The Elias M-1 Mailplane

Description of the Third Machine Built in Response to the Post Office Department's Proposal for Bids

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In 1925, the U.S. Post Office solicited proposals for a special purpose mailplane to replace the de Havilland DH-4Ms that were currently in use. Boeing submitted the Model 40 and Douglas, the eventual winner, the M-2. Elias submitted the M-1, but only the single example was built.

The latest production of the Aircraft Department of G. Elias and Bro. is the M-1 Mailplane to the designs of M. Stupar, the chief engineer. This machine was designed with the requirements of mail service in mind and every effort was made to incorporate all the desirable features. Among these may be mentioned the divided axle, the accessible mail compartment and ease of engine maintenance. The test pilot reported that the machine was very controllable and that it could be flown hands off at all speeds from 100 to 110 mph.

It is a single bay, wire braced biplane. There is no center section, the two upper panels being supported at the center by two inverted vee pairs of struts. There are two struts leading from the upper longerons to the lower wings above the landing gears on each side of the fuselage. Ailerons are fitted to both upper and lower wings. Control horns are used on the lower pair only, the upper one being controlled by a strut. The ailerons are not balanced. The wings are wood construction with box spars. The ribs have a plywood web with solid cap strips and vertical members. The fittings are low carbon steel plates with the bolts on the neutral axis of the spar. The internal drag bracing is double and of tie rod construction.

Fuselage

The fuselage is built up of welded steel tubing and struts with tie-rod bracing. The mail compartment is at the center of gravity and sheathed with 1/16 in. duralumin plates. This construction renders the compartment fireproof and able to stand up under hard service. The cover is hinged on the right side and fastened with two clasps and a cylinder lock similar to those on trunks. A shelf and rings are provided to take care of small or special loads. The fuselage is covered with cloth from the engine cowling aft. Special care was given the pilot's cockpit. The instrument board is divided and made of aluminum with the lettering etched in. The seat is adjustable on the ground

Quarter front view of the Elias M-1 showing the clean design and the accessible mail compartment and engine. (Substitute photo from the Jesse Davidson collection via Dan Shumaker and 1000AircraftPhotos.com)

and arranged for a seat type parachute. The wind shield is quite large and has an alcove in it for the magnetic compass.

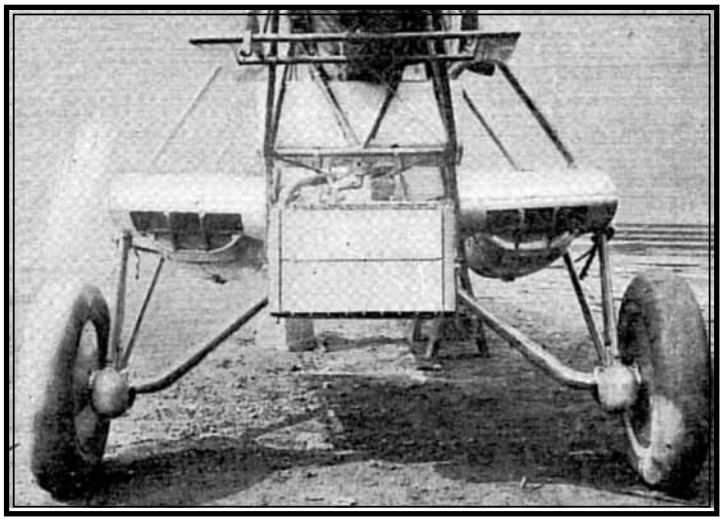
The landing gear is in two parts and in general arrangement similar to those on twin engined bombers. This construction gives a track of eight feet for the wheels. Regular rubber shock absorber cord is used and is located at the wheel hubs with a streamline housing. There are three struts to each wheel, one vertical attached to landing spar, one leading to the rear spar and one running from the lower longeron and carrying the wheel.

Empennage

The empennage is of conventional arrangement with the stabilizer braced only on the lower side with one strut. The elevators are of wooden construction and mounted on a single steel torque tube. The stabilizer is adjustable in the air. The wheel in the pilot's cockpit is calibrated so that the pilot can always tell the incidence of the tail. The rudder is balanced. The rudder and fin assembly can be removed by taking out three bolts. The stabilizer has an inverted camber, being flat on the upper surface.

Ball bearings are used throughout in the control system. There are four pulleys for the ailerons and two for the rudder. The aileron control wires are lead through the wing to two pulleys near the control horns. Inspection windows are provided for them. The elevator and rudder controls are carried outside the fuselage from aft of the pilot's seat. The rudder bar is adjustable fore and aft.

The engine is the standard Liberty XII used by the Post Office Department. The engine mounting is entirely of welded steel tubing. The removal of six bolts and the engine controls permits the entire engine assembly to be removed. Steps are provided for the use of mechanics working on the engine. The cowling is self supporting, being riveted to square steel tubing. The entire cowling may be removed by taking out six bolts and a few quick detachable pins of generous size. The propeller is fitted with a streamlined hub running easily into the cowling lines. The fire wall behind the engine is bumped out to allow room behind the accessories. This fire wall is double and is lined with $^{3}/_{8}$ in. asbestos and an air space. This construction permits it to insulate over 1200 deg. F. of heat. The radiator is mounted under the fuselage in a free air position. The shutters were designed to offer the least possible resistance to the air when open. The radiator is in two sections. The main gasoline tanks are in the wing roots under the non-slip sidewalks. There are two and each one contains 40 gal. These tanks are droppable in flight. There is also a gravity tank holding 10 gal. used for starting and as a reserve. This tank is made of $^{1}/_{8}$ in. material and is of crashproof construction. The device to disconnect the gasoline lines when the tanks are dropped has received considerable thought from the builders and is instantaneous in its action. The filler caps are quick releasable and the tanks may easily be filled from the ground. The gasoline control is on the instrument board and the pilot may use fuel from any one of the three tanks. The oil tank is mounted under the engine and is felt lined. ✈



The landing gear and radiator construction of the Elias. The droppable tanks are shown in place.

AIRPLANE CHARACTERISTICS

Length, overall	28 ft. 0 in.
Span, upper wing	40 ft. 0 in.
Span, lower wing	40 ft. 0 in.
Chord, upper wing	6 ft. 6 in.
Chord, lower wing	6 ft. 6 in.
Gap	6 ft. 0 in.
Stagger	0 in.
Airfoil (wing section)	Eiffel 385
Angle of incidence	- $^{1}/_{2}$ deg.
Sweepback	0 deg.
Dihedral, upper wing	1 $^{1}/_{2}$ deg.
Dihedral, lower wing	1 $^{1}/_{2}$ deg
Area of wings, including ailerons	497 sq. ft.
Area of ailerons	40 sq. ft..
Area of tail plane	61 sq. ft.
Area of elevators	26 sq. ft.
Area of rudder	15 sq. ft.
Area of fin	20 sq. ft.
Track of wheels	8 ft. 0 in.
Weight empty	2,857 lb.
Useful load	
Fuel and oil	610 lb.
Crew	200 lb.
Pay load (mail)	1,000 lb.
	1,810 lb.
Total weight	4,667 lb.
Wing loading	9.39 lb. /sq. ft.
Power loading	11.60 lb. /hp.
Fuel capacity	90 gal.
Range	450 mi.
Maximum speed, full load	130 mph
Landing speed, full load	48 mph
Initial rate of climb	1,100 ft. /sec.
Service ceiling	16,000 ft.