TREASURE IN THE DUST BIN OF HISTORY

By Harvey H. Lippincott

Until it became practical for the airplane to go to sea on ships, naval authorities discouraged the establishment of aviation in the U. S. Navy. Late in 1910 the first constructive steps were taken by the Navy to keep abreast of aviation development with the appointment of Capt. Washington Irving Chambers to follow aviation matters. Several developments occurred in rapid succession. Eugene Ely demonstrated the feasibility of take-off and landing from platforms on ships. Lt. T. G. Ellyson was ordered to the Curtiss school for instruction in flying. Glenn Curtiss developed the seaplane and demonstrated how it could operate at sea by landing alongside a ship to be hoisted aboard and then put back in the water for take-off. As a result of these demonstrations and other events, the time had come for the Navy activity to undertake limited training and experiment with aviation.

On March 4, 1911 an appropriation of $25,000 was made to the Bureau of Navigation for "experimental work in the development of aviation for naval purposes."[1] Lt. John Rodgers was ordered to the Wright Company for flight instruction on March 9. Later three airplanes were ordered; two from Glenn Curtiss and one from the Wrights. The Curtiss A-1 first flew on July 1 while the A-2 flew on July 13. On July 15 Orville Wright flew the Navy's third airplane the Wright B-1 for the first time.

By September the airplanes, pilots and ground personnel were assembled at the naval aviation camp at Greenway Point, Annapolis, Maryland to begin operations. On December 9 the B-1 was converted to a hydroaeroplane. The aviation group was ordered to North Island, San Diego to set up an aviation camp on land offered by Glenn Curtiss. By the middle of February, 1912 flight operations resumed at San Diego. A vast amount of the flying was essentially training and practice. However, certain experiments were undertaken in airborne wireless transmission, scouting and cross-country flying. Then on March 1, 1912 the first serious accident to the B-1 occurred. Ensign Victor D. Herbster was piloting on that day with civilian mechanic Waldo D. Waterman as passenger. Entry for flight 105 in the official Navy log for the Wright B-1 states:

> "Machine at 100 ft. elevation, struck by gust on right wing. Headed down but did not answer warp nor vertical rudder: did not answer horizontal when 20' from water. Probable cause: water in boats; more in left than right. Damage: 48 ribs broken; 1 spar; 2 front drags; 2 pontoons buckled; 1 tail; 1 perpendicular; 1 float rest."[2]

After the big splash in water off of North Island, the craft turned over onto its back, but remained afloat. Fortunately, neither person was much injured. W. B. Atwater, a Curtiss student, rushed out in a motor boat, and Glenn Curtiss who was flying a Curtiss hydroaeroplane nearby landed and taxied to the B-1, both attempted to rescue the two dripping men. They refused to be rescued by Curtiss people for fear Curtiss would use the rescue of Wright pilots to his publicity advantage. They waited for a Navy launch.[3]

