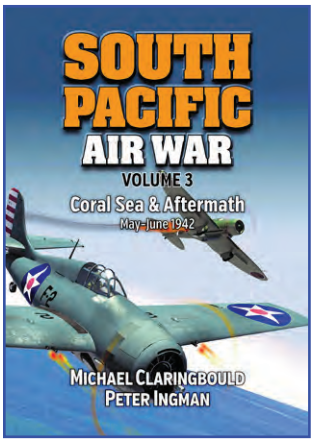
The author refers to these individuals as "the community," and rightly so. Many of the crew assigned to Vigilante squadrons tended to stay within this community, rotating squadrons and assignments within operational Vigilante squadrons, only moving on to other types as the Vigilante was phased out and retired.

If for nothing else, the book is well worth reading for the personal stories of experiences flying the RA-5C. From combat to simply operational sorties, these provide insight into what the life of a naval aviator was like during the 1960s and 1970s.

If you have an interest in the Douglas A3J/A-5, either technical or historical, this is an excellent book for your library.

Leland Pugsley

South Pacific Air War, Volume 3, Coral Sea & Aftermath, May-June 1942, Michael Claringbould and Peter Ingman. Avonmore Books, PO Box 217, Kent Town, South Australia 5071, Australia, www.avonmorebooks.com.au, 2018. ISBN 978-0-9945889-9-9. 9"x6", paperback, 248 pages, numerous color and B&W photos, paintings and illustrations, Appendix, References, Index. $26.95



This book is the third and final in a series detailing the air war in the South Pacific from Pearl Harbor to the Battle of the Coral Sea – the first six months of the war. The extensively researched and illustrated book provides the reader with a unique view through its matching of Allied accounts with Japanese records. This issue covers the period from May 1, 1942, with the Battle of the Coral Sea, to the end of June 1942. It opens with the deployment of two U.S. Army P-39 equipped squadrons of the 8th Fighter Group to Port Moresby between April 30 and May 4. These two squadrons lost half their planes during this same period, not to mention 10 pilots killed or missing.

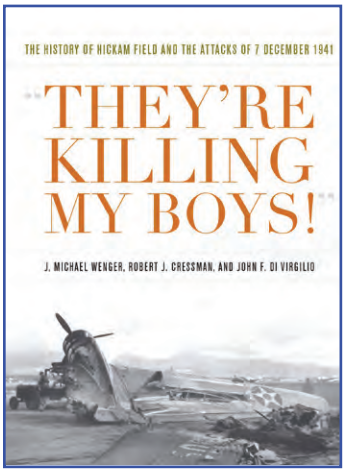
The authors take you through the lead in to the Battle of the Coral Sea with the fall of Tulagi to the Japanese and the American response from Admiral Fletcher's Task Force 17. The planned Japanese invasion of Port Moresby, Operation MO, and the lead in to the Coral Sea battle are described in detail to set the stage for this epic fight. The actual events of the battle are described in almost minute-by-minute detail from the perspectives of both sides.

These beautifully illustrated and documented books provide a detailed look into the state of the early months of WWII, not only from the Allies position, but from the Japanese as well.

This book series presents one of the clearest descriptions of the Allied and Japanese operations and how they effected their opponents. It would be a "must have" addition for anyone interested in the details of WWII South Pacific operations.

Hayden Hamilton

They're Killing My Boys! The History of Hickam Field and the attacks of December 7, 1941, by J. Michael Wenger, Robert J. Cressman and John F. Dv Virgilio. Naval Institute Press, , 291 Wood Road, Annapolis, MD 21402. ISBN: 978-16824745878.5"x11", hardcover, 274 pages, numerous B&W photos and drawings, Table of Contents, Notes, Bibliography and Index. $ 42.00



This book is part of the Pearl Harbor Tactical Studies Series printed by the Naval Institute Press that takes an in depth look at various aspects of the attack on Pearl Harbor from a tactical perspective. This work focuses on the development of the U.S. Army Hickam Field to address the growing need for more space, it's layout and construction, the challenges faced by its commanding officers and the impact of their decisions and actions leading up to and during the December 7, 1941 raid.

