AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTLE FOR AERONAUTICS

No. 60

STINSON COMMERCIAL AIRPLANE - TYPE S M-1

A Semicantilever Monoplane

Washington
October, 1927

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STINSON COMMERCIAL AIRPLANE - TYPE S M-1*

A Semicantilever Monoplane.

This is a semicantilever airplane with a closed cabin capable of seating a pilot and five passengers. It employs a high wing with the wing section N.A.C.A. M-6.

F u s e l a g e

The fuselage is of a conventional design and is constructed of aircraft steel welded together. One-piece steel tie rods are employed at the lower lift strut roots to take the tension across the fuselage. At the wing spar roots at the top, heavy chrome-molybdenum steel tubes are employed to take the compression of the spars.

Wooden strips are clamped to the various longerons and verticals to facilitate trimming and interior decorating. The doors are of wooden construction, as are also the window sills. All steel work is wire brushed, then covered with a coat of metal primer and finally covered with one coat of lacquer before assembling.

C a b i n

The cabin is equipped with six wicker chairs with a six-inch aisle-way between, giving three tiers of two chairs each.

*Prepared by the Stinson Aircraft Corporation.

A door on either side provides access. The visibility is exceptionally good and a non-shatter glass is used throughout. Dual exhaust heaters are connected to each side of the horseshoe exhaust manifold. One heater empties into the front of the cockpit to take care of the pilot and front passenger, while the other empties into the rear of the cabin, taking care of the passengers in the last four seats. Dual Deperdussin control is fitted to the two front seats. The left-hand control is equipped with individual brake pedals which operate either the right or the left wheel or both. The right-hand control is not equipped with brake pedals.

Power Plant

The airplane is equipped with Wright Whirlwind engine, which is mounted on a steel tube engine mount which is capable of being attached or detached with four bolts. Oil-soaked plywood washers absorb the vibration between the engine and the mount. The mount is constructed of chrome-molybdenum steel tubing with gusset plates welded on each end to reinforce the weld. Steel rivets are then added as a safety precaution. The mount is then annealed to equalize the internal stress in the metal. A seven-gallon oil tank is bolted to the front of the fire wall with flexible connections between the tank and crank case.

Gasoline Supply

The gasoline is carried in two wing tanks located in the first bay of the wings and gravity feed is maintained between these tanks and the two auxiliary tanks of 1½ gallons each. These two auxiliary tanks are located to the rear of the fire wall and have an air vent which opens to the atmosphere above the wing. The purpose of these two small tanks is to maintain a head of gasoline for the carburetor at all times. Thus when the supply is nearly exhausted in the large flat wing tanks and the drainage is necessarily slow during maneuvers a constant quantity of gasoline is maintained during any sharp bank, zoom or dive.

A two-way switch located in the line shuts off or turns on either wing tank. Gravity feed is maintained from the two small tanks of the cabin to the carburetor. Flexible connections are supplied at necessary points to diminish vibration.

Controls

Two out of the four controls are accomplished by push pull tubes. The stabilizer and elevator controls are actuated by bell cranks, torque tubes and push pull tubes. These tubes run through graphite bearings which not only keep the tubes from buckling but lubricate them as well. These bearings require no attention over a period of two years. With this type of con-

trol the surfaces are operated through a fixed mechanical system, and offer little or no backlash. Although they are slightly heavier than the cable controls they are believed much better.

The rudder control and aileron control are as yet operated by cables. The stabilizer is actuated by a left-hand lever which is connected through to the front spar of the stabilizer, thus the setting of the stabilizer can be accomplished by a single movement.

The elevator and ailerons are operated by two 14-inch plywood wheels which slide straight in and straight out from the instrument board and turn to the right or left.

W i n g s

The spars and ribs are made of spruce while the drag tubes are made of steel tubes. The spars are of the routed type. The front one, carrying most of the load, is left full at the strut point and is routed on a taper inside and outside of this point. The rear spar is left full the entire distance and is not routed. The ribs are built up of spruce and plywood. Double drag tubes and wires reinforce the wing against torsion.

