

Little known and little remembered today, this early French pioneer of flying models opened doors to both modeling and full-size aviation. His story still makes fascinating reading today. ■ Bill Hannan

THE STORY of Charles Alphonse Pénaud (pronounced pay-know), an early pioneer of model airplanes, deserves to be better known. In fact this 19th-century Frenchman may have been the most influential modeler of all time.

Born in 1850 in Paris, Pénaud expected to carry on the family tradition of career maritime service. However, complications from a severe hip injury rendered him physically unfit for naval service. Obligated to walk with crutches from a young age, he was plagued by discomfort for most of his

short life.

Mild and modest by nature, Pénaud was also something of a wunderkind and as inquisitive as Leonardo da Vinci. His interests included bird flight, balloons, ballistics, mathematics, meteorology, high-speed photography, hydrodynamics, rocketry, aerodynamics, and much more. Unlike many theoreticians, Alphonse had the ability to reduce complex, abstract ideas to simple terms and demonstrate them with practical hardware.

In 1876 Pénaud and his partner, Paul Gauchot, designed and patented an innovative full-size aircraft. A flying wing, it also featured such astonishingly advanced concepts as retractable landing gear, enclosed cockpit, extensive instrumentation, and automatic pilot.

Pénaud made frequent use of models in his aerodynamic experiments and conclusively proved their low-risk, low-cost advantages. So successful were his models, in fact, that Pénaud was rather resented by some of his contemporaries, who were unable to equal his results.

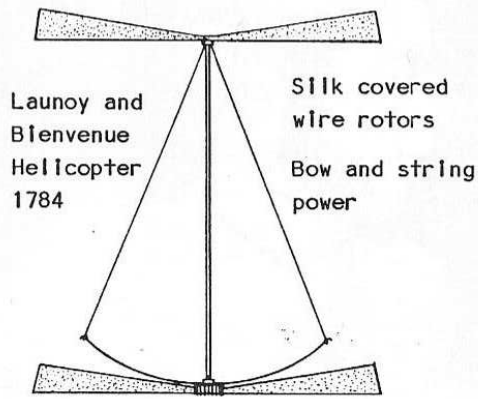
Although he experimented with kites as well as model Helicopters and Ornithop-

This drawing, executed by Bill Noonan, depicts Charles Alphonse Pénaud launching one of his rubber-powered models that he called a planophore. A hip injury in his youth incapacitated him for most of his short life.

ters, this discussion will concentrate on Pénaud's model airplanes. He called them planophores. Unfortunately the brilliant Frenchman was never able to gain financial support, or even that encouragement to carry out his ideas so vital to any inventor. His frustration, compounded by failing health, drove Pénaud into deep depression. In 1880, at only 30 years of age, he ended his own life, depriving the aeronautical world of one of its most talented experimenters.

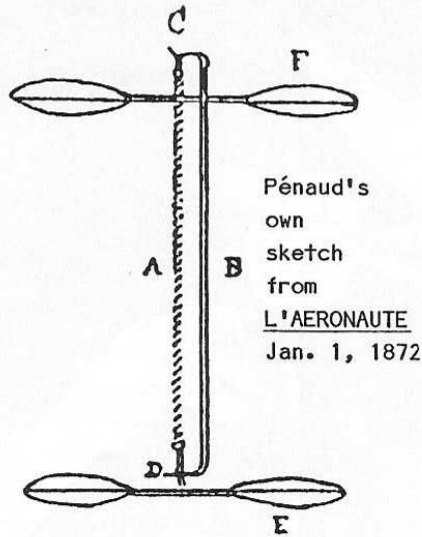
Tragic as this was, Alphonse Pénaud's

Pénaud Planophores

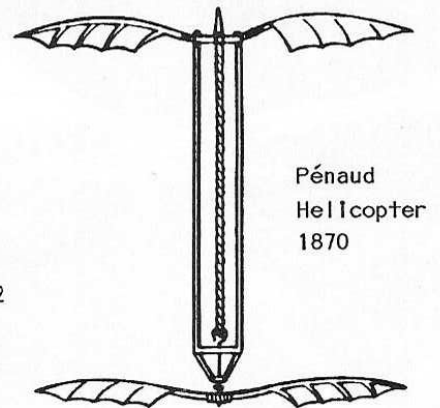


Launoy and Bienvenue Helicopter 1784

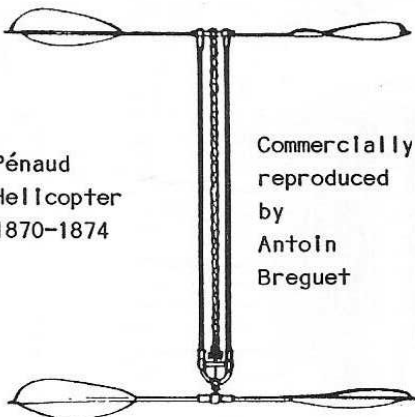
Silk covered wire rotors
Bow and string power