A good portion of the book looks in minute detail the actions (and challenges they faced) of the enlisted men and officers during each segment of the raid. Their attempts to return fire, save aircraft and injured comrades are documented through first person accounts. The authors have, where possible, tied the actions of individual attacking Japanese aviators to specific elements of the attack on the ground, whether it be defensive actions by individuals, or destruction of specific aircraft or facilities. Friendly fire (falling heavy anti-aircraft fire) from Pearl Harbor also played a role in the damages and casualties suffered at Hickam Field.

The book provides an insightful look at Hickam Field life leading up to December 7, and documents the frustrations and loss of confidence that many enlisted army personnel felt toward their commanding officers following the attack. It also amply portrays the heroic efforts of the personnel of all ranks to defend their base.

I would recommend this series of works to those interested in the details surrounding the attack on Pearl Harbor on December 7, and for those interested in military life in the late 1930s at a personal level.

Leland Pugsley

President's Message

You may be, like me, evaluating priorities, in realizing that our post-COVID world may be irrevocably altered. New restrictions for event gatherings, travel, expectations for remote learning and video-driven work programs that may become the norm could change what we love to do, or how we do it, while many businesses and organizations have been forced to close altogether. AAHS has been asked, "Is this the time for us to close our doors as well?"

Our membership numbers have been down, due largely to COVID upsets. We have many aging members. Many feel our product of aviation history articles, aviation images and other resources may not be relevant enough for this new world. We should address this question so you, our members understand our position regarding the anticipated longevity of AAHS.

AAHS was built by a group of aviation enthusiasts who worked to share their enthusiasm with others, and promote aviation history for the betterment of our country and future generations. This mission will continue to drive our service until we no longer have the resources or members to make it possible. With generous donations from members, we continue to be financially viable, and, are working to position ourselves so we can be more relevant in a mostly-digital age.

AAHS Members and volunteers at a recent Yanks Air Musuem event where we had a booth. **From left to right: Front row:** *Board member Howard Butcher, and wife Ostrid, Board Member Bob Brockmeier, President Jerri Bergen, volunteer Robert Littlefield. Not shown but also present is librarian Bob Palazzola and wife Mari.* **Back Row:** *Volunteer Joe Irwin, PLANESPOTTER administrator, Steve Riter and wife Sandi, Flabob staff Charlie Shaw. (AAHS archives)*

We are using our resources to get our images out of physical storage and onto the internet, where they can be shared more easily (our image digitization project). We are loading catalog information on our aviation library to an online book software program to make this a searchable resource. We are reaching out to classrooms and remote volunteers to participate in identifying our images through a native-built web application PLANESPOTTER (www.AAHSPlaneSpotter.com) that could conceivably have hundreds of people across the world tagging AAHS images. And finally, we are placing advertisements in three major aviation publications (a FIRST for AAHS!) to increase our visibility.

This last year has been turbulent, but there have been upsides too. We've met many wonderful new volunteers who are willing to share in our mission. We've begun to make partnerships with our neighbors at Flabob Airport who also share our aviation passion, and we're using the new 'remote-work' paradigm to accomplish AAHS objectives that we hadn't even considered five years ago.

I'm looking forward to the future of AAHS; to me, it looks a great place to be!

Jerri Bergen
AAHS President

PS: I will be remaining in President's role through this year, while so many new programs are begun.

AAHS FlightLine

American Aviation Historical Society

President: Jerri Bergen
Managing Editor: Job Conger

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Business Office:
15146 Transistor Lane
Huntington Beach, CA 92649-1156, USA

Phone: (714) 549-4818 (Mon/Wed/Friday)
Website: www.aahs-online.org
Email: aahs2333@aahs-online.org

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How Aviation Fuel Helped the Outcome of WWII

British and American forces shared a power advantage over their opponents in the sky throughout WWII thanks to their use of 100 octane aviation gasoline (AVGAS). Curiously, despite their ascendancy in other technical fields, Germany and Japan's use of 87 octane fuel remained consistent throughout the war. Why?