The aileron is constructed entirely of steel tube welded together and fabric covered and is actuated by a push pull tube running along the rear of the rear spar. Instead of the conventional bell crank arrangement at the aileron, an Arens control is used. This consists of a coil spring with cable inside

running in a bent brass tube. This allows the push pull action to be deflected through a 90° angle to the aileron horn. The gas tanks are hung between the spars on three padded steel straps and have no rigid mechanical connection to the spars.

Landing Gear

The landing gear is of the conventional split type with the shock absorber connecting the two halves under the center of the fuselage. Each half rotates about two bolts located on either longeron. Chrome-molybdenum steel is used throughout and is heat treated to a strength of 160,000 pounds per square inch. The tubular struts are streamlined on the rear side only with balsa wood. A heavy safety cable is supplied in case the shock absorber cord fails.

Lift Struts

There are four struts which brace the wings to the fuselage. Each of these struts has a screw adjustment on the lower end which facilitates rigging the wings. The struts consist of steel tubing, streamlined both fore and aft with balsa wood. The whole is then covered with fabric and doped.

Tail Group

The entire tail group is made up of steel welded construction. 1½-inch tube constitutes the spars, while smaller tubing

forms the ribs, trailing, and leading edges. Each unit is then covered with fabric and doped.

Characteristics

Due mainly to the airfoil used and the general lines of the fuselage, a very high speed is accomplished with this airplane. The stability in the air is perfect and the variation of loading, due to a change in the passenger list, is accomplished by the adjustable stabilizer. The airfoil employed is largely responsible for the longitudinal stability. This airfoil is inherently stable and the C.P. movement exactly opposite to that of most airfoils. Thus with this combination a negative lifting tail is unnecessary and a neutral tail may be employed.

The lateral stability is maintained through the use of the pronounced dihedral in the lift struts. The directional stability is maintained in the useful way by the offset fin and the torque effect of the engine is taken care of in the rigging of the wings.

Specifications, Stinson Commercial Airplane S M-1

Performance with Normal Full Load:

High speed at sea level	128 M.P.H.
Cruising speed at sea level at 1650 R.P.M.	105 "
Rate of climb at sea level	750 ft. per min.
Service ceiling	14,000 ft.
Landing speed	56 M.P.H.
Normal Cruising Range (with 70 gal fuel)	
A. Maximum speed	510 miles
B. Cruising "	550 "

Dimensions:

Over-all length	32 ft.
Over-all span	45 ft. 10 in.
Over-all height	8 " 3 "
Wing chord	84 "
Wing area	292 sq.ft.
Wing Section	N.A.C.A. M-6
Wing Loading	11.91 lb., per sq.ft.
Power Loading	17.4 " " HP.

Weights:

Weight, empty	1970 lb.
Useful Load	1515 "
Pay Load	1050 "
Gross Load	3485 "

