On October 7, 1903, Charles Manly sat at the controls of the Langley Aerodrome. The brainchild of Smithsonian Institution director Samuel Langley, the Aerodrome was the culmination of his research into heavier than air flight. A signal was given and the Aerodrome launched—and immediately plunged into the Potomac. A second attempt in December 1903 met the same watery fate. Manly, unharmed, was rescued each time.

Although the Aerodrome’s two ill-fated “flights” went nowhere, Charles Manly was clearly prepared for success. A pre-flight picture of Manly together with Langley shows him in his flying suit, which included a nautical compass sewn onto its left leg. Manly’s readiness showed that even in the earliest days of flight, navigation was a serious concern.

The potential for airplanes to travel rapidly over long distances was apparent from the start. In 1909, Louis Bleriot successfully flew across the English Channel—but without a compass, he initially navigated by following a destroyer of the French Navy. In the United States, the first attempts to cross wide expanses of countryside were undertaken by aircraft flying US Mail. The first flight, in May 1918, was scheduled from Washington, DC to New York City. The pilot became lost shortly after departure and landed to ask for directions, vividly demonstrating the ongoing shortcomings in aerial navigation.

Air mail served as an impetus to development of a nationwide aerial navigation system. By 1920 air mail service linked San Francisco and New York, yet the service was a hybrid. Mail flew by day and was transferred to trains overnight, taking nearly 3 days to complete the transcontinental journey. Night flight, especially over the vast and sparsely populated spaces of the western United States, was too dangerous to attempt. To solve this problem, a system of airway beacons was constructed.

Built between 1923 and 1933, airway beacons were intended to guide airmail pilots on night flights. Each beacon consisted of a 90’ tall tower topped by a rotating white beacon light, and a small building containing a gasoline-powered generator to power...
the beacon. The concrete footprint of each beacon formed the shape of a giant arrow, painted bright yellow to indicate the direction of the next beacon. Each individual beacon could be seen from 40 miles away in ideal conditions; a series of beacons about ten miles apart defined an airway, or route, across the country. The completion of the first transcontinental airway in 1923 permitted airmail to be flown coast to coast without the need to transfer to trains overnight, cutting the trip duration in half.

Airway beacons were developed in conjunction with airfields to service aircraft flying the mail. On the transcontinental airway between San Francisco and New York, stops at thirteen intermediate airports were made. These stops allowed for mail transfers, aircraft refueling and pilot changes. Airports received beacons of their own, with different color combinations to indicate airports of different types. Sequential green and white flashes denoted civilian land airports in the United States, a practice that continues today.

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Even as the last airway beacons were being erected, however, their demise was at hand. Airway beacons required clear weather to provide a safe and sure means of navigation. In poor weather, early pilots relied on a different type of navigation known as dead reckoning—flying a known compass course at a known speed for a carefully measured period of time. Charles Lindbergh used dead reckoning to cross the Atlantic Ocean in 1927, but while the technique sufficed to find a continent at the end of a 33-hour flight, it was insufficiently precise to thread a mountain pass, or find a small airfield. For that, greater precision was required—the precision that radio navigation could provide.

Although invisible to the naked eye, radio waves are able to shine through haze, clouds and darkness. Following a series of experiments undertaken by Jimmy Doolittle in 1929, low-frequency radio range (LFR) equipment was gradually installed along airways across the country. LFR signals required elaborate ground stations, but aircraft themselves needed only a simple AM radio receiver to follow the signal. The station transmitted two signals on the same frequency—the letters A and N in Morse code. The pilot listened to the radio frequency while following the defined airway. If the pilot heard a steady tone in the radio headset, the aircraft was on the course line. If either letter became audible, the pilot would know to turn left or right to regain the course. Following an LFR course for long periods of time was mentally demanding of the pilot, but the equipment requirements were modest and the precision sufficient to allow for instrument approaches to airports in extremely poor visibility. LFR systems were widespread across the United States by the mid-1930s, and were the mainstay of commercial aviation operations until VHF Omnidirectional Range (VOR) equipment became available following World War II.

