AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 34

VOJENSKA-SMOLIK S.16 AIRPLANE

All-Metal Long-Distance Observation Biplane

From "Flight," January 13, 1927

Washington
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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

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VOJENSKA-SMOLIK S.16 AIRPLANE*

All-Metal Long-Distance Observation Biplane.

Among the airplanes exhibited at the Paris Aero Show recently was an all-metal two-seater incorporating forms of construction of somewhat unusual type. This was the Vojenska Smolik 16, a long-distance observation biplane with 450 HP. Lorraine-Dietrich engine. It was not possible to give a very detailed description of airplanes exhibited in Paris, but it is thought that a reference to the Vojenska S.16 may be of interest in showing how one Czechoslovak firm attacks the problems of metal construction. It should be pointed out, for the benefit of those who are not already aware of the fact, that the Vojenska Tovarna Na Letadla of Prague, is the Czechoslovak Military Aircraft Factory, and therefore corresponds somewhat closely to our own Farnborough establishment as it was when it was called the Royal Aircraft Factory.

The Vojenska S.16 is produced in two forms, the parent type being a long-distance observation airplane, while the type 16b is a day-bomber. The constructional details are the same in both cases, only the equipment (and certain minor alterations) being different. Aerodynamically the S.16 is an

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orthodox biplane, the only unusual feature being that in spite of a wing span of 15.5 m (50.85 ft.), but a single pair of interplane struts are provided on each side. The chord is relatively narrow, giving the wings a high aspect ratio (the "span-loading," or span square divided by weight) is 0.52 in British units. The great length of unsupported spar, or free spar lengths, is somewhat relieved by a form of strut bracing used in England mainly on torpedo airplanes.

As regards its main structure, the S.16 is of mixed construction in that the fuselage is of steel tube construction while the wings are of duralumin. All surface covering is in the form of doped fabric.

The fuselage is composed of three separate units - the front portion in which is comprised the engine mounting, etc., a middle portion containing the two cockpits, and the tail portion, which is a plain wire-braced girder, in which the vertical and horizontal struts are pin-jointed to the tubular longerons, no welding being employed for parts that have to resist stresses of any magnitude. The cockpit portion of the fuselage is partly wire-braced and partly triangulated by diagonal tubes, while the front has built-up bulkheads in place of the normal tubular members. The construction of these bulkheads or formers can be seen in one of the photographs. They are of box section, lightened by drilling numerous holes. A double fireproof bulkhead separates the engine from the next

compartment, which contains the main gasoline tank. This has a capacity of 400 kg (882 lb.), and is covered with rubber as a protection against bullets. A service tank with a capacity of 174 kg (384 lb.) is placed in the center of the top plane, giving a total gasoline capacity of 574 kg (1.265 lb.), which is sufficient for a flight of 5½ hours at full power.

The wing construction, as already mentioned, is based upon the use of duralumin. The main spars - which, incidentally, are identical in both wings and front and rear spars alike - are of plain box type, not the drawn rectangular type of duralumin spar which was so popular with French designers some years ago, but a built-up box. It seems doubtful whether this form of spar is very economical from the point of view of strength for weight, although doubtless it is a fairly cheap manufacturing proposition. The length of unsupported spars is considerable in the S.16, and the angle of the wing bracing wires is rather small, so that one would expect compression loads to be not inconsiderable.

The wing ribs, also of duralumin, are of trough section, the edges facing outward. The actual wing portion sketched is the starboard lower plane wing root, which runs from the fuselage to the attachment of the diagonal struts supporting the undercarriage. All the main fittings, it should be pointed out, are of steel, such as the long straps shown in the sketch, the lugs for attaching the spars to fuselage and outer spars,

the spar end boxes, etc. In the ribs illustrated the upper and lower flanges are braced by vertical distance pieces only, but in the main ribs these, although fundamentally of the same type, are arranged in the form of a Warren girder so as to provide triangulation. One would imagine that in spite of standardization of a great number of small parts, the method of supporting the ribs from the spars would be somewhat expensive. Compared with certain French and other forms of metal construction, that employed by the Vojenska firm appears fairly simple and cheap, and it is believed that the particular type of construction has given good results in actual service. The main point is that Czechoslovakia has definitely entered the field of metal construction on original lines, and doubtless the future will see considerable progress in this direction.

