

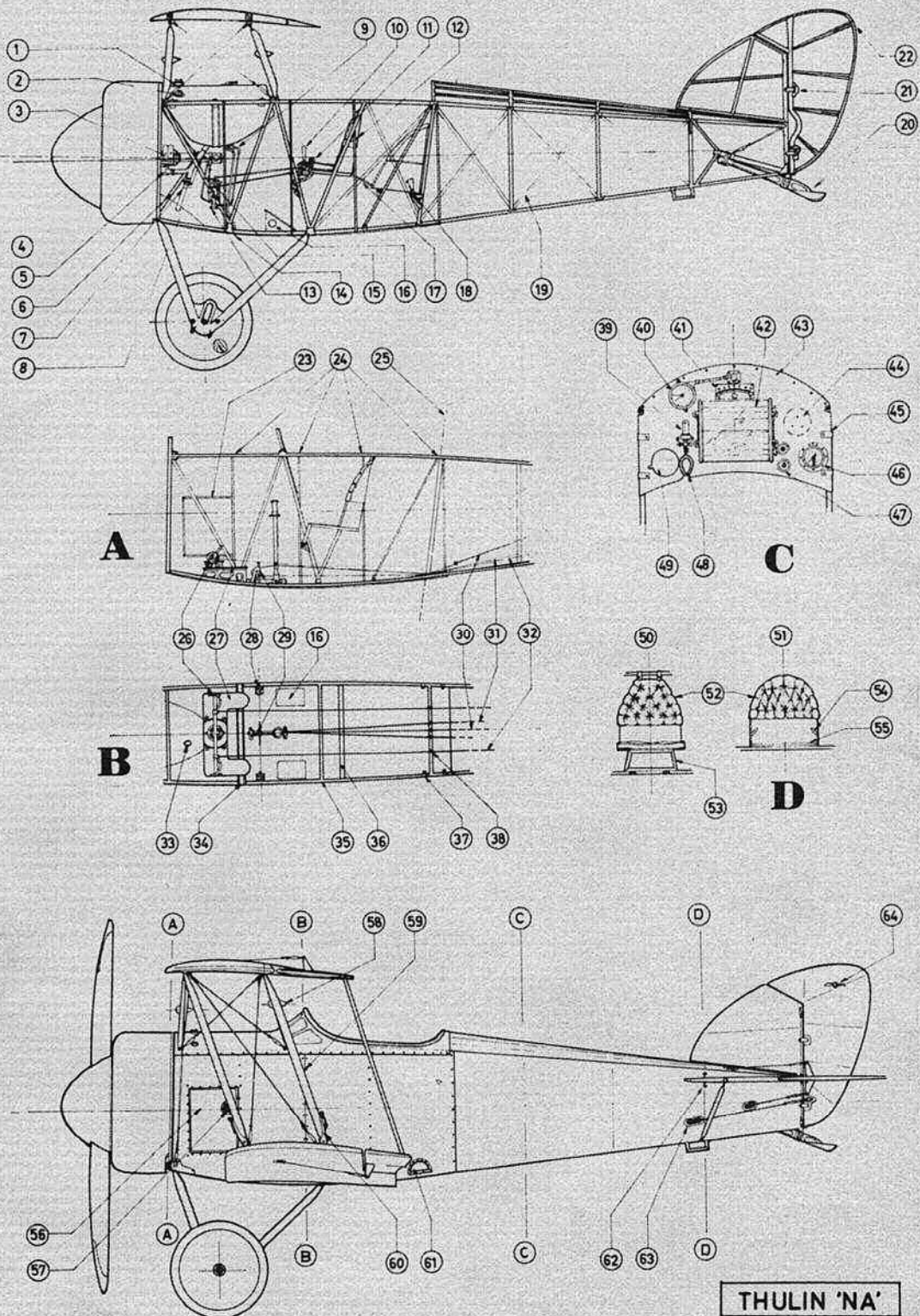
1. Fuel filler cap.
2. Oil filler cap.
3. Bosch magnetos, one on each side of crankcase.
4. Two degree upthrust from fuselage datum line.
5. Oil pump.
6. Steel-tube pylon support for rear engine mount.
7. Oil drainage cock.
8. Main oil cock.
9. Main fuel cock, also for tank drainage.
10. Throttle control handle.
11. Mixture control handle.
12. Original, lower mounting lugs for pilot's seat.
13. Fuel filter with mixture valve.
14. Fuel draining pipe leads through floorboard inside port lower longeron.
15. Throttle control bellcrank.
16. Plywood footrest for passenger.
17. Steel-tube strut between seats.
18. Harness secured to transverse member supporting seat.
19. Diagonal bracing; turnbuckles not shown.
20. Rubber-cord sprung wooden tailskid.
21. Rudder hinge with wooden fillets bolted to rudder mainspar.
22. Steel-tube ribs of rudder and elevator are offset from each other at outer frame.