Pénaud's own sketch from L'AERONAUTE Jan. 1, 1872

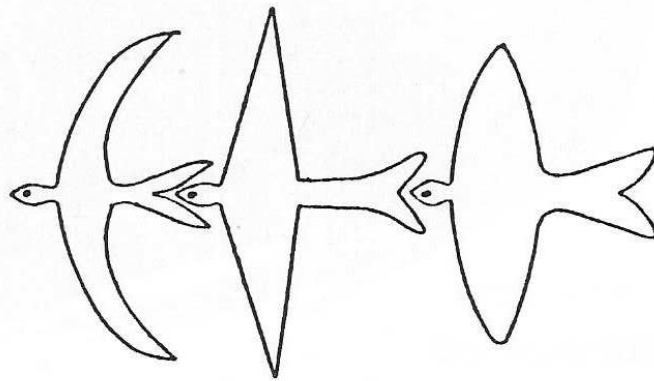


Pénaud Helicopter 1870



Pénaud Helicopter 1870-1874

Commercially reproduced by Antoin Breguet



Plaine's Bird Gliders, from: MODELES D'AEROPLANES, 1910

Reproductions of early Helicopter and bird glider drawings, including three Pénaud-designed Helicopters. Produced between 1870 and 1874, these Helicopters achieved some success, with flight durations of up to 26 seconds and even some hovering ability. They became quite popular at the time, and several variations were commercially manufactured as toys, one of which the Wright brothers came to possess.

lifework in aviation at least was not lost. His original concepts and designs had influence beyond his generation, surviving in the achievements of other pathbreakers whom it inspired. Among the scions of Pénaud's aeronautical genius were two young fellows named Wilbur and Orville Wright.

Pénaud's experiments in model aviation were wide-ranging. In addition to the cate-

gory of models which he named "planophores," the young Frenchman designed and flew Ornithopters and Helicopters. Although I have been unable to locate any illustrations of them, Pénaud also flew kites. (I would welcome assistance from readers who may know of the existence of any illustrations of Pénaud's kites.)

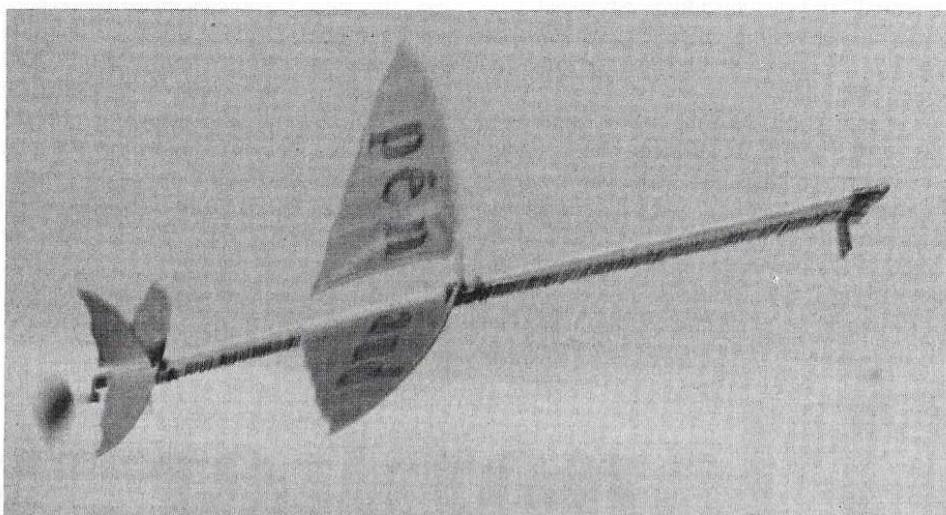
The Helicopters were among Pénaud's ear-

liest aeronautical experiments. Historical accounts suggest that he first constructed or re-constructed a model Helicopter of the vintage Launoy and Bienvenu type. This device employed a bow-and-string arrangement to power contrarotating silk-covered wire rotors. Its duration was extremely brief, but performance was impressive for the era. Though an Englishman, Sir George Cayley, had produced a similar model featuring bird feather rotors in 1795, Pénaud didn't learn about it until years after his own experiments.