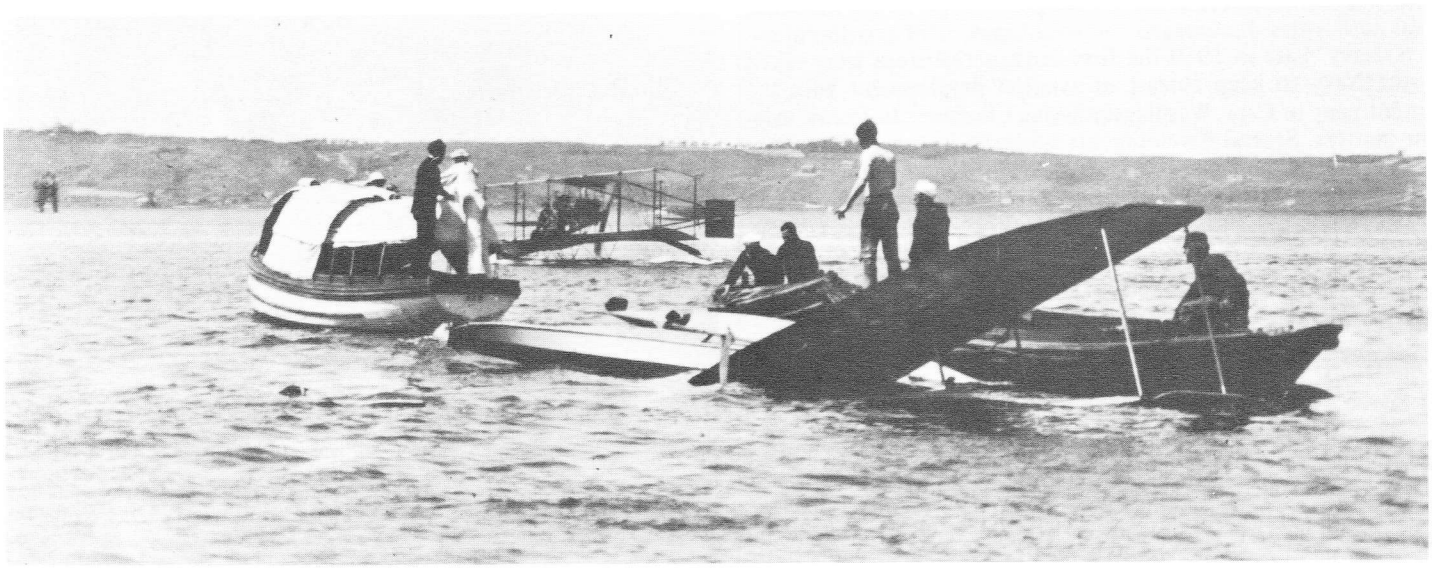
By Spring 1915 the Curtiss A-1 and A-2 as well as the Wright B-1 were worn out and salvaged. Progress in naval aviation pressed on to better airplanes. Soon the relics of the three pioneer airplanes of naval aviation's beginning in 1911 disappeared into the mists of time. Only pictures and written words remained. Admiral John H. Towers and a few others who were there remembered only the struggle to get naval aviation going and the frail craft they flew.

In July 1961 the newly formed Connecticut Aeronautical Historical Association received a priceless gift from George S. Pranaitis, pioneer aviation mechanic and dean of the aircraft inspectors of Connecticut's Department of Aeronautics. This was the remains of a Wright brothers vertical four cylinder aircraft engine, S/N 17. Years before Pranaitis had obtained the complete engine from pioneer Connecticut airplane constructor and aviator, Nels J. Nelson. He took the engine apart to "clean it up so it would run." One day while away at work, his mother-in-law allowed a junk man to canvas the property for available junk. In the process the engine cylinders, pistons, rods and other lesser parts were carted off. That evening Pranaitis thoroughly "blessed" his mother-in-law when he discovered what had happened and went looking for the junk man. He found him, but not the parts. The remains were stored for many years until he gave them to CAHA.

Wright brothers engines are very rare indeed. CAHA decided the engine should be reconstructed with new parts added to the old. A search for working drawings revealed none existed. The only recourse was to borrow an engine, disassemble it, measure it and make new drawings. Paul E. Garber, then Head Curator of the National Air Museum, Smithsonian Institution, agreed to loan one of their Wright engines to CAHA for this purpose. A group of Pratt & Whitney Aircraft design engineers agreed to contribute spare evenings to measure parts and make detail drawings.

A loan agreement was reached and engine NAM Wr-4, No. 2 was picked up by the author on August 5, 1961.[4] The engine was catalogued as one donated by the estate of James N. H. Jacobs.

Examining Wright engine from Navy B-1 airplane at Pratt & Whitney Aircraft. (l to r) Harvey H. Lippincott, Dale B. Sigler and Lee M. Pearson. Pratt & Whitney Aircraft Photo.



However, Paul Garber advised the author that he had a personal suspicion that this engine may have come from the Navy. Two Wright engines, the Jacobs engine and a Navy engine, had arrived about the same time at the museum and some confusion on identification had occurred.