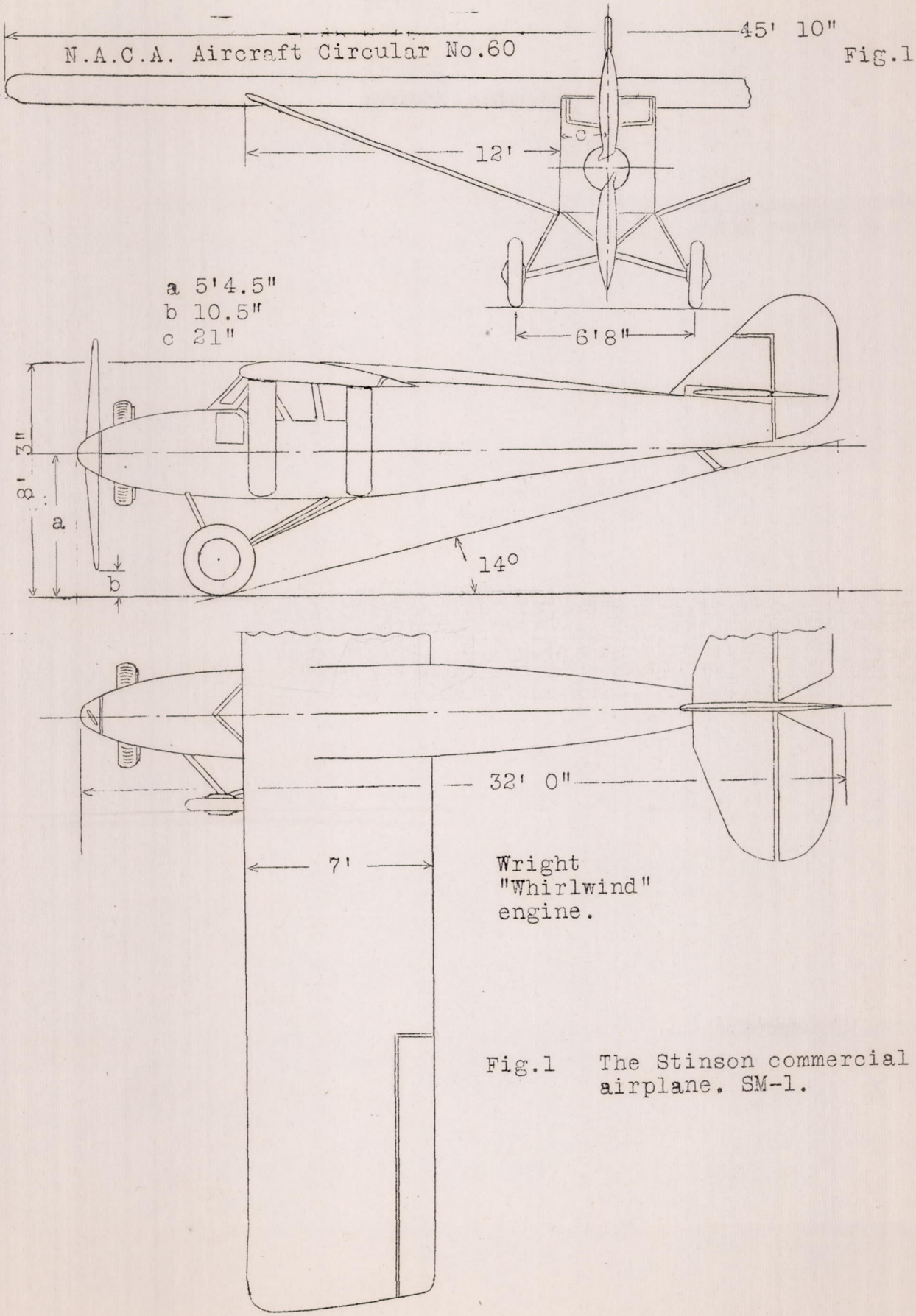

Fig.1 The Stinson commercial airplane. SM-1.