23. Reinforcement frame around service hatch, inside of panel.
24. Wooden auxiliary formers to which the plywood panelling is screwed.
25. Fabric covering of rear fuselage starts here.
26. Aluminium-tube rudder bar with metal stirrups.
27. Plywood footboard.
28. Aileron cable pulley.
29. Elevator cable pulley.
30. Upper elevator cables.
31. Lower elevator cables.
32. Rudder cables.

33. Aperture in exhaust shield for oil draining pipe.
34. Transverse U-bar between former wing mounts.
35. Rear wing attachment lugs.
36. Thin wooden strip over floorboard joint.
37. Floorboard fastening clamps.
38. Cable guides.

39. Oil pulsometer glass.
40. Fuel gauge.
41. Bank indicator of air-bubble type.
42. Map case with map spools and transparent cover.
43. Panel screwed to former.
44. Probable location for compass.
45. Clamps securing panel to former.
46. ASI.
47. Ignition switches.
48. Copper oil pipe.
49. Cut-out for rev. counter.

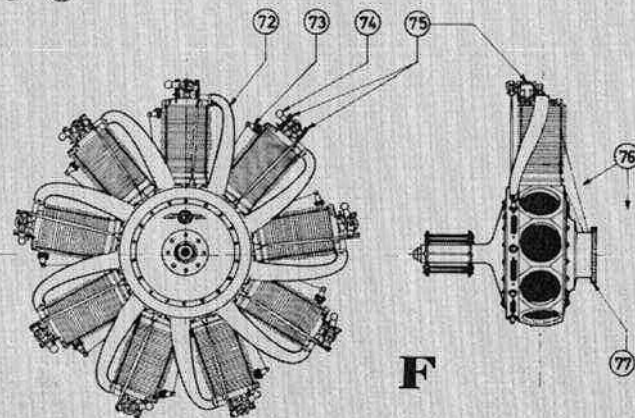
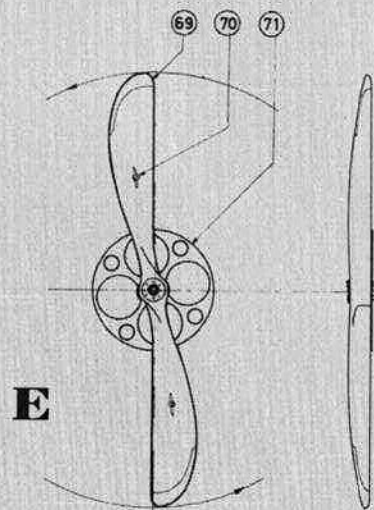
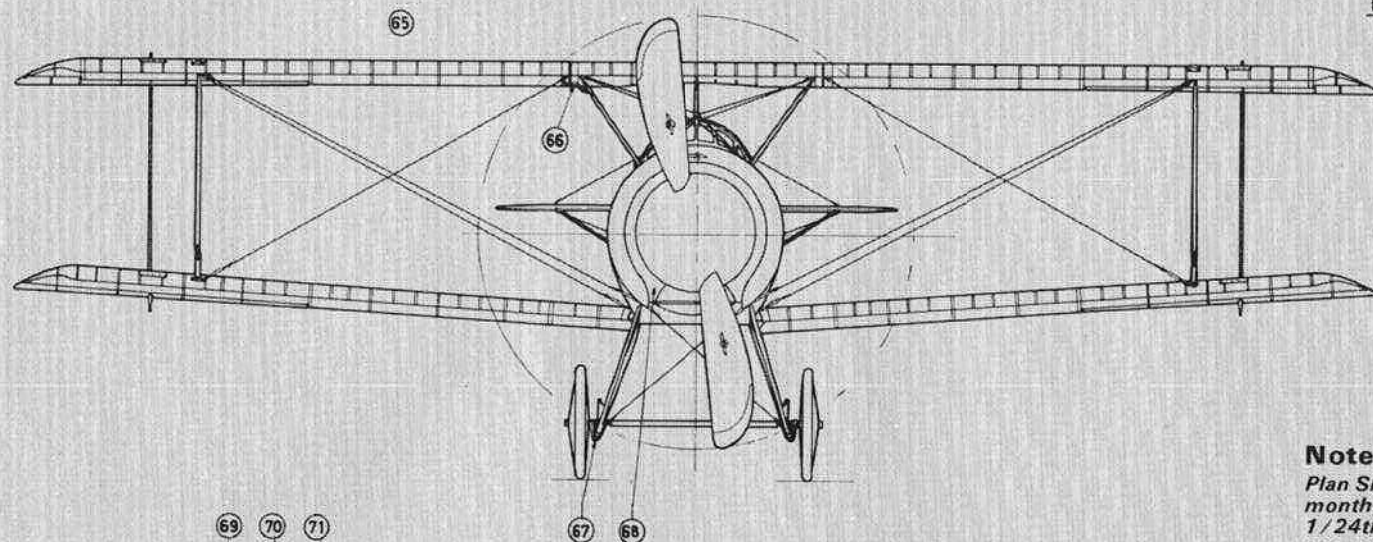
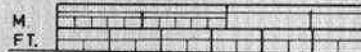
50. Pilot's seat.
51. Passenger's seat.
52. Imitation leather upholstery.
53. Welded U-profile support for seat.
54. Cut-out for harness.
55. Cushion for rear seat similar to that of pilot's seat.
56. Service panel, held in place by knobs.