German and British aircraft used 87 octane gasoline in the first two years of the war. While that was fairly satisfactory in the German Daimler-Benz V-12 engines, it was marginal in the British Rolls-Royce Merlin XX engines. These more modern engines featured higher compression ratios, making them more efficient – but also putting higher demands – specifically a requirement for higher octane rating – on their fuel.

Eugene Houdry. (Sunoco Oil photo)

High compression ratios, high combustion temperature, and relatively lean fuel mixture all contribute to detonation, a violent, damaging explosion in the engine's combustion chamber, rather than slower, smoother burn that can be captured as power. Refining high octane aviation gasoline using common distillation processes was inefficient and costly, so Tetraethyl lead (TEL) was used as an anti-detonation agent – but high concentrations of TEL fouled spark-plugs, caused valves to stick, and made for frequent engine maintenance problems.

Gasoline's anti-detonation capabilities are expressed as "octane rating." The detonation characteristics of a fuel consisting of 100 per cent iso-octane was assigned a rating of 100. Later fuels with even better anti-detonation qualities were given higher numbers, called "performance rating. The higher the octane, the more severe combustion chamber conditions (higher heat and compression) can be without detonation.

The implementation of the U.S. lend-lease assistance program introduced American aircraft into the British service in great numbers. As much as British engines chafed under the 87 octane gasoline, American General Motors-built, higher compression Allison V-1710 engines had to have their maximum power limits reduced to prevent destructive detonation, significantly compromising performance when up against a determined opponent.

Something had to be done!

Eugene Houdry, born in France, developed, one of the earliest catalysts to convert useless crude oil into high octane fuel. He revealed a more efficient and economical catalytic "cracking" process at a Chicago chemicals conference in 1938.

Never heard of him?

Eugene Houdry had served as a young officer in the French Tanks Corps in during WWI. He had been wounded in action, decorated for valor, awarded the Croix de Guerre, and made a Chevalier of the French Legion of Honour. Following the war, Houdry took an interest in auto racing and visited the United States. He toured a Ford auto plant and attended the Indianapolis 500 race. What he saw in the U.S. was a country on the move.

America was producing its own oil and gas. On the other hand, France had to import virtually every drop of oil that fueled its military and civilian vehicles. Houdry saw this as a dangerous situation for France. Oil was becoming the lifeblood of modern economies and he thought he could help his country produce the gas and other fuels it needed.

Having earned a degree in mechanical engineering from the Ecole des Arts et Métiers in Chalons-sur-Marne, Houdry set to work on converting brown coal (which France had in abundance) into fuel. He opened a small lab and by 1930 he had small samples of gasoline made from coal. This was considered pretty miraculous and made Houdry a pioneer of synthetic fuels. Houdry was soon producing 60 tons (approximately 22,000 gallons) of gasoline a day from coal using his revolutionary method. But the French government decided that importing oil was cheaper than making gas from coal and withdrew their funding of the Houdry process.

In America, Houdry's work found a welcome reception from the Vacuum Oil Co. (which later became Standard Oil). Houdry relocated to the U.S. and licensed his revolutionary catalytic refining method in a joint venture to cheaply produce high octane gas out of oil, without the need for TEL to reach higher octane ratings. The venture started with a single Houdry Process plant in Marcus Hook, Pennsylvania. Soon there were 17 other plants in operation. Standard Oil had licensed the process to other oil companies like Sun Oil (Sunoco). It also licensed it to Shell Oil.

A Spitfire fueled with 100 octane gasoline was 34 mph faster at 10,000 feet than when flown on 87 Octane. (AAHS archives, AAHS-S064408)

When the Germans finally learned that Allied aircraft where operating on higher octane fuel, they were chargrined to learn that the Bf 109E - their best fighter at the time - could not take advantage of the fuel. (AAHS archive, AAHS-S108690)

After WWII began and France fell the Vichy government added insult to injury. It stripped Houdry of his citizenship for being a founding member of France Forever, which sought to eject the German invader from the country. Houdry became a U.S. citizen and continued his work.