Airway beacons remained in use following the adoption of LFR radio ranges, and in fact early LFR stations were often co-located with airway beacons to define the same airways. Following the adoption of VOR navigation, however, the beacons gradually fell into disuse. By 1970s most had been decommissioned, and today only a handful of beacons remain operational. By 2020 just one operational airway beacon—located at MacDonald Pass, Montana—is expected to remain. In contrast, the white-and-green rotating beacons identifying airports are still a welcome and familiar sight to 21st-century aviators.

In 2017 the Hiller Aviation Museum acquired a decommissioned aerodrome beacon from San Francisco International Airport, The beacon will be reconditioned by Restoration Shop volunteers and placed on display in 2018. Retired after many years of service guiding aircraft from around the world to SFO, this new exhibit serves as a reminder of aerial navigation in a bygone era.

Resources
https://airandspace.si.edu/collection-objects/air-mail-usa-facilities-navigation-beacons-dayton-wright-dh-4-photograph, downloaded 1 November 2017
https://www.nps.gov/nr/feature/places/14000462.htm, downloaded 1 November 2017

Perspective
Our 13th annual fundraising event, “Not Even the Sky is the Limit” was held at the museum in October and thanks to the hard work of the museum Board, volunteers, our MC Sandhya Patel, guest speaker Bonnie Warner Simi and our own Rebecca Duran, Vice President of Development, the event was a great success.

Meanwhile, work continues by our restoration shop volunteers in constructing a full-size replica of a WWI Fokker Dr.1 triplane. In the coming months, the aircraft will again be removed from its temporary display in the gallery back to the restoration shop where you can watch the intriguing process of putting fabric covering over the wings, control surfaces and fuselage.

In the center of the gallery, a new display is taking shape called “Flying Destinies in California”. In pictures and text, the stories of Bay Area aviation pioneers is told including Lincoln Beachey, Allan Lougheed (Lockheed), Robert Fowler and the Jacuzzi Brothers. Plus, fascinating accounts are displayed of the 1927 Dole Air Race (the first from Oakland to Hawaii) and the 1929 Women’s Air Derby. Soon to come in this area is the completely refurbished airport beacon which shone at SFO for many decades.

The museum’s 6th annual Aero Design Challenge was successfully undertaken this October and over 350 youth from the Bay Area spent five days at the museum tackling the challenge of designing, engineering and flying gliders. Several hundred additional students will be participating from South San Francisco in the weeks between Halloween and New Year’s. We are especially thankful for the event’s sponsors, Peaxy and SAP, including many of their company employees who volunteered to help during the multi-day event.

A heartfelt “thank you” goes to all of the many contributors, visitors and museum Members for supporting us and making the museum part of your lives. There are great things coming and we look forward to seeing you this winter at the Hiller Aviation Museum.
NEW MEMBERS


SPECIAL THANKS TO:

Presenting Sponsor
Mark Jon Bluth

Supporter
Asset Management
Chris Malachowsky/NVIDIA

Individuals
Jeffrey Bass & Lisa Bobbitt
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Special Thanks to the Gala Event Committee
Eileen DiGiorgio
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Brenna O’Boyle

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www.hilleraviationmuseum.org
**SR-71 PILOT BRIAN SHUL, SATURDAY DECEMBER 30, 11AM**

Brian Shul is one of the most popular and dynamic aviation speakers in America today. As an Air Force fighter pilot, Brian was shot down in the Vietnam War and severely burned in the ensuing crash. Initially given up for dead, he was rescued and spent one year in hospitals, endured 15 surgeries and was told his flying days were over. Amazingly, Brian returned to active duty flying, became an Airshow Demonstration pilot in the A-10, went on to become a TOPGUN instructor, and culminated his Air Force career by flying the top secret spy plane, the SR-71. Flying the world’s fastest and highest flying aircraft required an astronaut physical and Brian made Air Force history when he passed with no waivers.