THULIN 'NA'

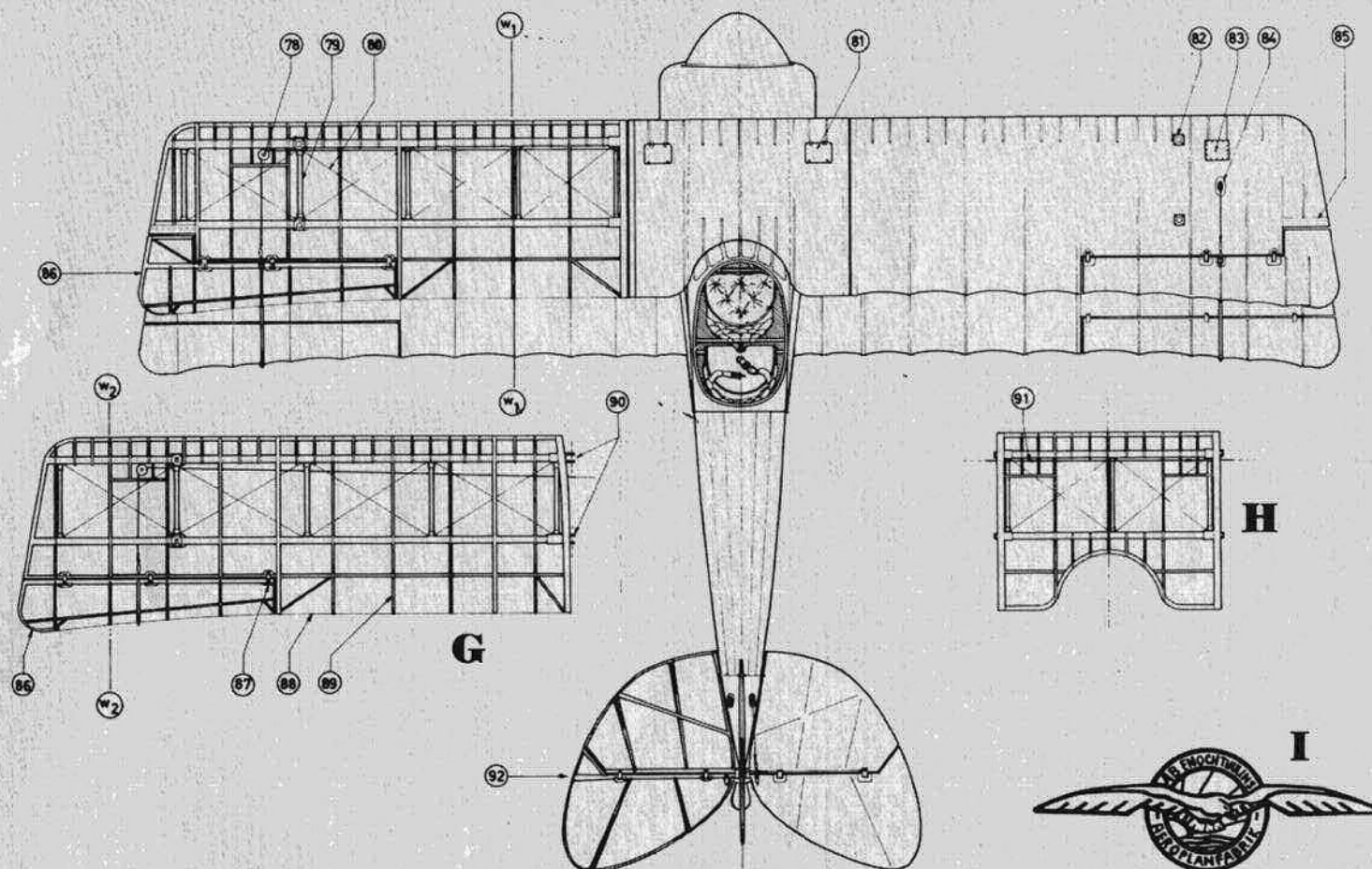
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M.
FT.



F. 135 HP THULIN 'G' ROTARY

72. Inlet tube.
73. Bosch-made sparking plugs, two per cylinder.
74. Counter balance on valve rocker.
75. 'Hairpin' valve spring.
76. One cylinder only shown. Crankshaft extension, mounting plate, magnetos, oil-pump and carburettor not shown.
77. Gear-wheel for electric starting, not used on the NA.

**Sheet No. 3**

- 78. Aileron cable pulley.
- 79. Steel-tube compression member.
- 80. Internal bracing: piano wire.
- 81. Hinged metal panel over aileron cable connections.
- 82. Strut attachment points consisting of two square steel washers, clamped over spar by four vertical bolts.
- 83. Metal panel over cable pulley, held in place by wood screws.
- 84. Leatherette reinforcement at cable leadout.
- 85. Sheet metal fairing, covered with fabric.
- 86. Steel-tube ailerons.