When the war in Europe began, the U.S. was manufacturing a modest 40,000 gallons a month of 100 octane gas. By 1944, it was making 400,000 gallons of avgas a month from 77 Houdry Process plants.

A Spitfire fueled with 100 octane gasoline was 34 miles per hour faster at 10,000 feet than when burning 87 octane fuel. The need to replace engines went from every 500 hours of operation to every 1,000 hours. It reduced the cost of British aircraft by 300 pounds Sterling – and even more, when used in four-engine bombers.

The Germans couldn't believe it when Spitfires that couldn't catch them a year before started shooting their Bf-109s out of the sky as though pushed along by invisible tailwinds.

The American Allison engines improved remarkably with 100 octane gasoline, and did much better when 130 octane was introduced in 1944. The 130 octane Gasoline also improved performance of the radial-engine bombers built in the USA. To keep up with increasing engine performance, gasoline performance ratings were ultimately increased to "115/145" – 115 on a lean mixture, and 145 on a rich mixture. Although 115/145 is only made today in small batches for unlimited air races, the same rating system is still used. Low octane 80/87 is becoming rare, and today's most common AVGAS is "100LL." Because TEL is extremely toxic, a push to reduce the lead content of the high performance grade 100/130 resulted in today's 100 "low lead."

The Germans, say historians, did not discover the secret of Britain's aviation fuel until shortly before the end of the Battle of Britain, when a Spitfire on bomber escort went down in occupied Belgium.

"German technicians swarmed over the wreck," *The Times* reported. "They were startled to find, on testing the fuel left in the tanks, that the British were not using 87-octane gasoline. "They were further chagrined to discover that their best fighter, the Messerschmitt 109E, could not take full benefit from the superior British fuel because its engine did not have a high enough compression ratio or enough supercharger boost."

The Japanese never realized we had re-invented gasoline. Neither did the Russians. In the war-torn skies over Europe and Pacific, 100,000 Americans died. Lord only knows what that number would have been without our "super-gasoline." ✈

Is Supersonic Air Travel on the Horizon?

For many years, the Concorde supersonic airliner flew wealthy passengers across the ocean from London to New York and back. Purchased by only two airlines, British Airways and Air France, it was not allowed to fly supersonic in the lucrative North American market, due to the resultant sonic boom, although some suspect it was because the Boeing SST was in competition with the Anglo-French Concorde.

While it seemed to be a worldwide hit, its clientele was limited to the rich and famous, as well as a horrendous 100-seat capacity. Over time, it would not be either profitable or practical, and the crash of an Air France Concorde in 2000 sealed its fate.

With Concorde's demise, the dream of supersonic flight passed into the realm of fantasies and dreams. The technology to develop a practical supersonic transport just didn't exist.

Fast forward 50 years – with vast improvements in design and technology at least four companies have emerged to rekindle supersonic flight. Their designs range from business jets like the Mach 1.4, 8-12 passenger Aerion AS2 to commercial transports seating 65 to 85 passengers such as the Boom Supersonic Mach 2+ transport. Reports indicate that production of these two designs are scheduled to begin in late 2022 or 2023 with production aircraft available in the late 2020's.

But if you are going to dream, then dream big. Aerion announced in early April 2021, their next generation aircraft design, the AS3. This is a commercial airliner designed to carry 50 passengers, 7,000 nautical miles at Mach 4.3. Yes, that is not a typo – Mach 4.3.