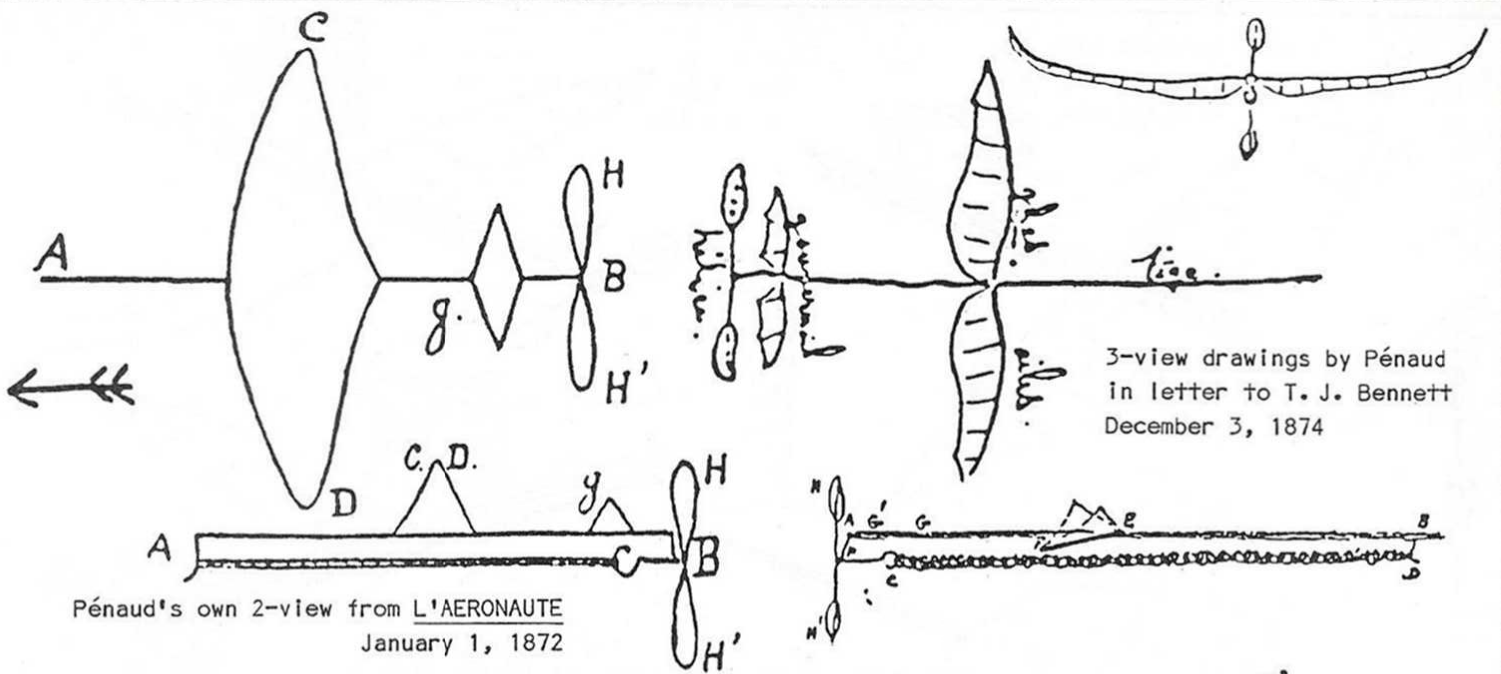
Other experimenters had tried clock-spring-powered Helicopters, with disappointing results. Their machines "...partook more of the character of an aerial somersault than true flight; for they had no sooner commenced to ascend than the spring had run down, and the screws stopped."

After investigating these existing concepts, Pénaud conceived his single most far-reaching idea, the wound rubber motor. It's important to note that he made no claim for having invented rubber power—and correctly so.

Indian rubber ("caoutchouc" in French) was employed for flying models by Pierre Jullien in 1858, and had been proposed by Sir George Cayley even earlier. However, these mechanisms depended upon rubber