G: Lower wing

- 87. Aileron hinge with wooden fillet on both sides.
- 88. Wire trailing edge.
- 89. Fretted plywood ribs.
- 90. Attachment lugs.

H: Centre section

- 91. Aileron cable connection.
- 92. Tailplane and elevators: welded steel-tube construction.

I: Aeta trademark.**THULIN 'NA'**

Sheet No. 4

J: Ribs, twice given scale.

- 93. Leatherette reinforcement patches at strut and wire attachment points.
- 94. Seam in fabric.
- 95. Control stick bolts.
- 96. Strip of sheet metal covering floorboard joint.
- 97. Aperture for tailskid.
- 98. Bracing wire attachment lug.
- 99. Carburettor air-intake.
- 100. ASI pipes clamped to rear c/s strut.

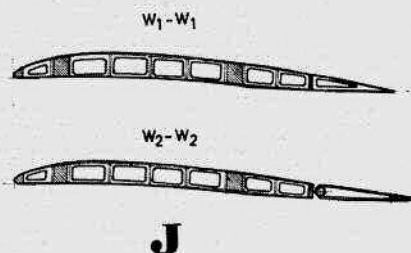
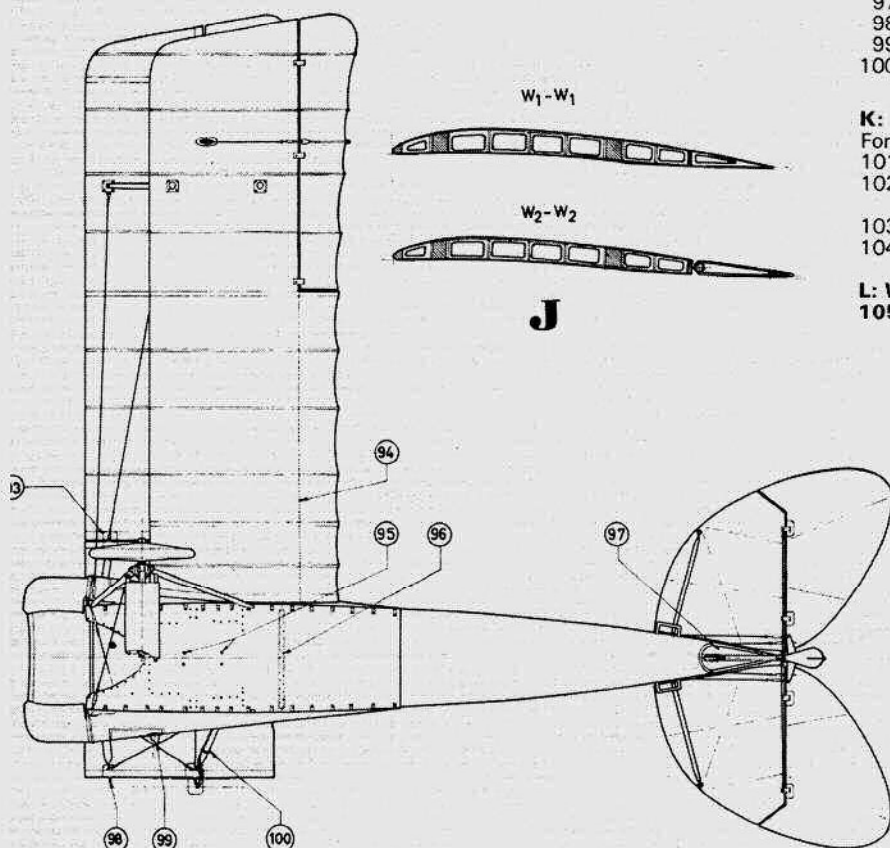
K: Fuselage cross sections

For reference, see sheet No. 1.

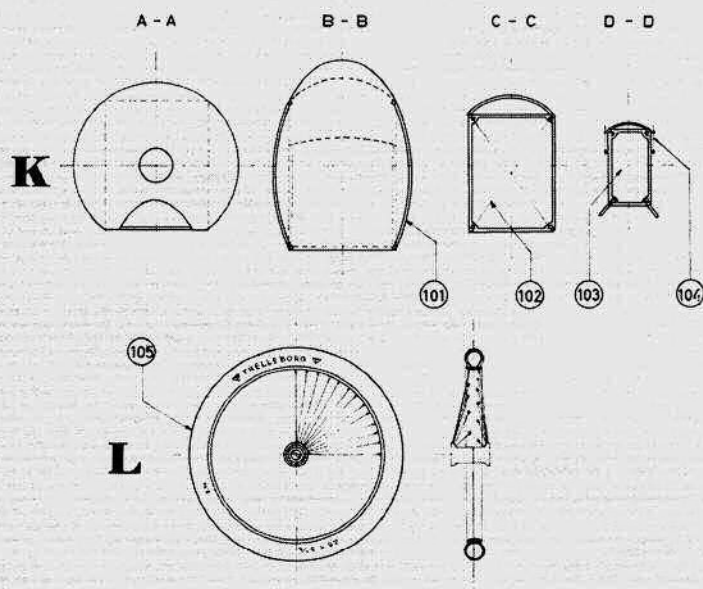
- 101. Wooden auxiliary former.
- 102. Bracing wire-loops run through eyelets welded inside the corners of the former.
- 103. No crossbracing in the rearmost former.
- 104. Tailplane incidence adjustment.