This engine was taken to the Pratt & Whitney Aircraft Service School at Wethersfield, Conn. where facilities existed for disassembly, measuring and proper care of the engine and where drafting tables were set-up for the drawing project. Upon unpacking the engine a large, ugly sheet metal patch was seen to be bolted on to the left side of the cast aluminum crankcase. Here was a major identification mark! Following up on Garber's remarks of the possibility of a Navy engine, the author consulted AEL Museum Engines 1909 to 1951, AEL Report No. 1235 dated 31 December 1952. This report described the historic engines that had been at the "engine museum" of the Aeronautical Engine Laboratory, Naval Aircraft Factory at Philadelphia Navy Yard. Sure enough, pictures of the 4-cylinder vertical Wright engine that had been in the Navy collection revealed the same ugly crankcase patch. The engine was now identified as a U. S. Navy engine.

What Navy aircraft could have used this engine? To the author' knowledge, the Navy used only four Wright airplanes, the B-1, B-2, B-3 and A-51 aeroboat. B-1 was the most logical choice as the others used six-cylinder engines. Though the B-1 was delivered from the Wright factory with a 4-cylinder vertical Wright engine, the log contained no engine serial number. Nor was the serial number available on the engine for the stamped numbers had been removed when the top of the crankcase was replaned sometime in the past.

Following the aforementioned entry of the B-1 crash in the official Navy log for flight 105, was another entry for March 3rd to 19th inclusive which describes the repair:

> "Took machine apart, put in new ribs, rebuilt planes; took engine apart; repaired crankcase; overhauled engine; assembled engine; assembled aeroplane; put on new boats from Navy Dept. Connected up controls. Used spare parts when possible; made only when necessary; received help from (U.S.S.) Iris in making diagonals to boats; fittings for boats, etc. Overhauled and repaired magneto; ignition & feed system; put in new spark plugs. Repaired and overhauled tachometer. Tested out engine."[5]

The words *"repaired crankcase"*. Could this be the original engine from the B-1? The log indicated up to this point the original Wright engine had remained in the airplane from the time the B-1 was accepted. (Later it was replaced by a Mead 4-cylinder, then a Gyro 7-cylinder aircooled rotary, and finally a Sturtevant 4-cylinder, all giving around 50 hp each.) If this was the B-1 engine it would be the sole remaining piece of aviation hardware of Naval aviation's beginning in 1911! It was an exciting prospect. If it could be proved, then a national aeronautical treasure would exist. The patch, while indicative, was not sufficient proof. How to prove it?

Upon removal of the side cover of the crankcase, a crack was found in the lower part of the crankcase behind the patch plate. Further, an adjacent vertical structural web of the crankcase casting was also cracked and repaired by bolted on steel reinforcing plates. No holes through the crankcase existed. The interior surfaces of the crankcase were of normal casting finish without nicks or damage from rotating parts. Thus the condition indicated no internal failure had occurred. Therefore, one could only conclude the cracks were caused by an outside force, such as may have occurred in a crash.

One way to get action sometimes is to make a positive statement. A letter was drafted to the Navy Department summarizing the findings and stating a claim that the engine was the Wright B-1 engine.[6] The letter and claim created considerable interest at the Navy and the National Air Museum. Further research there produced no additional information.

A year later Charles L. Wiggins, Calbraith Perry Rodgers' mechanic, hearing about the Wright Navy engine, handed the author a copy of a letter from Dale B. Sigler of Portland, Oregon. Sigler stated, "I was the first enlisted man detailed to aviation service in the United States Navy . . . I am the only one now living of the original Naval Aviation Detail of four officers and four enlisted men . . ."[7]

The author immediately wrote to Sigler on November 12, 1962 relating the situation and asking if he could identify the engine.

Sigler replied; "with the substantiating evidence of the log of the Navy B-1, I have no hesitancy in saying that, unless positive evidence to the contrary can be produced, the engine pictured is definitely that of the B-1. I have a very distinct memory of the crankcase being cracked . . . I recall that an attempt was made to weld or solder the break, but, with the techniques of the time, it proved impossible, so the steel plate was used."[8]

Sigler's letter was sent to the Navy. There the discovery of Sigler and his memory of the engine and its repair caused considerable excitement all around.