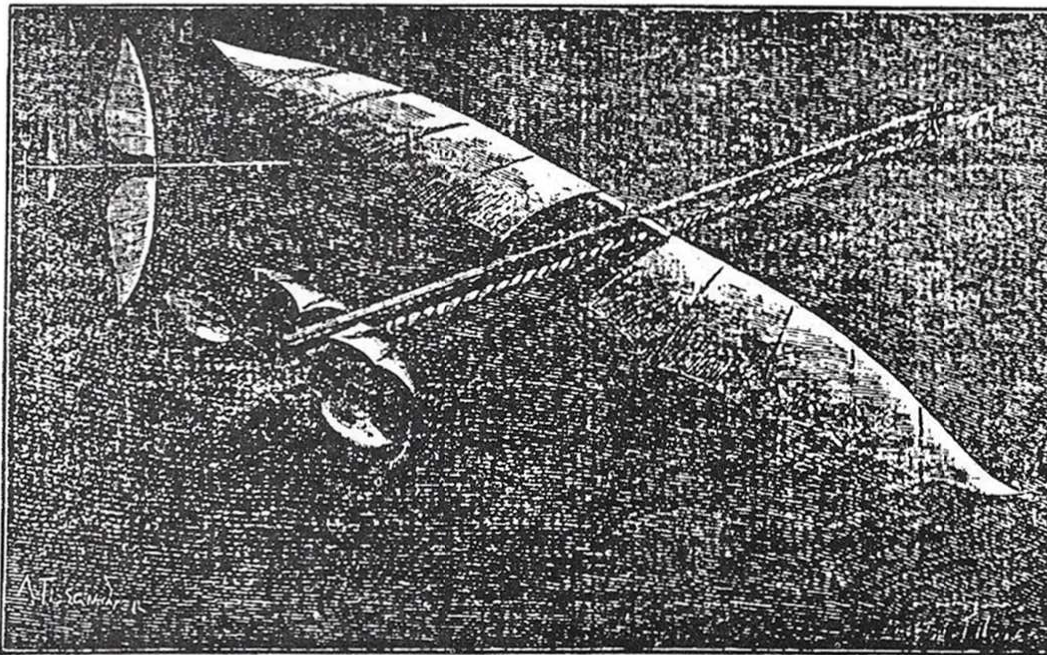


The Bill Hannan planophore in full flight. This model was built in 1978 and was motivated by a contest for pusher-type models of prewar design. This one certainly qualified as prewar!



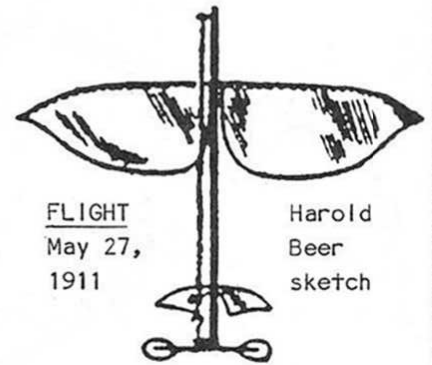
3-view drawings by Pénau
in letter to T. J. Bennett
December 3, 1874