L: Wire wheel with tyre, twice given scale.

- 105: Trelleborg 28 x 3 1/2 natural rubber tyre.



J



Plan Sheets 1 and 2 were published in the July 1982 issue of Aeromodeller. A set of dyeline prints to a scale of 1/24th of these 1/48th scale drawings are available as Plan No. 3048, price £1.50 inclusive of VAT plus 45p p&p from the Aeromodeller Plans Service, PO Box 35, Bridge Street, Hemel Hempstead, Herts., HP1 1EE.

THULIN 'NA'

August 1982



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405

THULIN TYPE NA

**AIRCRAFT
DESCRIBED**

No. 253



By
Goran Lundin

THE ENOCH THULIN AEROPLANE MANUFACTURING CO. — usually abbreviated AETA, which is short for Aktiebolaget Enoch Thulins Aeroplanfabrik — at Landskrona, Sweden, was founded in 1914.

Production started with a series of licence-built Blériot monoplanes of the widely copied and used XI-type, which were given the designation Thulin type A. They served as trainers both in Sweden and Denmark.

The B and D types that followed were slightly improved Morane-Saulnier G/H and L monoplanes, none of them built in more than a few examples.

With the E-type two-seater biplane in 1916, a line of Thulin-designed aircraft was commenced. The main contractor for this and subsequent types were the Swedish Army and Naval Air Services, but a comparatively large number, especially of the FA and K types, were also exported.

During its short production life the Thulin Co. outgrew its original premises — which were literally nothing more than a couple of sheds, and moved into a modern factory building including metallurgical and aerodynamic laboratories. This was equipped with a wind tunnel where aircraft models and airfoils could be tested. The production expanded, and the number of employees rose from a mere ten in 1915 to over 800 in 1918.

After the armistice the civil market was virtually flooded with comparatively cheap surplus aircraft. The AETA could no longer find a market for its products, which in addition were in certain respects a bit obsolete by 1918/19 standards.

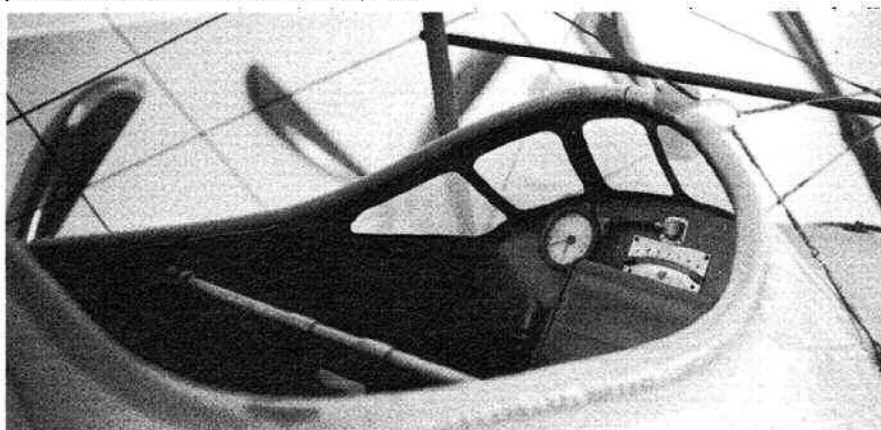
In addition to his work as a manager, designer and aerodynamic expert, Enoch Thulin was also a very skilled and experienced pilot and as if the financial troubles of the firm were not enough, on the 14th July, 1919 Dr. Thulin was killed when his personal type K single-seater monoplane crashed into the dockyards of Landskrona. The accident was probably caused by structural failure of the aircraft.

A few months later production ceased, and the AETA was forced into liquidation. Production then totalled 99 aircraft of 14 different types and some 700 engines of five types. The engine built in largest quantity was the famous 110hp type A, which was basically a LeRhône rotary, considerably improved by a new crankshaft/piston connection evolved by AETA designers. The A-type rotary was also exported to Germany under somewhat obscure circumstances, and used in Fokker Dr. 1s.

The last aircraft design to emerge from the AETA was to be the NA of 1919. Drawings were prepared during 1918, and early in the spring of 1919 the NA was ready for transport to the Ljungbyhed aerodrome, where today the R.S.A.F. Flying School resides.

During the spring some preliminary ground tests were conducted. The pilot's view was found too restricted, and consequently the front seat was slightly raised. This also necessitated a modification of the throttle/mixture-control mounting, which was replaced by a rather makeshift console.