Characteristics*

Length	10.22 m	(33.53 ft.)
Span	15.30 "	(50.20 ")
Chord	1.60 "	(5.25 ")
Height	3.23 "	(10.60 ")
Weight empty	1230.00 kg	(2712.00 lb.)

*Taken from Manufacturers' catalogue.

Characteristics (Cont.)

Useful load	448 kg.	988 lb.
Weight of fuel	602 "	1327 "
Full load	2280 "	5027 "
Load per m^2	49.2 kg/m^2	(10.08 lb./sq.ft.)
Load per HP.	5.07 kg/HP	(11.02 lb./HP.)
Maximum speed	230 km/hr	(142.92 M.P.H.)
Minimum speed	80 "	(49.71 ")
Climb to	5000 m	(16404 ft.)
Service ceiling	6500-7000 "	(21300-22900 ft.)
Duration at full throttle - corresponding to a radius of	5.5 hr 1237.0 km	(700 mi.)

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Span	15.30 m	(50.20 ft.)
Chord	1.60 m	(5.25 ft.)
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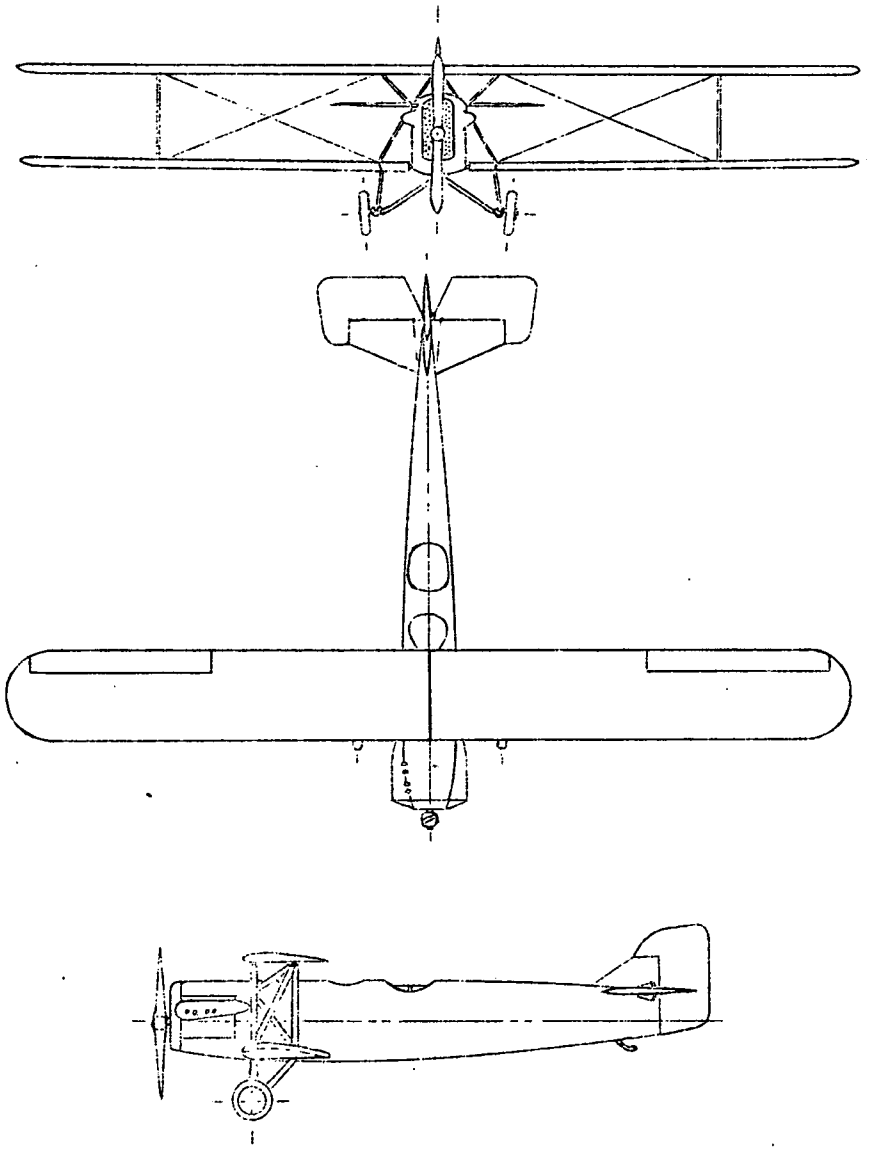
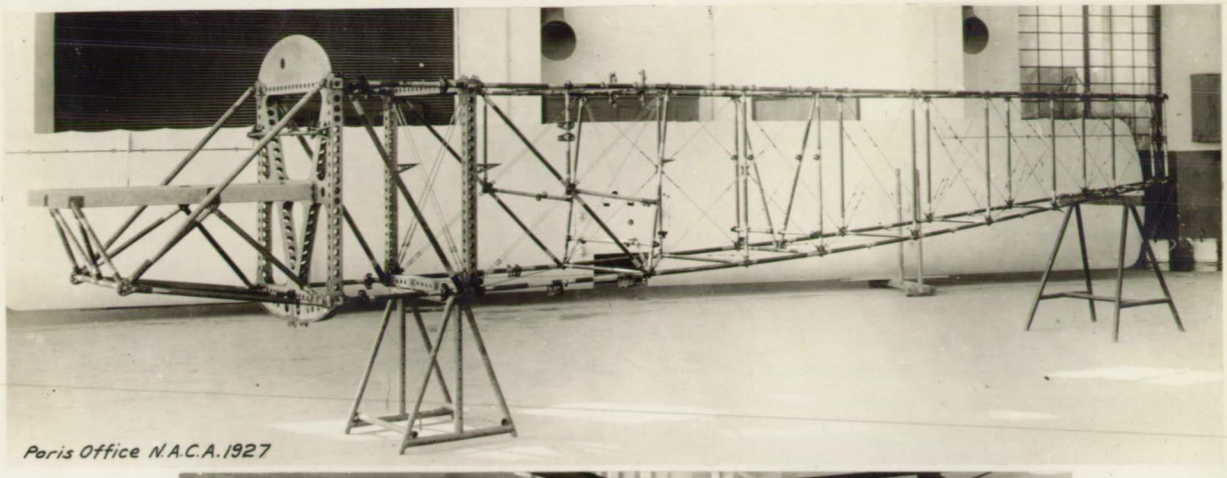
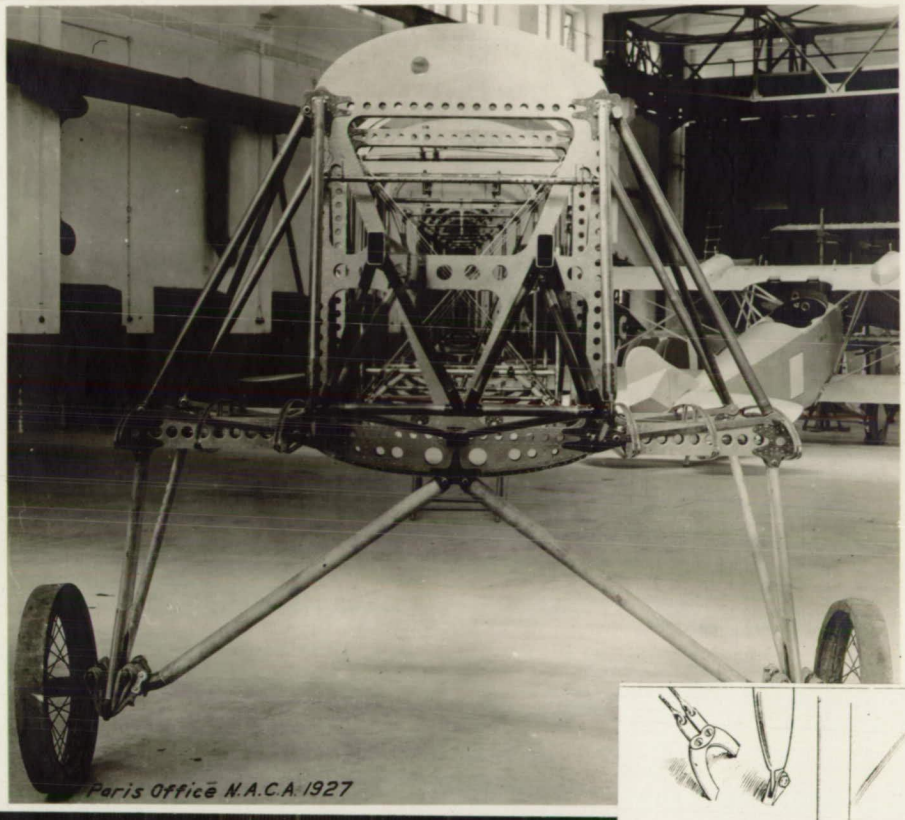