Lee Pearson, Historian, Bureau of Naval Weapons, wrote to Sigler on 28 December, 1962; "If it is an engine that was flown in the B-1, as all evidence suggests, it is the oldest original piece of naval aeronautical equipment in existence." In response to Pearson's request Sigler agreed to come east to examine the engine and try to authenticate it. In time Sigler's trip east was arranged, and he and Pearson inspected the engine at Pratt & Whitney Aircraft on October 11, 1963.

The patch had not been removed since its installation in 1912. Before removing the patch, Pearson asked Sigler, before witnesses, how he would know if this was the engine he had known and monitored at the time of repair in 1912. Sigler described in detail the chamfered crack and some beads of solder remaining from the unsuccessful "welding" effort.

Sigler's statement dated 18 October 1963 is of interest.

"The Navy aviation mechanics crew, of which I was a member as mechanic in charge of the B-1, did not make the repairs on the engine as we had the plane itself to rebuild, but I followed, very closely, the efforts to make the engine serviceable. As the factory could not promise a replacement of the engine short of three months, it was necessary if possible, to restore it to service.

"A specialist was employed who, at first, attempted to weld the crack, and later to solder it, but, with the techniques then available, neither of these processes was successful, and, as a last resort, a steel plate was bolted to the crank case, and proved adequate to restore it to service.

"Following the work closely as I did, I noted that in the attempt to weld it, the crack was slightly chamfered, and the direction and contour of the crack were definitely impressed upon my mind and memory. When asked if I could positively identify the engine, I felt certain that if the steel plate was removed and I could see the crack itself, I could definitely do so. When the plate was taken off, there was not the slightest doubt in my mind, as the direction and contour of the crack were exactly as I remembered them, and there was a noticeable deposit of solder in the chamfered edges of the crack.

"In addition to the detailed reasons above stated, I cannot believe that two four-cylinder Wright engines could have been similarly damaged and repaired in the same manner. So I will state positively that the engine now at the Pratt-Whitney plant in East Hartford, Connecticut, is undoubtedly the one with which the Navy Wright B-1 was originally equipped."[9]

Pearson concludes his report with, "As an underlying conclusion it is exceedingly improbable that two Wright engines would have been patched with sheet metal patches such as the one on this engine and which is described by Mr. Sigler. It is even more improbable that an attempt would have been made to weld or solder breaks in two Wright engines. Thus the vee chamfer and remaining solder provides inconvertible evidence that this was indeed the engine in the Navy's Wright B-1 aircraft flown by John Rodgers and V. D. Herbster."[10]

The Connecticut Aeronautical Historical Association, Pratt & Whitney Aircraft and the author were commended for their part in the identification and authentication of the Wright B-1 engine in letters by Rear Admiral K. S. Masterson, Chief of the Bureau of Naval Weapons, dated 20 November 1963.

The Smithsonian handed us an engine, and, out of the dust bin of history we gave them back a national treasure - "the oldest original piece of naval aeronautical equipment in existence," a relic of Naval Aviation's beginning in 1911.[11]

Technical Description of the Wright Vertical 4-Cylinder Engine

Initially the Wright brothers designed and built four-cylinder horizontal in-line engines ranging in power from 12 to 25 hp, including the engine used in their first airplane flown on December 17, 1903. Three such engines were built, each varying in detail.