Cockpit with 'streamlined' windshield and leather padding. The transverse tube visible just above the windscreen is part of the harness in which the aircraft is suspended.

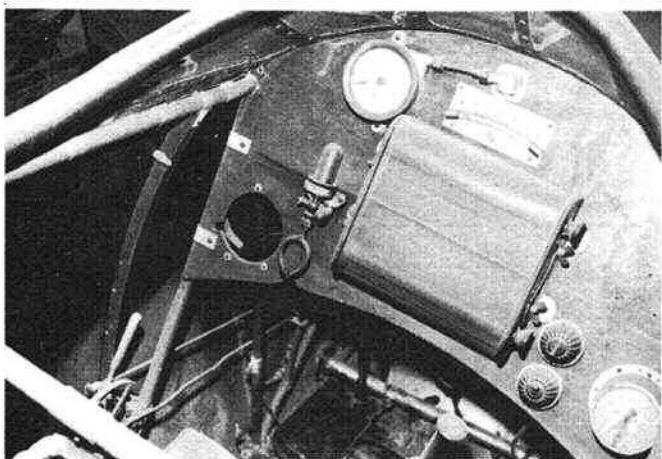


However, the trials were never concluded due to the liquidation of the AETA, and the NA was more or less forgotten. It was not until 1921 that the first and only test-flight was made by Count von Bismarck, a German pilot visiting Sweden. He is said to have expressed great satisfaction with the performance and general handling qualities of the aircraft.

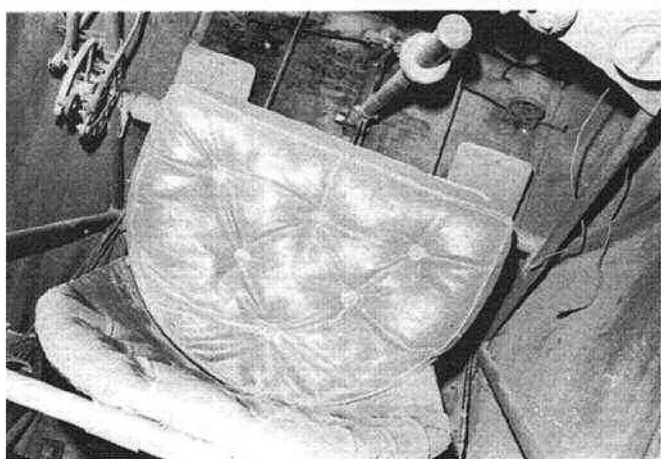
The NA was in essence a development of the previous type N single-seat fighter, which it in many respects resembles. Only one example of the N type and NA were built and both still survive. Both the N and NA were powered by the 135hp 'G' rotary, final development of the Thulin/LeRhône engine.

The NA is usually described as a two-seat fighter, but this is in fact quite misleading. The word 'fighter' is an often misused one in early Swedish aviation, for very few of the aircraft so designated did actually carry any armament, even if the general idea was that they should be able to do so.

In the NA case it does not seem as if it ever was intended to be equipped with any kind of armament. As far as can be judged by the writer this would have been im-



Instrument panel; for reference see detail on drawing. The throttle/mixture control levers can be seen in the lower left corner of the picture.



Pilot's seat. Disconnected ASI tubes can be seen dangling to the right. Top left throttle/mixture control levers also note guide pulley on floor for aileron cable.

possible without fairly radical alterations. The fuel and oil tank unit, would as it is, prohibit any conventional arrangement of forward-firing guns, while the cockpit is too cramped to allow any practical use of a flexible gun for the observer. It is also very likely that the extra weight of a gun installation would have proved detrimental to the aircraft's performance.

The NA is a fairly conventional-looking single bay biplane, to some extent bearing a resemblance to the Sopwith Camel, e.g. the wing arrangement and 'broken' upper longerons. The slab-sided, welded steel-tube fuselage, diagonally braced in the rear portion by 'endless' wire-loops, also suggests that the AETA designers might have been influenced by Reinhold Platz of Fokker fame.

The front side panels are covered with plywood, screwed to four wooden auxiliary formers on each side, providing a smooth fairing between the circular cowling and the flat-sided rear fuselage. The sheet-metal top decking consists of two screwed-on components, the foremost covering the tank unit and the rear one pressed in one part with the streamlined windscreen frame. The entire cockpit is surrounded by leather padding.

The rear portion of the fuselage is covered with unbleached, varnished linen.

All tail surfaces are welded steel-tube structures, fabric covered and bolted to the fuselage. Both fin and tailplane incidences can be adjusted, though not during flight, which by 1919 standards perhaps seems unnecessarily primitive.