**SANTA CLAUS ARRIVES BY HELICOPTER**

**SATURDAY NOVEMBER 25, 10:30 AM**
**RAIN OR SHINE. DOORS OPEN AT 9:30.**

Join the West Bay Community Band and sing Christmas Carols while the kids line up to tell Santa their Christmas gift list.

**No Museum admission fee required for this event!**

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**Join Now!**

<table>
<thead>
<tr>
<th>Category</th>
<th>Membership Fee</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>Senior (age 65+)</td>
<td>$50</td>
<td>Unlimited admission for you + 2 guest passes.</td>
</tr>
<tr>
<td>Individual</td>
<td>$65</td>
<td>Unlimited admission for you + 2 guest passes.</td>
</tr>
<tr>
<td>Family</td>
<td>$90</td>
<td>Unlimited admission for 2 named adults and up to 4 children (17 &amp; under) + discounts on Aviation Camp.</td>
</tr>
<tr>
<td>Pioneer</td>
<td>$125</td>
<td>Family Membership benefits + an additional card for a named member (ideal for caregivers) and 2 guest passes.</td>
</tr>
<tr>
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<td>$275</td>
<td>Family Membership benefits with a total of 3 guest passes + 8 FMX Flight Simulator passes and 50% off additional FMX tickets.</td>
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<tr>
<td>Barnstormer</td>
<td>$550</td>
<td>Pilot Membership benefits with a total of 8 guest passes + 10% off Museum Rental and Birthday Parties.</td>
</tr>
<tr>
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<td>$1,000</td>
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<td>Explorer</td>
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<td>Navigator</td>
<td>$5,000</td>
<td>Pilot Membership benefits with a total of 12 guest passes + 25% off Museum Rental and Birthday Parties and a Hiller Aviation Museum jacket.</td>
</tr>
<tr>
<td>Aviator</td>
<td>$10,000</td>
<td>Pilot Membership benefits with a total of 12 guest passes + 25% off Museum Rental and Birthday Parties and a Hiller Aviation Museum jacket.</td>
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**Thank you for your support.**

Please make checks payable to Hiller Aviation Museum
601 Skyway Rd, San Carlos, CA 94070

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**Annual Membership Application**

Or join online at **www.hiller.org/member**

I want to be a member of Hiller Aviation Museum in the following category:

- [ ] Senior (age 65+) $50
- [ ] Individual $65
- [ ] Family $90
- [ ] Pioneer $125
- [ ] Pilot $275
- [ ] Barnstormer $550
- [ ] Adventurer $1,000
- [ ] Explorer $2,500
- [ ] Navigator $5,000
- [ ] Aviator $10,000

- [ ] New Member
- [ ] Annual Renewal

Primary Adult Member: ____________________________________________________________

Second Adult Member: ____________________________________________________________

Third Adult Member: ____________________________________________________________

Address: __________________________ City: __________________________

State: _____ Zip: ___________ Daytime Phone: _________________________

Email: ____________________________________________________________

This is a gift membership from: _________________________________________________

Card #: __________________________ Exp. Date: __________________________

CSC: ______ Print Name on Card: _______________________________________________

Signature _________________________________________________________________

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**December**

**SAT, DEC 2**
Museum Closed Private Event

**SAT, DEC 9 • 10:30AM & 2PM**
Starlab Sky Show

**THU-FRI DEC 21, 22**
Aviation Camp – Flight Science Lab

**SAT, DEC 25**
Closed All Day

**MON-FRI, DEC 26 – 29**
Aviation Camp – Wright Flight

**WED, DEC 27 • 11AM**
Happy Birds

**WED, DEC 27 • 1PM – 3:30PM**
Nano Drone Workshop

**SAT, DEC 30 • 11AM**
SR-71 Pilot Brian Shul

**SUN, DEC 31 • 10AM – 1PM**
Noon Years Party

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**January**

**MON-FRI, JAN 2 – 5**
Aviation Camp – Aero Engineers

**WED, JAN 3 • 11AM**
Perfect Paper Plane Workshop

**Gourmet Food Truck Drone Plex • Saturdays & Sundays**

**Invention Lab • Saturdays & Sundays, 10:30AM-12PM & 1PM-3PM**

**Flight Sim Zone • Saturdays & Sundays, 11AM-2PM, Noon Years Party**

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**Untitled Skies of WW-I**

**SATURDAY JAN 27, 11AM**

In the first days of World War I, aviation technology was rushed to the battlefield. Inadequately tested, new aircraft designs made their aviators unwitting test pilots with an average life expectancy of less than six weeks!