Another way to express this in more day-to-day terminology, this is equivalent more than 2,800 mph, or up to seven times as

Aerion's AS2 is a private jet for 8-12 passengers with a speed of Mach 1.4 (1,728km/h) over a range of 8,400-10,000 km. (Aeron photo)

Aerion sees the AS3 as a commercial jet with stronger appeal to airlines keen not to miss out on a slice of the supersonic market. (Aerion photo)

Boom Supersonic Overture supersonic transport designed to carry 65-85 passengers at Mach 2 plus. (Boom Supersonic photo)

fast as a regular long-distance passenger plane.

Fancy making the transatlantic hop between London and New York in closer to two hours, meaning you would probably spend more time at the airports than in the air?

Crucial to the success of this next generation of supersonic flyers will be reducing the sonic boom through both design-shape considerations (NASA has a current research project in this area) and "boomless cruise" technology where the shockwave is reflected off a denser, lower layer of air and never reaches the ground (or is so muted that it is lost in normal background noises).

"Our vision is to build a future where humanity can travel between any two points on our planet within three hours. Supersonic flight is the starting point, but it is just that — the beginning," said Aerion's chairman, president and CEO, Tom Vice. "We must push the boundaries of what is possible."

Earlier this year Aerion expanded its ongoing partnership with NASA's Langley Research Center, with a specific focus on commercial flight in the Mach 3-5 range. Aerion is working with General Electric to design a new engine and won backing from Boeing two years ago.

Aerion sees the AS3 as a commercial jet with stronger appeal to airlines keen not to miss out on a slice of the supersonic market, even if that's a small but moneyed one of corporate travelers, luxury leisure passengers and other movers and shakers who want to spend less time shuttling around in the skies.

"High-fidelity weather models will be coupled into the Aerion's Boomless Cruise technology to compute an optimized flight plan" favoring supersonic speeds, said Vice.

Aerion is focused on speeds around Mach 4.3 for the AS3 because of heating, shock waves and other tricky engineering issues that emerge at Mach 5 (the beginning of the hypersonic flight regime) and above, he said.

Other Players

Boom Supersonic plans a $200 million supersonic jet that can carry 65 to 85 passengers at more than twice the speed of sound, which it says will enter service by 2030. The company has orders for 30 jets from Japan Airlines and Virgin Group.

Virgin Galactic surprised investors last year with plans for a Mach 3 aircraft seating as many as 19 people, an interim step on the company's path toward eventual hypersonic point-to-point travel.

The basic parameters of the initial high speed aircraft design include a targeted Mach 3 certified delta-wing aircraft that would have capacity for 9 to 19 people. Flying at an altitude above 60,000 feet, the airplane would also be able to incorporate custom cabin layouts to address customer needs, including Business or First Class seating arrangements.

Virgin Galactic's delta-winged, 9-19 passenger, Mach 3 transport. (Virgin Galactic photo)

Virgin's supersonic project is being assisted by Rolls-Royce, which is also working with Boom on supersonic engine technologies.

A fourth player, Boston-based Spike Aerospace, plans a 12-18-passenger supersonic jet that cruises at Mach 1.6 and has range to cover nonstop flights from London to Hong Kong and Dubai to New York.

Engine Development

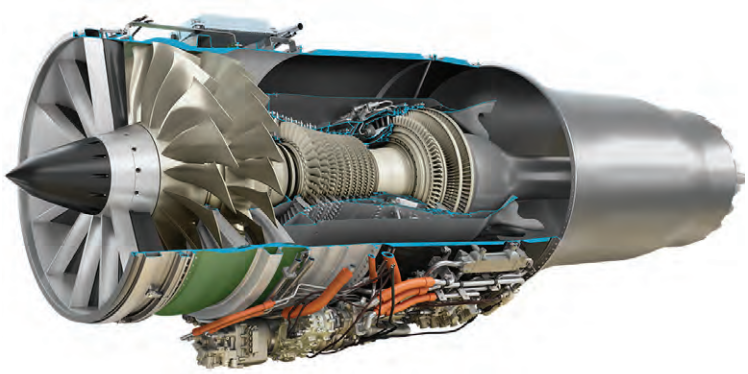
All of the designs are focusing on the use of state-of-the-art sustainable aviation fuel. Baselining sustainable technologies and techniques into the aircraft design early on is expected to also act as a catalyst to adoption in the rest of the aviation community. The goal is to have a very small, or ideally zero carbon emmissions from their operations.