The 9-cylinder 135hp 'G' rotary is bolted to a star-shaped bearer frame in the circular front former, its rear mounting being supported by a pyramid shaped steel-tube pylon fixed to the front former with its apex pointing rearwards. The tank unit is internally separated into two compartments for oil and petrol respectively and is suspended from the top longerons immediately behind the engine. It has its lowest point exactly above the carburettor/throttle unit which is fed via a fuel flow regulator/filter mounted approximately midway between the cockpit floor and the fuselage datum line on the port side of the cockpit. All fuel and oil piping is copper tube with brass cocks and connections. The oil pump is mounted on the



Close-up of control stick, cables and pulleys on cockpit floor.

engine bearer plate and driven from the same gearwheel as the Bosch magnetos for the two separate ignition systems. Lubrication is controlled by a pulso-meter glass on the instrument panel.

The wooden instrument panel is dominated by a large, glass-covered map case, around which the few necessary instruments are grouped: A.S.I., fuel gauge, rev-counter, a simple bank indicator of the air bubble type and the two brass-cased ignition switches. The rev-counter is missing on the aircraft together with at least one other instrument which may have been a compass or an altimeter. It is possible that some of these instruments were never fitted. The instrumentation is completed by an air bubble climb indicator on the starboard upper longeron, immediately aft of the instrument panel.

Seats are made from plywood, with the

backs and separate cushions covered with brown imitation leather.

Wings are orthodox in construction: fretted plywood ribs with wooden capstrips on two hollow mainspars and a smaller-sectioned auxiliary rear spar. The mainspars are interconnected by steel tube compression struts, and internal bracing is by means of piano wire. Ailerons of welded steel-tube construction are carried on all four wingtips, those on the upper wing are balanced and linked to the lower ones by streamlined steel-tube rods.

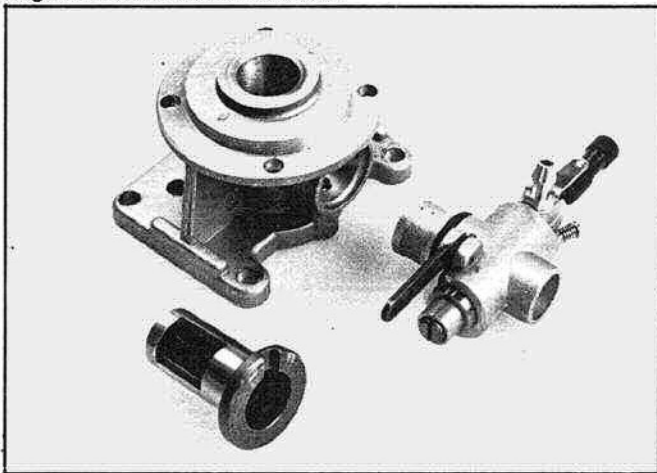
All struts including also the landing gear V-struts are of streamlined tubing. The wings can easily be dismantled and re-erected without the usual wire adjustments, thanks to a simple but rather ingenious locking-device provided at the lower ends of all four main struts. All wing surfaces are fabric-covered.

After the single flight made by Graf von Bismarck in 1921, the NA was put aside and was for many years stored at the old Thulin factory. Today it is suspended from the ceiling in the Thulin-section of the Landskrona town museum, which also houses a collection of Thulin engines and airscrews.

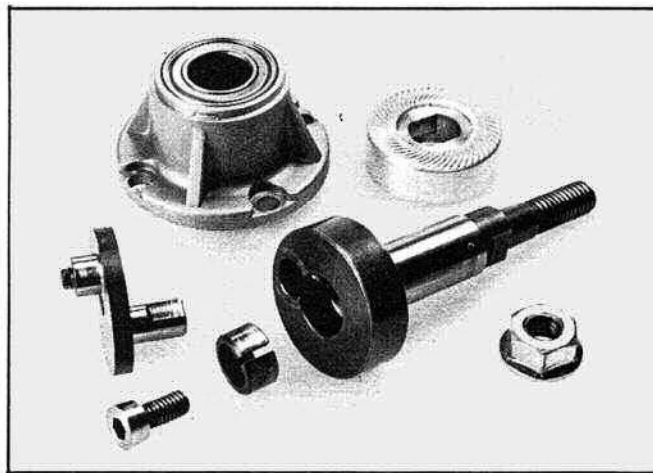
Despite the fact that no attempts towards rebuilding or restoration have been made, the NA is in a very good condition for its age. Of course the fabric is very brittle and even punctured here and there, but the aircraft is complete apart from a missing pair of instruments. The Technical Museum of Stockholm also keeps aircraft of the A, B, G and N types; all except the A-type in store and, due to lack of funds, in a rather deplorable state.

DATA AND PERFORMANCE

Length: 19 1/4' 1/4" / 5.8m
Span: 26' 6 7/8" / 8.1m
Height: 8' 3 1/16" / 2.53m
Wing surface: approx. 220sq.ft. / 20.45m²
Lower wing dihedral: 3 deg.
Upper wing dihedral: nil.
Stagger: 16 deg.
Weight empty: 882lbs. / 400kg
Flying weight: 1,146lbs. / 520kg
Max. load capacity: 661lbs. / 300kg
Engine: Thulin 'G', 135hp 9-cylinder rotary with double ignition systems, spark plugs and magnetos made by Bosch.
Maximum speed: 134mph / 215kmh
Landing speed: 59mph / 95kmh
Climb to 3,278ft. / 1000m / 3.5 min.