Untamed Skies explores major innovations born of necessity and improved upon over time to produce safer and more capable warplanes. Lightning-fast advancements in materials science, engine, and aerodynamic engineering led to designs that proved to be ingeniously creative and outlandishly dangerous—and sometimes both at once! As aircraft improved so too did weapons and tactics mature, changing the face of warfare forever.
"NOON" YEARS EVE PARTY • DECEMBER 31 11AM – 1PM

Presented by The Hiller Aviation Museum and Bay Area Parent Magazine

You’re invited to attend the "Noon" Years Eve Party on Sunday, December 31 at the Hiller Aviation Museum. This annual event is designed especially for kids. Join us for these exciting activities:

• Count Down to 12:00 Noon ("Noon" Years)
• Balloon Drop in two separate rooms this year
• Slides and Jumpers
• Face Painting, Games and Fun
• Dance Shows, Magic and more!

Event runs 11am-1pm Sunday, December 31 at the Hiller Aviation Museum. Event included with museum admission.

Sponsored by

OPEN COCKPIT DAY

JANUARY 6, 10AM – 2PM

Who isn’t fascinated with sitting in the cockpit of a modern airliner or a jet? The Hiller Aviation Museum is unique in regularly providing visitors access to real aircraft cockpits like an A-4 jet trainer, a Hiller H-12 helicopter and our Boeing 747. On this special day, we swing open additional cockpits including the Grumman HU-16 Albatross, Boeing 737 airliners and the Cessna 177 Cardinal. From general aviation piston aircraft to commercial airliners, you will get a real “hands-on” experience and unique perspective on flying from real pilots and airline captains. Event included with museum admission.

FLYING FOOTBALL FUN FEST & PUPPY BOWL

SATURDAY, FEBRUARY 3, 10AM – 1PM

Join the excitement of the Super Bowl as the Hiller Aviation Museum explores the junction of football and flight in a family-friendly extravaganza! See a helicopter football drop, watch a puppy bowl, check out the Drone Bowl combat demonstrations, experiment with aerodynamics of footballs and more! Event included with museum admission.

BAY AREA GARDEN RAILROAD

SATURDAY FEBRUARY 10, 10AM – 3PM

The Bay Area Garden Railroad Society’s waist-high track features live steam locomotives. These railroad engines are designed to be run in anyone’s backyard garden. Live steam locomotives have a butane-fueled fire that boils water. The resultant steam is then used to power the pistons. This is the same technique full-sized locomotives have used for 175 years. Many examples of old-time model steam locomotives will be seen running on the track, all the while puffing wonderful plumes of steam.
WINTER PROGRAMS FOR KIDS

HOME SCHOOL WEDNESDAYS
Drop-In Field Trip Tours and Programs
Grades K-8

- Home school students Grades K-8 may be admitted individually at the field trip rate when accompanied by an adult paying regular Museum admission. No reservations are necessary, space is available on a first-come, first-served basis.
  December 6, January 10, February 7, March 7.

DRONE BUILD WORKSHOPS

- Drone Rangers (Grades K-5)
  January 15, February 17, March 10
  10 AM – 12:30 PM
  Explore the world of unpiloted flight! Drone Rangers features hands-on experiments in drone construction, multirotor flight simulation and flight training in the Museum's Drone Plex. All participants take home an entry-level mini-drone!