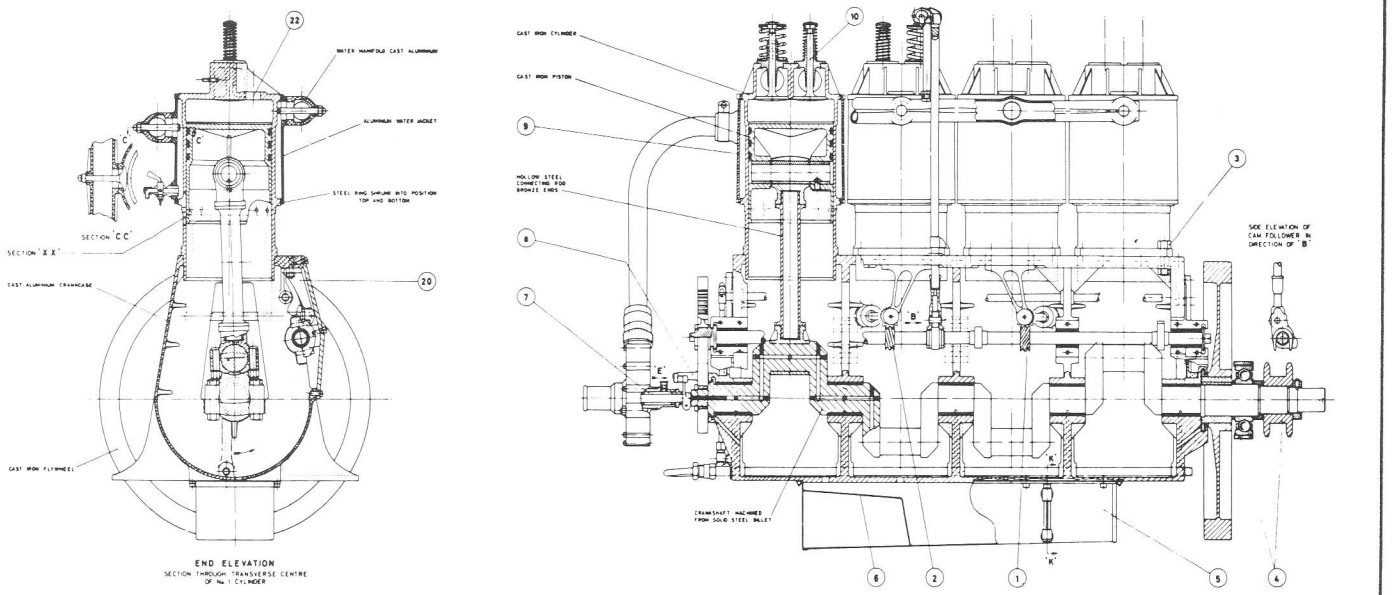
Beginning in 1906 the Wright vertical four-cylinder in-line engine appeared and became the standard production Wright engine on into 1912. Orville was responsible for the design of the most used of all the Wright engines. While no accurate information is available, possibly as many as 125 vertical 4's were built by the Wrights.

Putting the engine in an upright instead of a flat position, was probably done primarily to provide for a minimum variation in the location of the center of gravity with and without a passenger. Whether or not it had any influence, the vertical cylinder arrangement was becoming predominate in automobile power plants by this time.

A cast one-piece aluminum crankcase was employed incorporating strengthening webs and supporting ribs. The cam

Opposite: Rescue of Wright B-1 crew after crash on March 1, 1912. Boats arrive to rescue the crew. Glen Curtiss in hydroapirplane standing by. Ensign V. D. Herbster in center boat, black sweater and hatless. Waldo Waterman standing in bow of boat to right in light shirt alongside Chief Machinist Mate C.A. Jerreries. Machinist Mate J.P.Eck in stern. Persons in Navy launch to left are unidentified. Photo: Smithsonian Institution.

San Diego Bay, February, 1912. Wright B-1 mounted on twin pontoons with four-cylinder Wright engine. "Piggy-back" debarkation. Dale Sigler carrying Lt. John H. Towers, Lt. John Rogers seated in aircraft. Photo: Smithsonian Institution.



Sectional Drawing of Wright Vertical Engine, French Version Manufactured by Bariquand et Marre. Courtesy Smithsonian Institution.

shaft was supported directly in the case. The crankshaft was installed through the ends of the crankcase while the connecting rods and caps were assembled through the left side, access to which was attained by removal of a flat steel plate.

The basic cylinder was a machined iron casting with a four cornered flange that was fastened to the crankcase by means of studs and nuts. An integral boss on top of the head contained the valve guides and ports. The valves seated directly on the cast-iron head. A cast aluminum water jacket was shrunk over flanges on the cylinder barrel and steel rings were shrunk on the ends of the jacket over the flanges. The rings insured the maintenance of a tight joint despite the tendency of the aluminum jacket to expand away from the cast-iron barrel.

In addition to an exhaust valve the cylinders were exhaust ported so that at the end of the power stroke the ports were uncovered by the pistons allowing some of the exhaust gas to escape. Employment of exhaust ports meant that the lower portion of the cylinder was uncooled. As a result only about half of the cylinder surface was cooled directly.