Above left: crankcase backplate houses rotary-valve and incorporates intake boss and four-point engine mounting flange. Right: unique G-Mark feature is its built-up two-throw overhung crankshaft. See text for details.



Right: unique G-Mark feature is its built-up two-throw overhung crankshaft. See text for details.

size for use with the G-Mark. Such a prop may well suit a clean, fairly light model. On the other hand, a bigger scale model that might require the increased take-off thrust of a larger diameter prop, would be better with a 10 x 4, 10 x 5 or, perhaps, 11 x 4.

A problem frequently encountered with twin cylinder two-strokes where, as in the case of a flat-twin, a common crank chamber feeds both cylinders, is the tendency for mixture to be unevenly distributed between the two cylinders, as a result of which one cylinder will be prone to cut out when the engine is throttled down.

The G-Mark was very much better than average in this respect: in fact it kept firing on both cylinders irrespective of the throttle setting. For the record, we have to qualify this, however, by saying that the test engine would not throttle down to less than 3,800rpm. This was due to a fault in the original carburettor which allowed air to leak into the downstream side of the carburettor choke when the vertical sliding throttle barrel approached the idle position. This fault was communicated to the manufacturers who quickly produced a modified carburettor that has since been

fitted to all production engines, enabling the engine to be throttled down another 1,000rpm.

In all other respects, the G-Mark .30Twin performed extremely well on test. The silencer is effective and unobtrusive and its bottom outlet helps to keep the engine clean. In all, a refreshingly different little motor.

Manufacturer: Kawaguchiko Seimitsu Co., Ltd., Kawaguchiko, Yamanashi, Japan.

U.K. Distributor: Irvine Engines, Ltd., Brunswick Industrial Park, New Southgate, London, N11 1JL.

THULIN TYPE NA

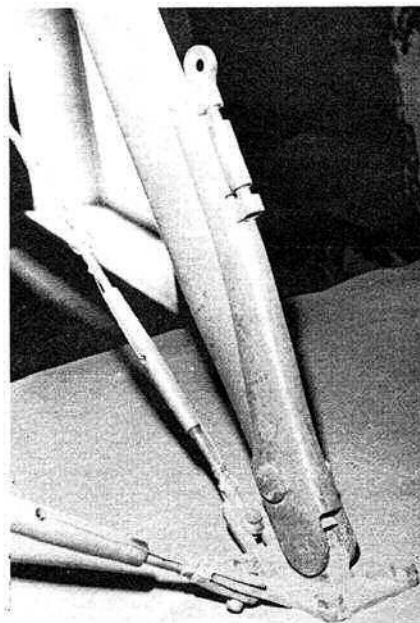


Conclusion of the article published in July 82 issue

COLOUR NOTES AND HINTS FOR THE MODELLER

The colour scheme of the NA is almost as simple as it could be. All fabric covered surfaces, i.e. wings, fuselage rear portion, tail surfaces and wheel covers were clear doped. Humbrol HG7 with some white added to make it paler would be a good approximation of the fabric as it appears today. If one intends to portray the aircraft as it may have looked when fresh from the factory, Humbrol 'Clear doped linen' would probably be better, perhaps toned down slightly with 'German Pale Yellow'. The finish should in this case be gloss. All visible metal areas were painted a high-gloss dark olive, just a shade paler than Humbrol HB15 'R.F.C. Green'. This does not apply to the tailplane struts, which are black, and the exhaust shield which is left unpainted aluminium. The plywood fuselage panels were also clear varnished, which resulted in a warm, yellowish brown tone. The finish of these panels is by no means impressive, on the contrary the surface is very rough. This may of course have been caused during the years by storing in damp premises. The 'period' photographs are not very good and give no hints as to the finish of the woodwork.

On the NA the instrument panel was made of a very bright plywood. The stick and rudder bar were unpainted aluminium. This applies also to the A.S.I. case and backplate of the bank indicator. The fuel gauge rim and ignition switches are bright polished brass. Instrument faces are



Main strut locking device. Note also metal wire used to prevent turnbuckles from unscrewing.

white with black figures and hands. The handle of the control stick and sides of the map case are a dark reddish brown.

Viewing the fuselage structure from inside the cockpit, it appears to be painted the same green as the other metal areas of the aircraft.

Finally: Tyres of the NA — and indeed of many other WWII-period aircraft — were NOT black, but a pale yellowish colour of natural rubber. Again, Humbrol HG7 would be useful, slightly dulled by a drop of light grey. Most engines of the period, and Thulin engines are by no means an exception, were highly polished and the best approximation is to use silver with a tint of black.

References:

The drawing and technical description are mainly based upon measures, photographs and studies of the preserved Thulin NA at Landskrona Museum. Original AETA drawings made available by the Technical Museum of Stockholm have also been used.

Facts and figures for AETA production and for the NA are taken from a manuscript written by Ivar Malmer, one-time Technical Manager of AETA.