450 HP Lorraine-Dietrich engine

Fig.1 The Vojenska-Smolik S.16 observation airplane.



Paris Office N.A.C.A. 1927



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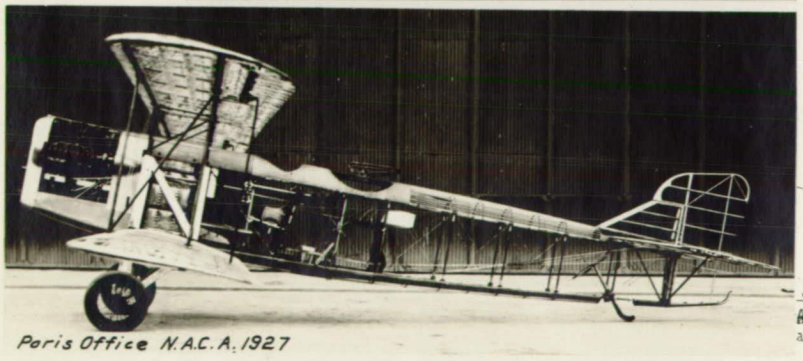

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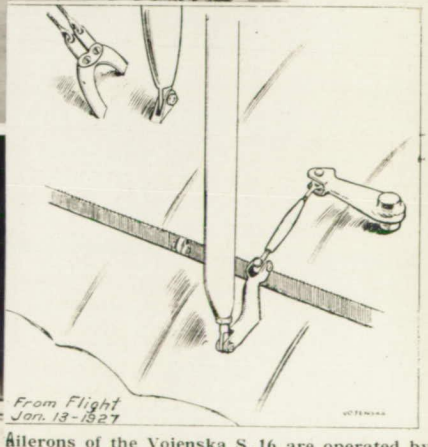
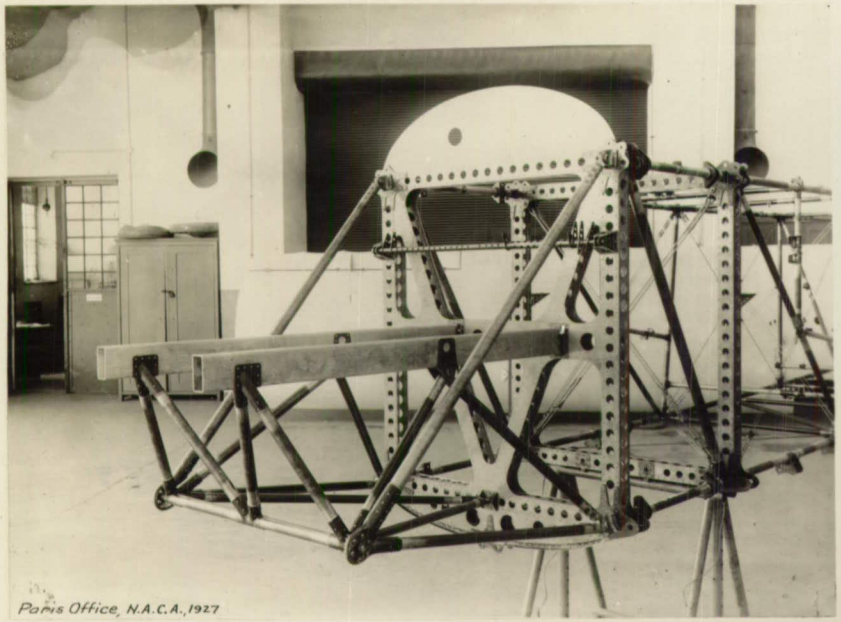
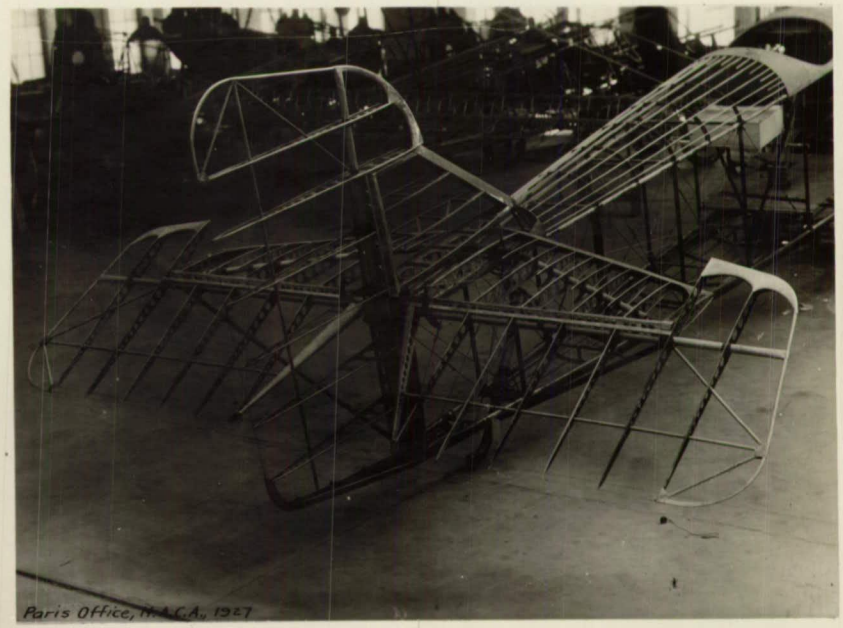