Pénau's own 2-view from L'AERONAUTE
January 1, 1872



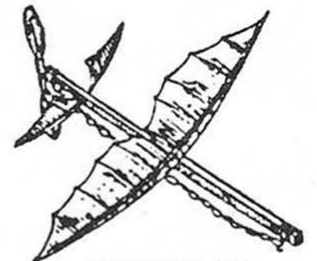
Albert Tissandier

LA NATURE engraving
April 17, 1875

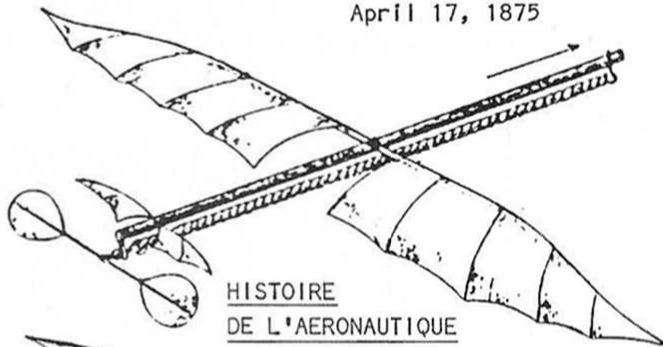


FLIGHT
May 27,
1911

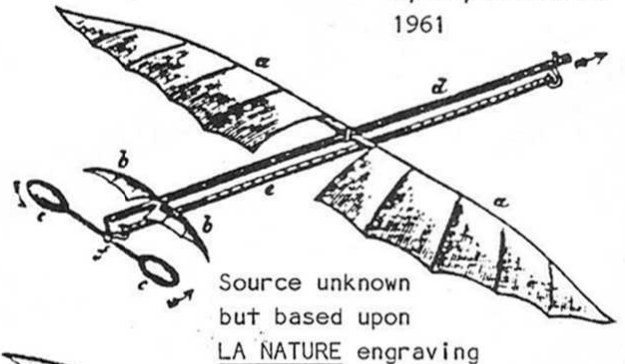
Harold
Beer
sketch



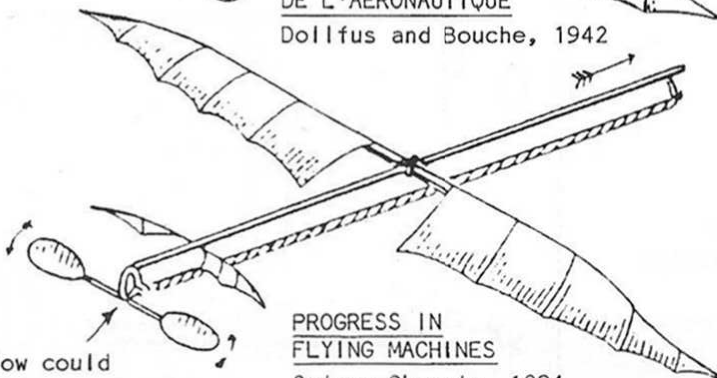
AEROMODELING
by Ray Malmström
1961



HISTOIRE
DE L'AERONAUTIQUE
Dollfus and Bouche, 1942

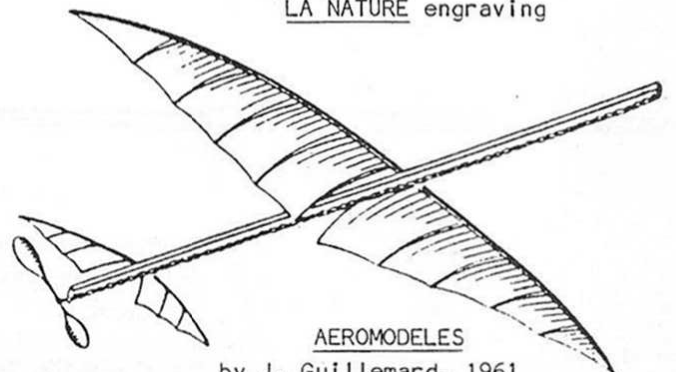


Source unknown
but based upon
LA NATURE engraving



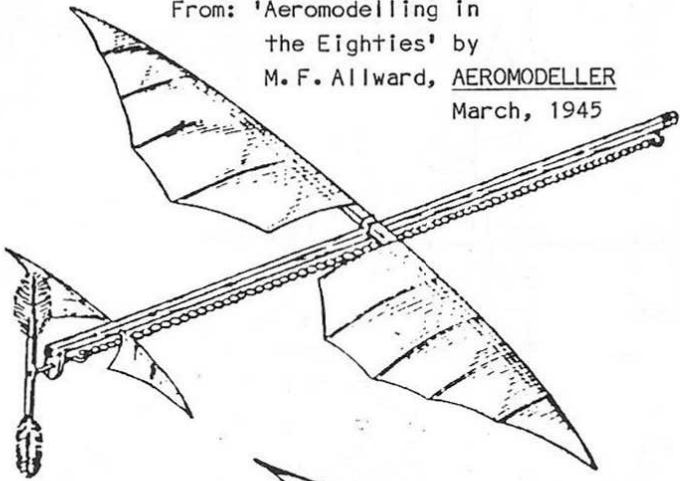
PROGRESS IN
FLYING MACHINES
Octave Chanute, 1894

How could
this function!

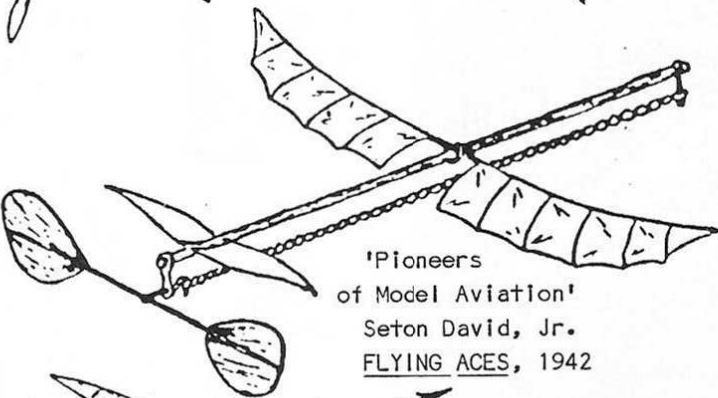
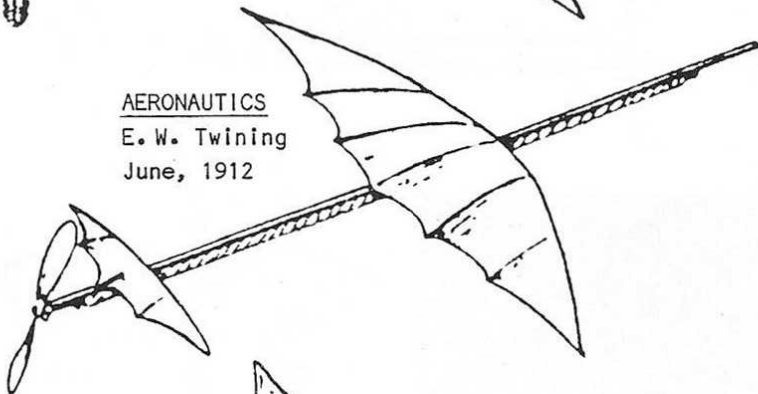