Long cast iron pistons with three wide rings were employed. A set screw locked the piston pin in the piston while the connecting rod was free floating on the piston pin.

Typical for the time, an automatic inlet valve was employed. The exhaust valve was mechanically actuated by a rocker arm, a push rod, a cam follower and cams on a solid steel shaft. The cam shaft and magneto were driven by the crankshaft through a three-member spur gear train.

The connecting rods were seamless steel tubing with cast bronze (later steel) bearing ends screwed on. The crankshaft end was babbited and incorporated an oil scupper.

Crankshafts were machined out of solid blocks of high carbon steel heat treated to a machinable hardness. No counterweights were employed. It was mounted in five bearings in the webbing of the crankcase. A cast iron flywheel was keyed and shrunk onto the crankshaft. The flywheel was essential to minimize torque variations in the engine that would cause distress in the propeller chain drive system.

An oil pump and fuel pump were mounted side by side on bosses cast into the crankcase and driven from the camshaft by worm gears.

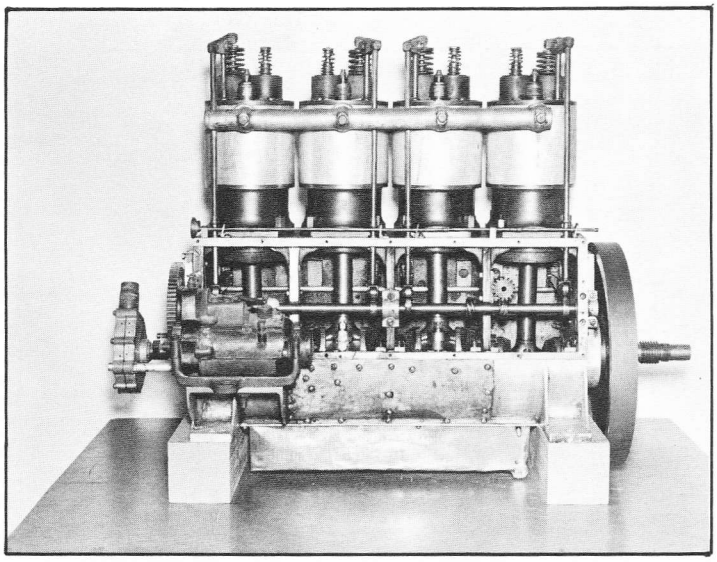
A carburetor was not used. Instead, a simplified fuel injection system was employed where a metering gear pump piped fuel to a gallery manifold running alongside the cylinders wherein fuel and air were mixed and passed to the inlet chamber.

Ignition was by high-tension magneto and spark plug. The spark advance control was in the magneto and, since spark timing was the only means of regulating the engine power and speed, a wide range of adjustment was provided.

A manually operated compression release enablhd the engine to be shutdown more quickly and more positively. Furthermore, this device was an asset in endurance and distance flights for exhibition when much time was spent in gliding. It enabled the engine to be shut down and started at will, thus greatly conserving fuel.

A water pump driven directly by the crankshaft circulated water to the cylinder manifolds, to the radiator and back.

Reliability of aircraft engines at that period was never outstanding. Durability was even less. Ten to twenty hours operating time on an engine before overhaul (up to 2000 hrs on modern piston engines) was considered normal. The Wright engines were as good if not better than most engines of the period. They performed well, and in every case met or exceeded the existing requirements.



Wright 30 h.p. engine from Navy B-1 airplane with crankcase cover removed. Large sheet metal patch bolted to lower crankcase was clue to idenfification of engine. Pratt & Whitney Aircraft Photo.

Wright B-1 at North Island, San Diego, 1912. Aircraft mounted on twin pontoons and Wright four-cylinder engine after the aircraft and engine were repaired from March 1st crash. Heath-Paragon propellers installed as shown between April 4 and April 16, 1912. Airplane crashed again with Lt. John Rodgers on 16th. Thereafter twin pontoons were replaced with single Curtiss pontoon. Photo Smithsonian Institution.