Aerion boss Vice argues that Aerion has an advantage when it comes to engine development, pointing to its partnership with GE and its plan to build the first commercial supersonic power plant in more than five decades. The design is exclusive for Aerion, said Vice, who declined to disclose how much the engine development will cost or how it's being financed.

"Somebody else wanting to build a supersonic business jet – they're going to have to go find a different engine," Vice said. Aerion "for sure" will be the first new supersonic commercial aircraft to market, he predicted. "We'll get there years ahead of anybody else."

Aerion said it scoured the world for an engine, including Russian designs that would meet noise restrictions, fuel-burn requirements and reliability over thousands of hours of high-speed flying. No existing engines fit the bill, though.

Instead, the company turned to GE to build an engine with 20,000 pounds of thrust, special acoustic linings to reduce takeoff noise and dual turbo-fans that don't require fuel-guzzling afterburners.



General Electric's Affinity engine. (General Electric photo)

GE's Affinity is a new class of medium bypass ratio engines that provide exceptional and balanced performance across supersonic and subsonic flights. It is a twin-shaft, twin-fan turbofan controlled by a next generation Full Authority Digital Engine Control (FADEC) for enhanced dispatch reliability and onboard diagnostics.

GE's Affinity integrates a unique blend of proven military supersonic experience, commercial reliability and the most advanced business jet engine technologies. It features a proven engine core with billions of hours of service, a durable combustor with advanced coatings for sustained high-speed operation, and a special, non-augmented supersonic exhaust system.

It is deliberately designed to enable efficient supersonic flight over water and efficient subsonic flight over land, without requiring modifications to existing compliance regulations. The engine is designed to meet stringent Stage 5 subsonic noise requirements and beat current emissions standards and long-term regulatory goals.

GE's Affinity engine will also be the first designed to run on traditional kerosene and synthetic fuel made in part by capturing carbon dioxide from the air.

Virgin Galactic and Boom Supersonic have turned to Rolls-Royce for their engines. Rolls has experience in commercial supersonic flight having been the provider of the Concorde's engines. In addition, Rolls has been working with NASA over the past couple of years on propulsion designs for supersonic flight. While not much is known at this stage regarding the engines being proposed to power Virgin's and Boom's aircraft, the companies are all touting a low emissions designed based on sustainable aviation fuel (fuel made from renewal energy sources like cooking oil, animal fat, and paper waste products said to reduce carbon emissions by over 80% for the lifecycle of the fuel).

Summary

There are still technical and regulation challenges ahead for all these players and it will be interesting to see whether their financial backing will sustain any of these development programs to fruition. Even then, it probably will not be cheap, catering primarily to the well-heeled travel community. We'll just have to wait and see. ✈

Wants and Disposals

WANTED: Katherine Stinson info

I am ready to start a rough draft of a book on aviation pioneer Katherine Stinson of the Flying Stinson family. I would like to ask if any of you have primary and/or secondary sources on Katherine not available in the Otero-Stinson Papers at the Univ. of New Mexico, Albuquerque, or not in the Marjorie Claire Stinson Papers at the Library of Congress in Washington, D.C.

Also, if any of you can refer me to a Stinson descendent or relative who might be willing to be interviewed either in person or via email, phone, Zoom, etc., I would greatly appreciate that help as well.

David Langley
Asst. Prof. of English, Retired
Dbl2000@hotmail.com

DISPOSAL: Aircraft Negatives

B&W original negatives of U.S. military aircraft photographed from the mid 1960s to 1980s for sale at $ 3.00 each. A limited number of older negatives photoed after the late 1940s are priced higher.

For info, please email:

Bob Exposit
baesposit@verizon.net

or call (856)-627-5872

New Members

Editor's Note: Due to search engines extracting and indexing personal information, the AAHS no longer publishes detailed addresses. Please contact the office if you wish to contact a member.