AEROMODELES
by J. Guillemard, 1961
Optical illusion?

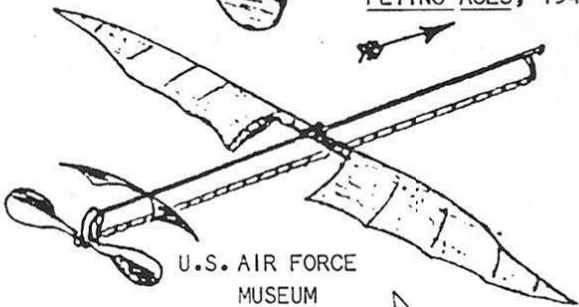
From: 'Aeromodeling in the Eighties' by M. F. Allward, AEROMODELLER March, 1945



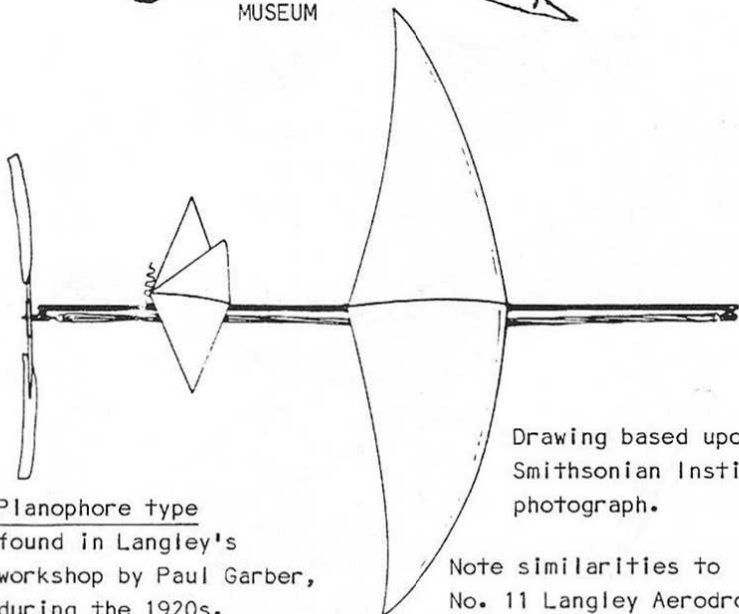
AERONAUTICS
E. W. Twining
June, 1912



'Pioneers of Model Aviation'
Seton David, Jr.
FLYING ACES, 1942



U.S. AIR FORCE MUSEUM

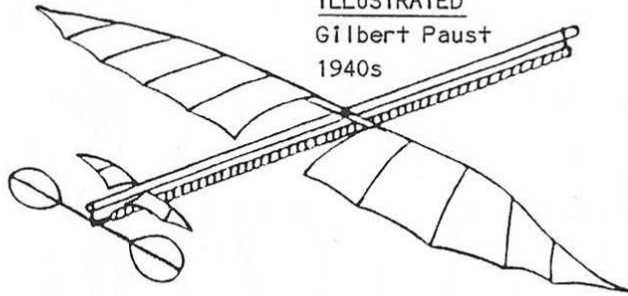


Planophore type found in Langley's workshop by Paul Garber, during the 1920s.

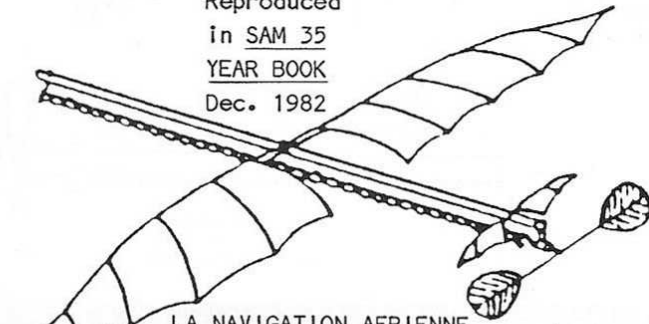
Drawing based upon Smithsonian Institution photograph.