Fig.2 Three-quarter rear view of the Stinson commercial airplane SM-1

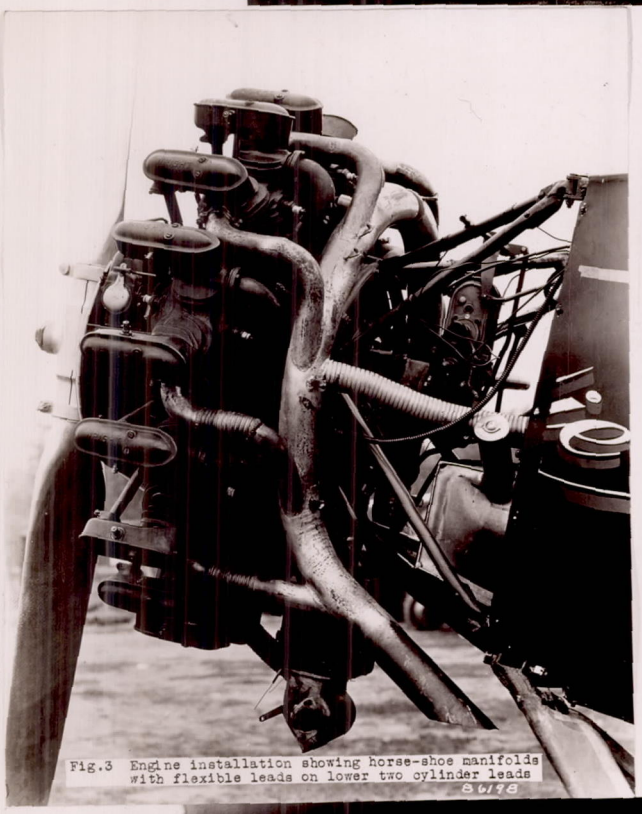

Fig.3 Engine installation showing horse-shoe manifolds with flexible leads on lower two cylinder leads

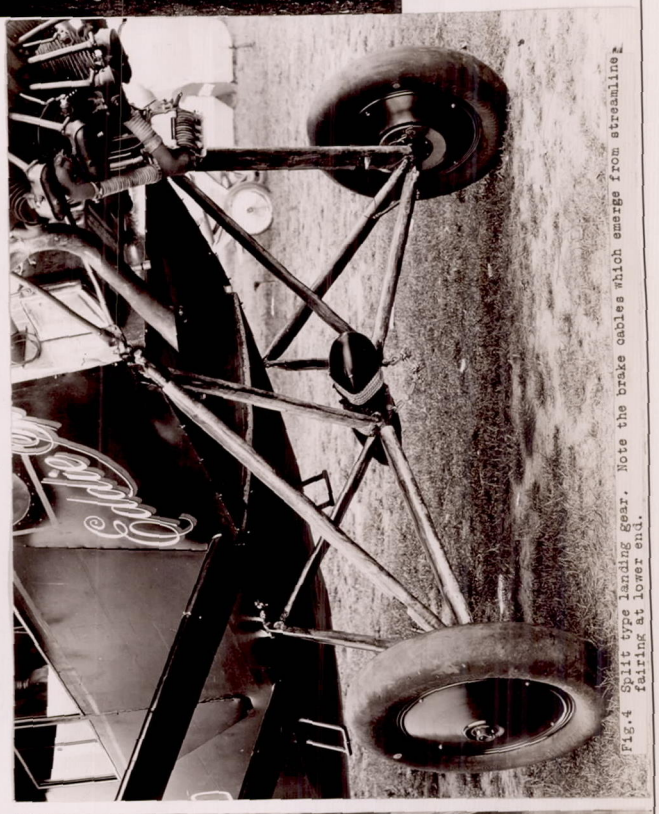

Fig.4 Split type landing gear. Note the brake cables which emerge from streamline fairing at lower end.