Nevertheless, the engines had their difficulties and failures. Bearing lubrication was a problem at times. However, their major problem was piston and cylinder barrel bearing surfaces resulting in scuffing or seizure of pistons and broken cylinders. Valve failures were a continuing problem. Nevertheless, the overall record of the Wright engines shows them to have been remarkably reliable in view of the state of the internal combustion engine at that time.

Characteristics of Vertical
4-cylinder Wright Engines

Cyl/Form	4/vertical
Bore and Stroke (in)	4-3/8 x 4
Displacement (cu.in.)	240
Horsepower	28-42
RPM	1325-1500
MEP	70-87
Weight (lb)	160-180

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2. Aviation Log Wright Hydroaeroplane Navy No. B-1 (AH-4) 15 July 1911 to 5 June 1913, facsimile edition published by Navy Department, 1961. Flight 105, March 1, 1912.
3. Sudsbury, Elretta, *Jackrabbits to Jets,* Neyenesch Printers, Inc. San Diego 1967, P. 24
4. Shipping Invoice, Smithsonian Institution to Connecticut Aeronautical Historical Association dated August 4, 1961. Defines terms of loan.
5. B-1 Log, op. cit, March 3 to 19, 1912
6. Letter to Adrian O. Van Wyen, Head, Aviation History Unit, OP-05A5G, office of Chief of Naval Operations, Department of the Navy from Harvey H. Lippincott dated September 17, 1961
7. Letter to Paul Coates; *The Los Angeles Mirror* from Dale B. Sigler dated December 20, 1961
8. Letter to Harvey H. Lippincott from Dale B. Sigler dated November 19, 1962.
9. Report on Visit of Mr. Dale B. Sigler and Authentication of Wright B-1 Engine by Lee M. Pearson, Bureau of Naval Weapons Department of the Navy, Washington, D.C. 2 Dec. 1963, Enclosure (1)
10. Ibid, Enclosure (2) Page 5
11. A re-enactment by Sigler of the identification of the B-1 engine was put on film by Paul E. Garber, retired Head Curator of the National Air and Space Museum, Smithsonian Institution, in a Film (No. KN-10759E) sponsored by the Ramsay Fund and produced by the U.S. Navy Air Systems Command, titled *The History of Flight.* Unfortunately no reference is made in the film of the prior work in identification of the engine leaving an inaccurate impression that the Smithsonian was responsible for the discovery and indentification of the B-1 engine.

    Today, the B-1 engine rests in a glass case at the Naval Aviation Museum, Pensacola, Florida unglorified for the significance it played in the history of Naval Aviation. While its label is correct, the museum inexplicably has seen fit not to emphasize "the oldest original piece of naval aeronautical equipment in existence."

Author's Note

This summary is directly compiled from the excellent study of *The Wright Brothers' Engines and Their Design* by Leonard S. Hobbs, Smithsonian annals of Flight, Number 5, National Air and Space Museum, Smithsonian Institution Press, Washington, D.C. 1971, condensed and summarized by Harvey H. Lippincott. Portions are directly quoted from Hobbs. The monograph is available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 – price 60c.

ABOUT THE AUTHOR

A native of Moorestown, New Jersey, Harvey H. Lippincott graduated from Georgia Institute of Technology with a degree in Mechanical Engineering. He is a thirty-year veteran with United Aircraft and its subsidiaries. He was a Pratt & Whitney Aircraft field service representative in Italy during World War II and afterward in Portugal and Spain. Later he became an installation engineer with P&WA working on jet engine performance. His interest and knowledge in aviation and company history brought him into the newly created position of Corporate Archivist for United Aircraft Corporation.

A life long interest in aeronautical history lead to a major role in founding the Connecticut Aeronautical Historical Association. He was its president for eight years and has now retired to head its museum work as Director of the Bradley Air Museum. He has served as a member of the Board of Directors of the American Aviation Historical Society for twelve years. While deeply interested in all aspects of aeronautical history, his deepest passion is aero propulsion history. His historical interests do not stop with aviation, but encompass all fields of history including living in a 240-year old Connecticut farm house.