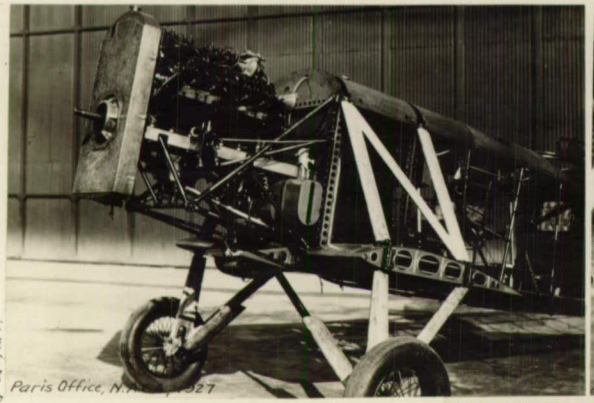
From Flight Jan. 13-1927

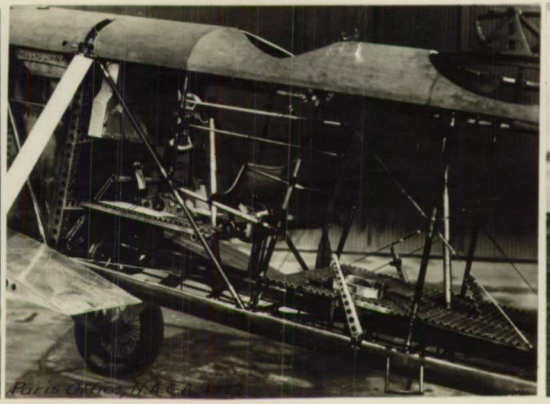
Ailerons of the Vojenska S.16 are operated by a somewhat unusual arrangement of cranks.

Views showing structure of "Vojenska-Smolik" S.16 all metal observation airplane.









Views showing structure of "Vajenska-Smolik" S.16 all metal observation airplane.