Note similarities to No. 11 Langley Aerodrome.

MECHANIX
ILLUSTRATED
Gilbert Paust
1940s

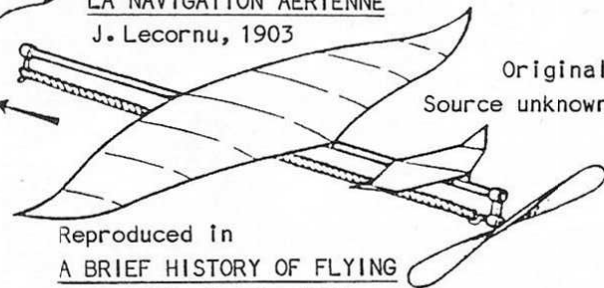


Reproduced in SAM 35
YEAR BOOK
Dec. 1982



LA NAVIGATION AERIENNE
J. Lecornu, 1903

Original Source unknown



Reproduced in A BRIEF HISTORY OF FLYING
C. H. Gibbs-Smith, 1967

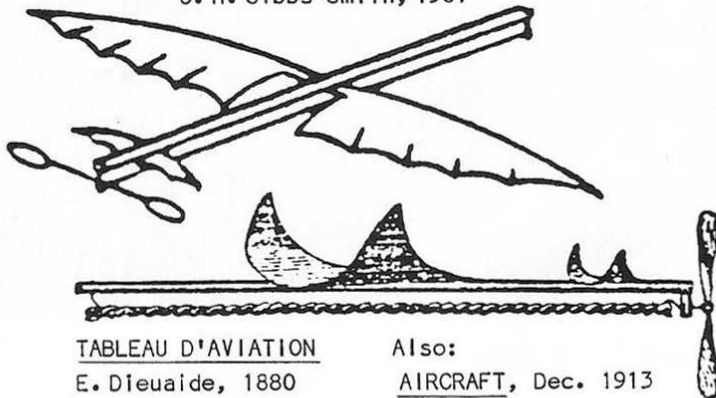
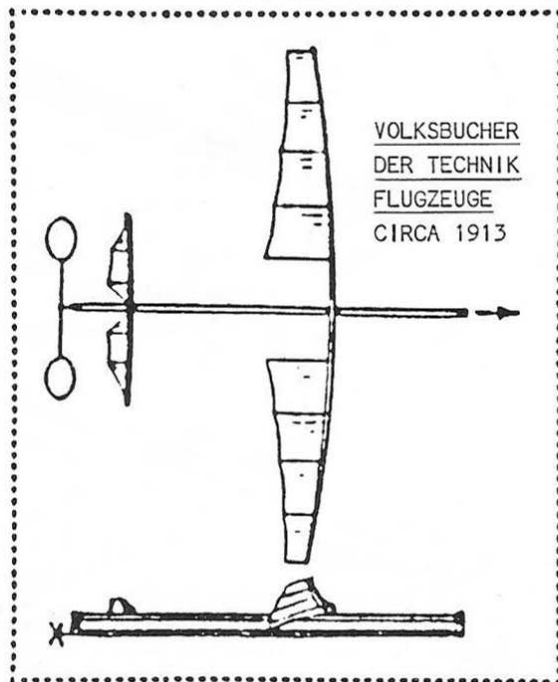


TABLEAU D'AVIATION
E. Dieuaide, 1880

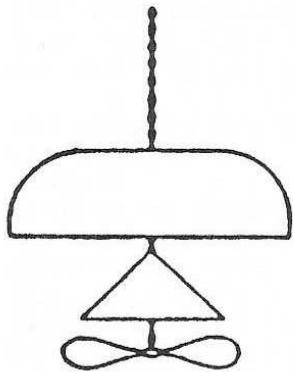
Also: AIRCRAFT, Dec. 1913



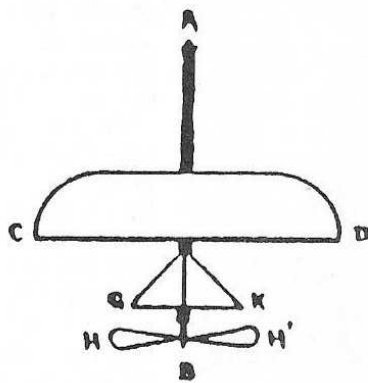
VOLKSBUCHER
DER TECHNIK
FLUGZEUGE
CIRCA 1913