Kristin P. Snyder
Parker, CO 80138

Daniel Blaich
Savannah, CA 31405

James Flint
Carlsborg, WI 98324

Xavier Vervaecke
2550 Kontich,
BELGIUM

Christopher D. Nagano
Washougal, WA 98671

Ruth Huggler
Youngsville, NY 12791

Gregory Morehead
Hamilton, OH 45013

Randall Davis
Cartersville, GA 30120

Magnus Wrigell
S57337 Tranas,
Sweden

Noel Scambler
Ivanhoe, VIC 3079
Australia

Philipp Flaschberger
5603 Kleinarl,
Austria

Peter Butt
Korat, Nakhon Ratchasima
30000,
THAILAND

Dan Sharpes
Albuquerque, NM 87123

Henry Faulkner
Dover, MA 02030

Nasser Alhamad
Brooklyn, NY 11222

Samuel Kloda
Hampstead , QC H3X 3W3
Canada

Michael McKendry
Wake Forest, NC 27587

Bethany Triana
Vancouver, WA 98661

Robert Goldberg
Washington, DC 20001

Matthew Kaller
New Orleans, LA 70115

John Stemple
Winter Haven, FL 33881

Freddie Smith
Ewa Beach, HI 96706

Check Six
Herndon, VA 20170-3649

Shirley Seller
Hemmingford, QC
JOL 1H0
Canada

Ingeborg Kendall Maranto
Claremont, CA 91711

Sonia Beerer
Glendale, CA 91208

Robert Brandes
Fredericksburg, TX 78624

Michael Green
Woodinville, WA 98072

Stephen Smith
Claremont, CA 917711
Zoggavia
00140 Helsinki
Finland

Scott Coleman
Pensacola . FL 32507

Diane Heinze
Oakland. CA 94618

Christopher J. Riedener,
Beaverton, OR 97008

Bob LaBouy
Redmond. WA 98053

Steve Riter
Seal Beach, CA 90740

Brian Robinson
Wallsend Tyne and Wear
NE28 7HT
United Kingdom

Timothy Dowse
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Please email me as a member of the AAHS. Enclosed is my check (money order or bank draft) for dues as checked below. I understand that I will receive all issues of the AAHS Journal published to date during my membership year, plus all issue of the AAHS FlightLine (Downloadable from the AAHS website). Individuals joining after October 1, will have their membership begin the following year, but will receive the Winter issue of the Journal as a bonus. I also understand that renewal is due at the end of the calendar year in which membership will expire. (Valid through December 31, 2021)

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AAHS Photo Archive CDs Series

The Society has recently started development of a series of photo CDs. These CDs contain high-resolution scans of negatives, slides and prints from the AAHS Image Library. The resolution of these scanned images is sufficient to make an 8"x10" photographic quality print. Each CD focuses on a particular aspect of American aviation history - be that a particular manufacturer, type or class of aircraft.

As of this date, the following CDs are available. Each CD contains between 70 and 140 images depending on content.

1001 Douglas Propeller-Driven Commercial Transports
1006 Lockheed Constellations, Part I
1007 Lockheed Connies in Color
1009 Lockheed P-38/F-5
1011 Curtiss Transports
1021 Boeing Propeller-Driven Commercial Transports
1031 Golden Age Commercial Flying Boats

These CDs are available to members for $19.95 ($29.95 non-members) each plus shipping ($2.50 U.S., $10.00 International - add $1.00 for each additional CD). Order forms are available online and on request, but a note along with your donation specifying your particular interest is sufficient.

Proceeds go to support the preservation of the photo archives. Do you have a particular interest or suggestion for a CD in this series? Drop us a line or email the webmaster (webmaster@aahs-online.org). We are currently researching the possibilities of offerings covering the following areas: Connies Part II, XP-56, Northrop X-4, Bell Aircraft, and Early Lockheeds.