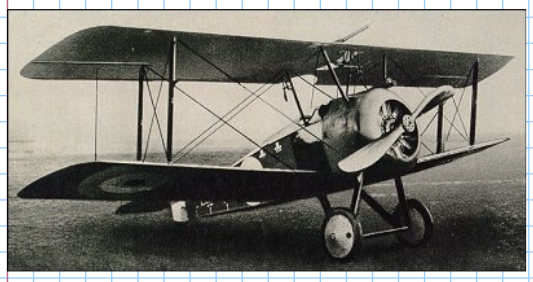
Structural Design Case Study: Sopwith Camel

JKF
26.3.2014

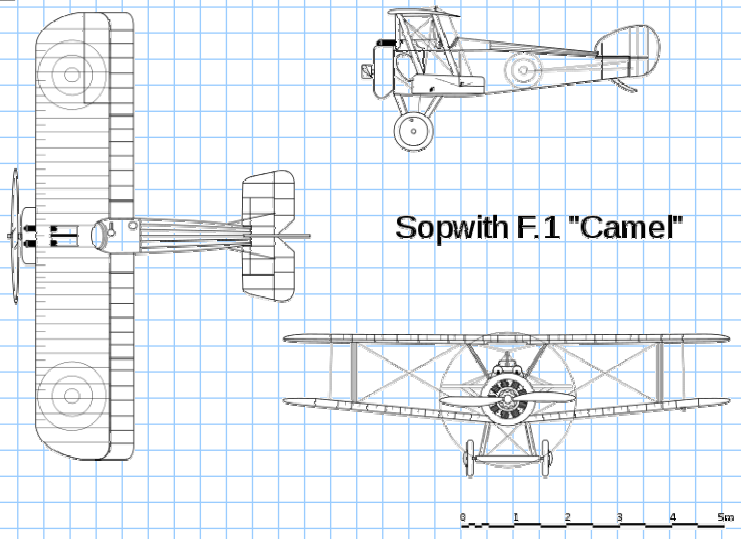
Note Title 26/03/2014



http://science.howstuffworks.com/sopwith-camel-f1.htm

3-View:

associazioneala.it



Designer: Herbert Smith
1890-1978

Scale adjusted to ~ match squared paper

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Specification:

General characteristics
Length: 18 ft 9 in (5.71 m)
Wingspan: 28 ft 0 in (8.53 m)
Height: 8 ft 6 in (2.59 m)
Wing area: 231 ft² (21.46 m²)
Empty weight: 930 lb (420 kg)
Loaded weight: 1,455 lb (660 kg)
Powerplant: 1 × Clerget 9B 9-cylinder Rotary engine, 130 hp (97 kW)
Aspect ratio: 4.11

Performance
Maximum speed: 115 mph (185 km/h)
Stall speed: 48 mph (77 km/h)
Range: 300 mi ferry (485 km)
Service ceiling: 21,000 ft (6,400 m)
Rate of climb: 1,085 ft/min (5.5 m/s)
Wing loading: 6.3 lb/ft² (30.8 kg/m²)
Power/mass: 0.09 hp/lb (150 W/kg)
Lift-to-drag ratio: 7.7

5g! GLoc!?

Materials
Fabric, stick + string!

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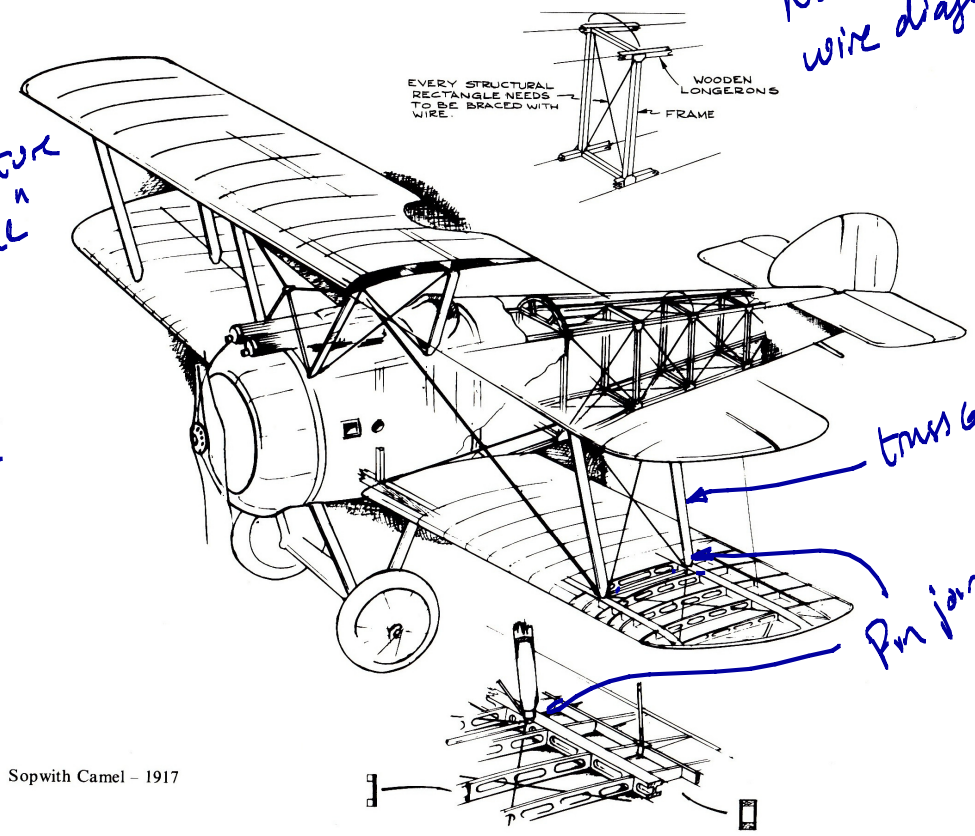
Note cross braced wire diagonals