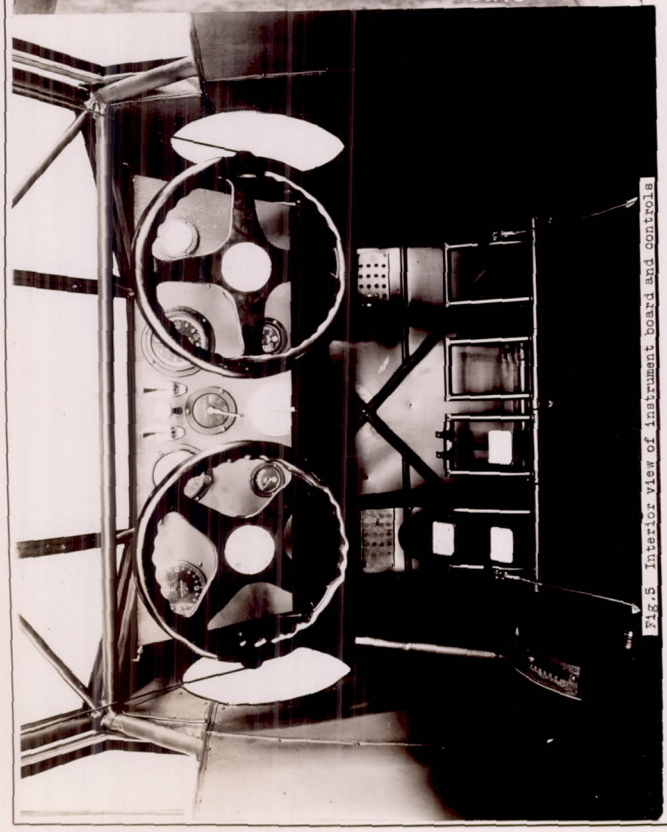

Fig.5 Interior view of instrument board and controls

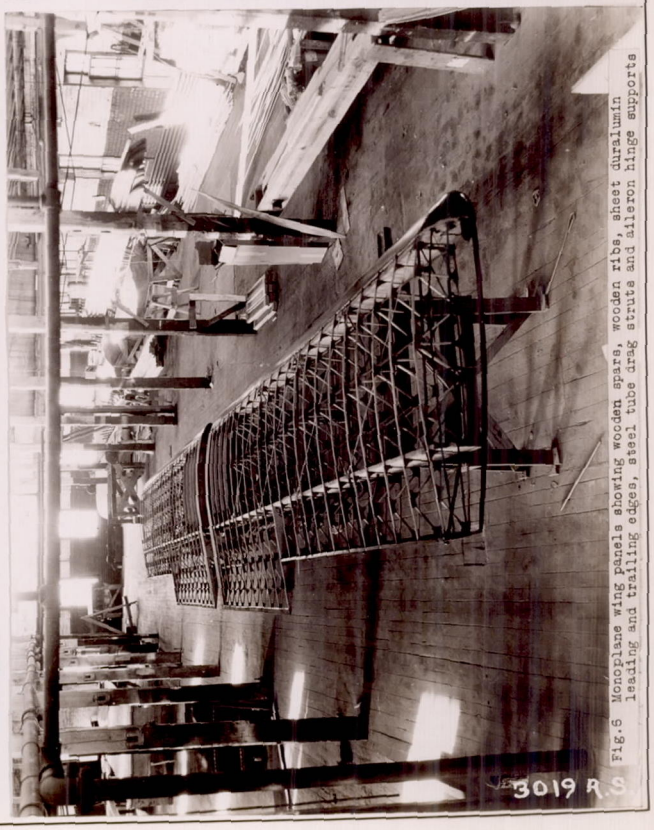

Fig.6 Monoplane wing panels showing wooden spars, wooden ribs, sheet duralumin leading and trailing edges, steel tube drag struts and aileron hinge supports

Fig.7 Three-quarter front view of the Stinson commercial airplane SM-1

Fig. 8
Chrome-molybdenum engine mounting, weight 14 pounds.

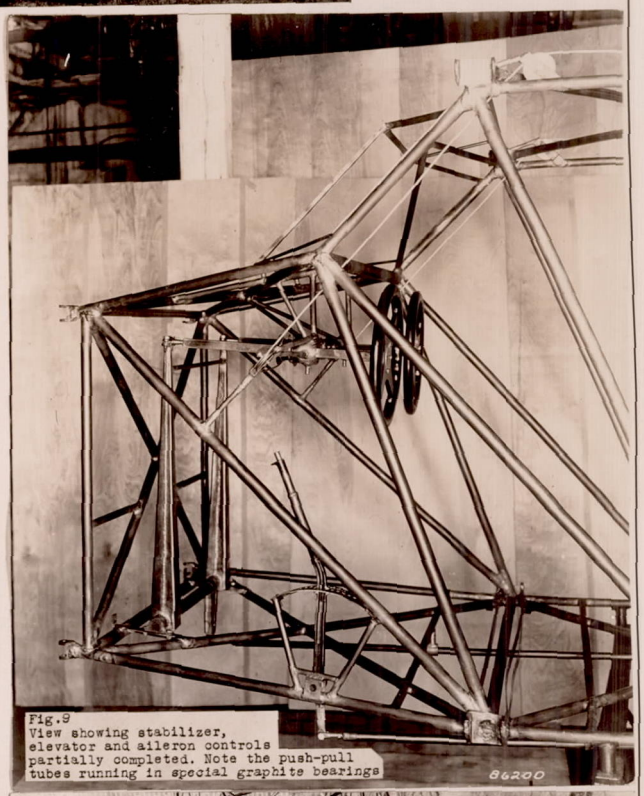

Fig.9
View showing stabilizer, elevator and aileron controls partially completed. Note the push-pull tubes running in special graphite bearings