- Nano FPV Workshop (Ages 10-Adult)
  December 27, January 6, February 17, March 10
  1:00 PM – 3:30 PM
  Take flight with Hiller Aviation Museum and Aerial Sports League! Discover the world of first-person-view (FPV) drone flight. Complete a training session with simulators and flight aircraft, then don the FPV goggles to master the art of virtual flight! Participants take home a complete set of FPV flight equipment. Advance registration required for all drone workshops. Visit www.hiller.org for more information or to enroll today.

ENGINEERING CHALLENGES

AERO DESIGN CHALLENGE
January 27, 2018 • 1 PM – 4 PM
Explore the design process with an exciting adventure in flight! Prepare for the task of building a high-performance glider by experiencing wind tunnels, flight simulation, aerodynamics labs and more! Then, work in a small group of 3-4 to design, build and test a glider. Each team competes to reach the longest distance in an exciting culminating competition!

The Aero Design Challenge is sponsored by Peaxy and SAP. There is no charge to participate and Museum admission is not required, but space is limited and advanced registration is required.

ENGINEERS’ WEEK
February 12-16, 2018
The countdown has begun for a high-flying adventure in engineering! This year’s 90-minute program explores the cutting edge of flight with an adventure in suborbital spacecraft. Children Grades 4-8 design, build and test a small water rocket while using the engineering design process.

Engineers Week programs are offered 3:30 PM – 5:00 PM Monday through Friday, February 12-16. There is no charge to join these programs but space is limited and advance registration is required.

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WINTER AVIATION CAMPS
December, January and February Programs Available

Take to the skies with special Aviation Camp program for Grades K-8! Four different topics are available, each offering hands-on experiments, flying models, flight simulation and encounters with real aircraft.

FLIGHT SCIENCE LAB • December 21-22
WRIGHT FLIGHT • December 26-30
FLIGHT SIM ACEs • December 26-30
AERO ENGINEERS • January 2-5
PHYSICS FLYERS • February 19-23

Winter Camp programs are available Full Day (9 AM—4 PM), and extended hours are available for an additional fee. Partial-week enrollment options are available for most sessions to meet school vacation and family holiday plans. Space is limited—register today to secure your child’s spot in winter Aviation Camp!

STARLAB SKY SHOW
December 9, January 15 & 20, February 3, March 10
10:30 AM, 2:00 PM

Enter the Hiller Aviation Museum’s Starlab Planetarium and take a spectacular trip through the glittering stars, planets and constellations of winter. Identify star patterns visible from your own backyard this season during a special 30-minute presentation. Space for each presentation is limited. Tickets are required and may be purchased at the Gift Shop on the day of the program. Presentations are designed for children aged 5 and up. Children aged 3-5 are welcome to join the first presentation each day. Visit www.hiller.org for more information.

SPECIAL EVENT PRESENTATIONS

HAPPY BIRDS
Parrots, Macaws and Cockatoos
Wednesday, December 27 • 11 AM—12 PM

Many birds migrate south for the winter, but not the Happy Birds! Returning to the Hiller Aviation Museum for a special holiday engagement, this talented team of precocious parrots gives a remarkable demonstration of feathered flight. Marvel at their antics as they fly, walk, talk and even sing through a wide range of amazing behaviors that will entertain your whole family!

PERFECT PAPER PLANES
Featuring Paper Airplane Champion John Collins
Wednesday, January 3 • 11 AM—12 PM

Join a unique exhibition of paperlight flight! Author and master paper airplane builder John Collins leads an interactive 45-minute session investigating the science of making things fly and the notebook-scale engineering required to fold and fly record-breaking paper gliders. Come prepared to try your hand building and flying your own paper aircraft!

AVIATION CAMP SUMMER 2018
Dates and topics available online
January 3, 2018
Register early for best selection! www.hiller.org
SPECIAL HOLIDAY SHOPPING

Friday Nov 24 through Sunday Dec 31

Museum Members receive a 25% discount in the Gift Shop
Friday, November 24 through Sunday, December 31 Only

Become a Museum Member and take advantage of this great holiday offer!

An Aviator’s Paradise,

Shop on line: www.hiller.org,
Gift Certificates available!