Fus = 3D truss structure "space frame"

Wing = Beam / truss structure

truss columns

Pin joints

Sopwith Camel – 1917

Cutler "Understanding Aircraft Structures" Granada Publishing 1981

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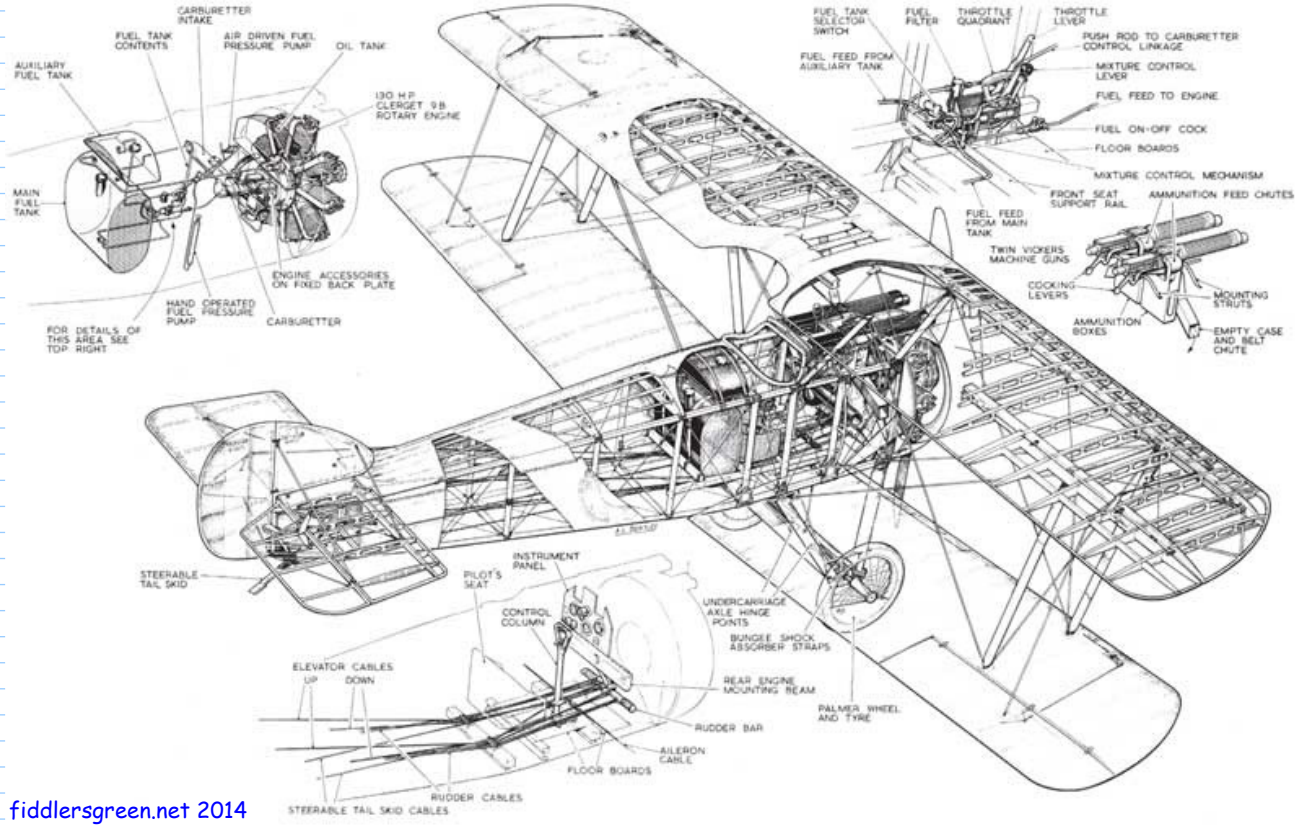
Further details