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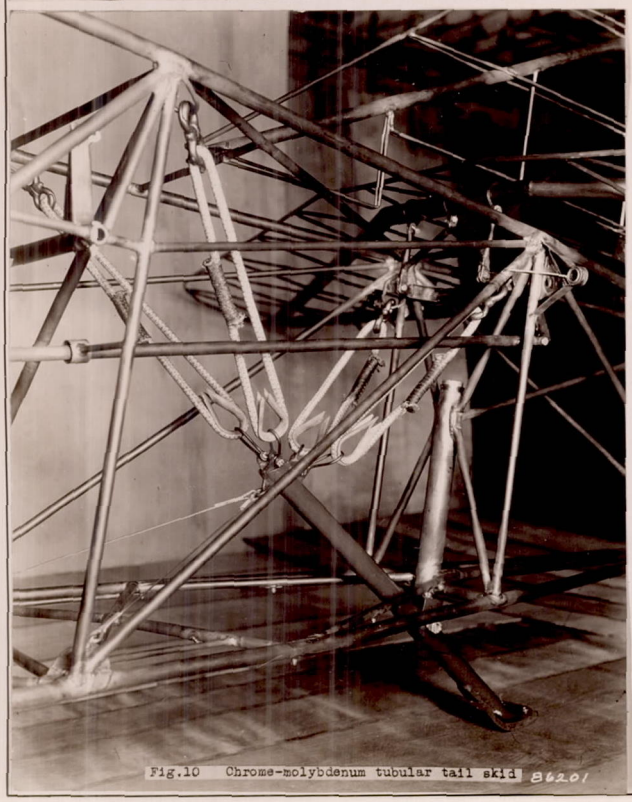

Fig.10 Chrome-molybdenum tubular tail skid 86201

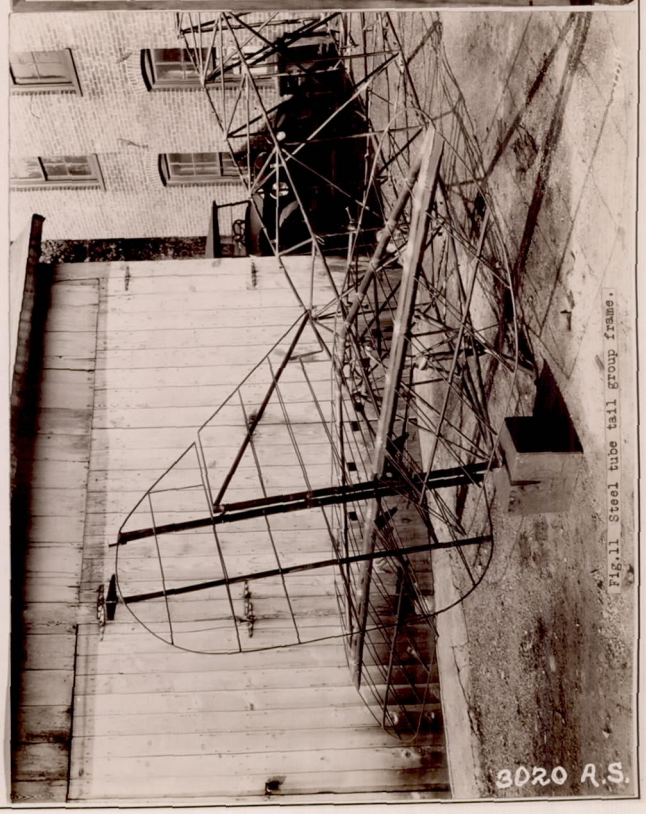

Fig.11 Steel tube tail group frame.

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