LANGLEY MEMOIR ON MECHANICAL FLIGHT

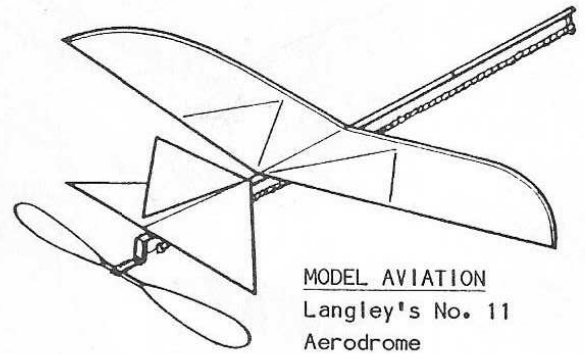
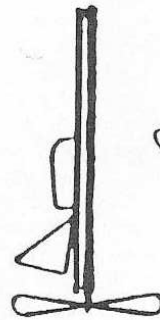
By Langley and Manley, Smithsonian Institution, 1911



McCLURE'S MAGAZINE
S. P. Langley article
June, 1897



No 11



MODEL AVIATION
Langley's No. 11
Aerodrome
by Bill Hannan

These drawings represent some of the research conducted by Samuel Pierpont Langley, third secretary of the Smithsonian Institution, on rubber-powered flight. He met with only limited success, but several of the nearly 40 models he built closely resembled Pénaud's designs.

strip stretched lengthwise, *in tension* around a revolving spool or spindle. While capable of storing tremendous power, the method offered only brief duration and exerted considerable strain on the machinery, which consequently needed to be strong and heavy.

By contrast, Pénaud's innovation employed rubber strands in *torsion* (twisted), allowing simpler, lighter airframes and extended duration.

Although moderate in performance by today's standards, Pénaud's little Helicopters were sensational in 1870, yielding flight durations of 15 to 26 seconds and even demonstrating some hovering ability. Delighted audiences applauded the clever models, which soon were adapted for commercial manufacture as playthings and widely marketed. Among those who eventually received such a flying toy were young Wilbur and Orville Wright.

The planophores. When Alphonse turned his attention to fixed-wing flight, he was fortunate in knowing Joseph M. Pline, who was skilled in the design of tiny paper *oiseaux* (birds) and *papillons* (butterflies). Pline had painstakingly determined principles of balance, incidence, and dihedral angles in providing the automatic equilibrium so essential to Free Flight models.

By combining improved variations of Pline's self-stabilizing features with his own rubber-in-torsion motors, Pénaud created the series of simple model airplane designs that he called planophores.

He experimented with contrarotating propellers to minimize torque influences, but soon discovered much easier ways of achieving similar results. Simply adding a small amount of ballast to the model's wing tip, and/or setting one wing panel to a slightly greater incidence angle than the other, worked effectively in counteracting torque. Pénaud also tried tractor (front-mounted) propellers, though he favored a single pusher for propeller protection in the event of collisions.

Although Pénaud tested multiple blades, he preferred two-bladed arrangements for simplicity and damage resistance, since they could lie flat during landing. He didn't want to complicate his models or increase their weight with landing gear.

The educational and entertainment value of Pénaud's models was resoundingly proven during his 1871 outdoor public demonstrations in Paris' famous Gardens of Tuileries and inside the beautiful Horticultural Hall. These demonstrations brought much favorable publicity for both the planophores and their creator.

Although planophores were constructed by Pénaud and his associates, "in various forms of different styles with diverse results," the most successful fliers seem to have spanned from 18 to 24 in. One 18-in.-span example had about a 4-in. wing root chord, a 20-in.-long fuselage stick, and an 8-

in.-dia. propeller. The blades generally were made of paper, but sometimes of bird feathers, and the front and rear motor hooks were steel wire.

The wings were constructed from bird feather quills, pinned together and covered with goldbeater's skin. Dihedral was either in shallow V form or achieved simply by curving the wing tips gracefully upward. The wing assembly could be slid along the fuselage stick to adjust balance, and the incidence angles of the individual wing panels could be altered. The similarly constructed horizontal tail was also adjustable for incidence, and its tips could be raised for added stability.

Some planophores were equipped with a vertical tailplane, which Pénaud likened to the steering function provided by a ship's rudder. The tailplane was rarely, if ever, shown in early illustrations.



Walt Mooney launching Bill Hannan's planophore. At a Flightmasters West Indoor contest, Walt proxy-flew Bill's planophore for an officially clocked 58-second flight. The model weighs 16 grams, about equal to a Pénaud original. It's built from basswood and is tissue covered.