fiddlersgreen.net 2014

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Wing structure

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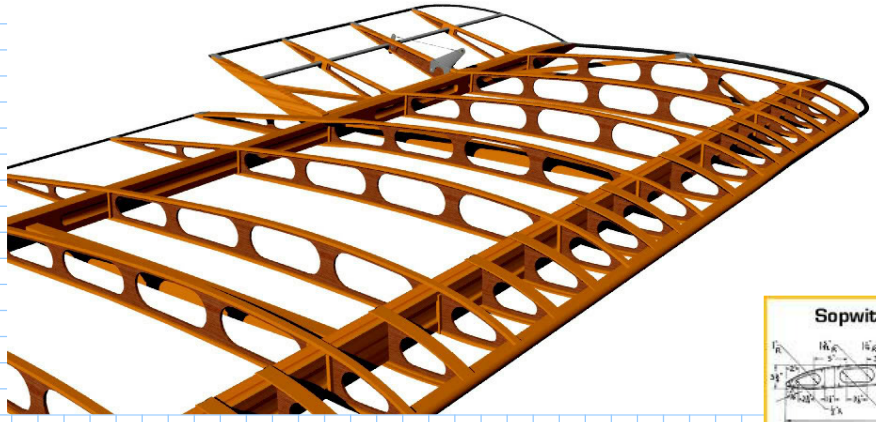

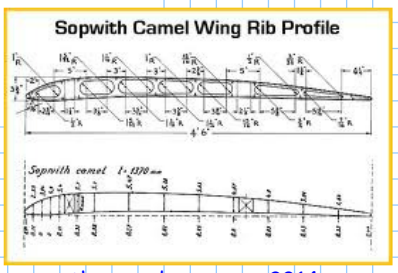

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Wooden ribs and spars.

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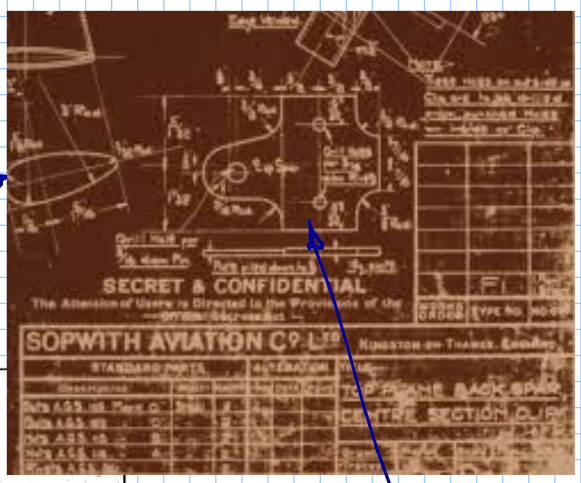
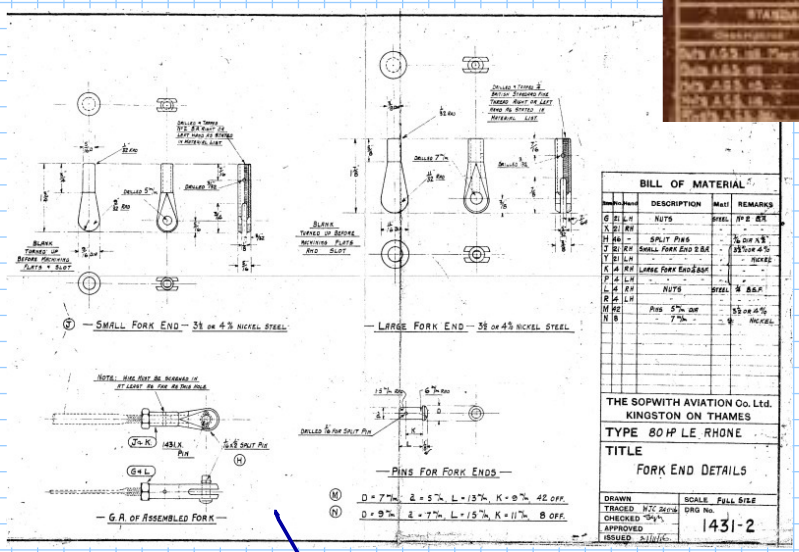
Pin joints!

Aero-form struts



Lug attachment



Lugs + pins.

Fork-end details

Original Sopwith Aviation Co. drawings!

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