

Stu1 Structural Design Case Study : Spitfire

JZF
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Note Title



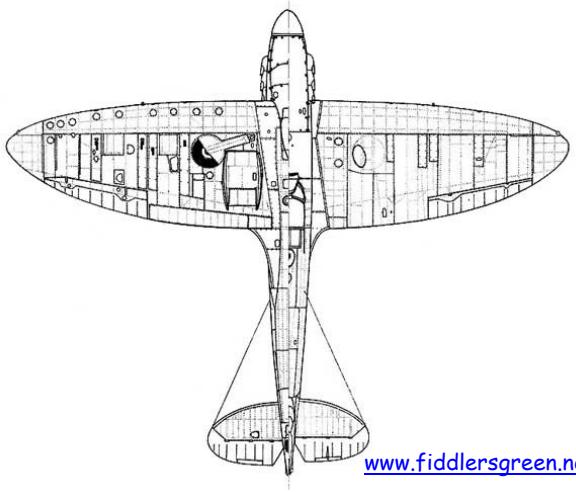
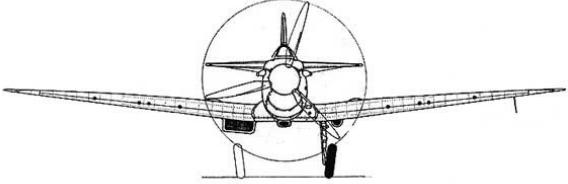
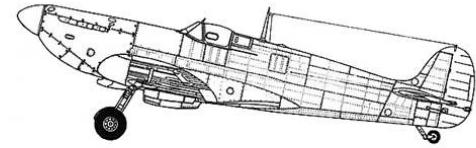
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"If anybody ever tells you anything about an aeroplane which is so bloody complicated you can't understand it, take it from me: it's all balls" -

R.J. Mitchell, 1895-1937

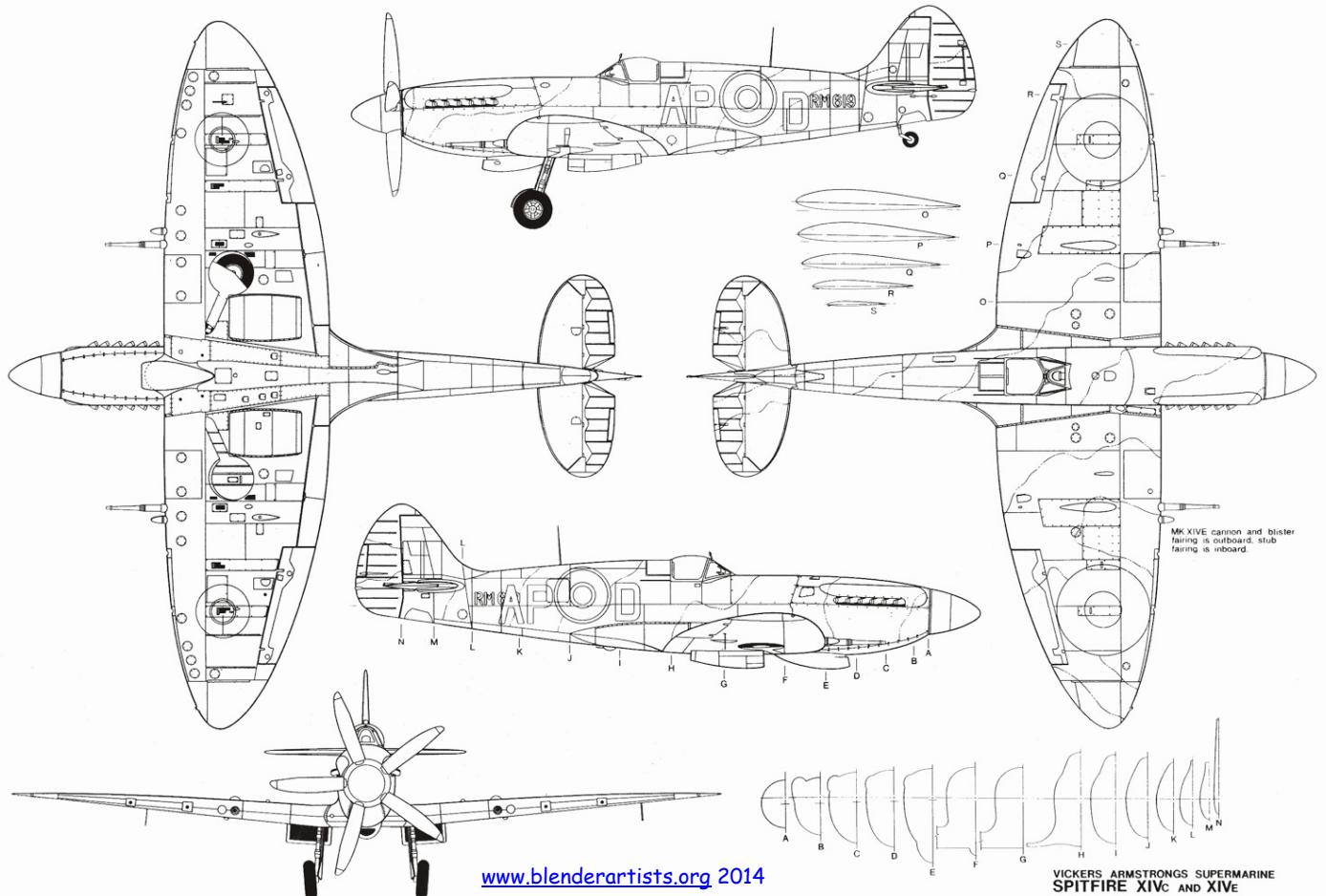
Creator of a legend



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3-View :



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VICKERS ARMSTRONGS SUPERMARINE SPITFIRE XIVc AND XIVe

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Specification:

General characteristics

Length: 29 ft 11 in (9.12 m)

Wingspan: 36 ft 10 in (11.23 m)

Height: 11 ft 5 in (3.86 m)

Wing area: 242.1 ft² (22.48 m²)

Airfoil: NACA 2209.4(tip)

Empty weight: 5,065 lb (2,297 kg)

Loaded weight: 6,622 lb (3,000 kg), Max. takeoff weight: 6,700 lb (3,039 kg)

Powerplant: 1 × Rolls-Royce Merlin 45 supercharged V12 engine, 1,470 hp (1,096 kW) at 9,250 ft (2,820 m)

Performance

Engine dry weight: 1640 lb (744 kg)

Maximum speed: 370 mph, (322 kn, 595 km/h)

Combat radius: 410 nmi (470 mi, 760 km)

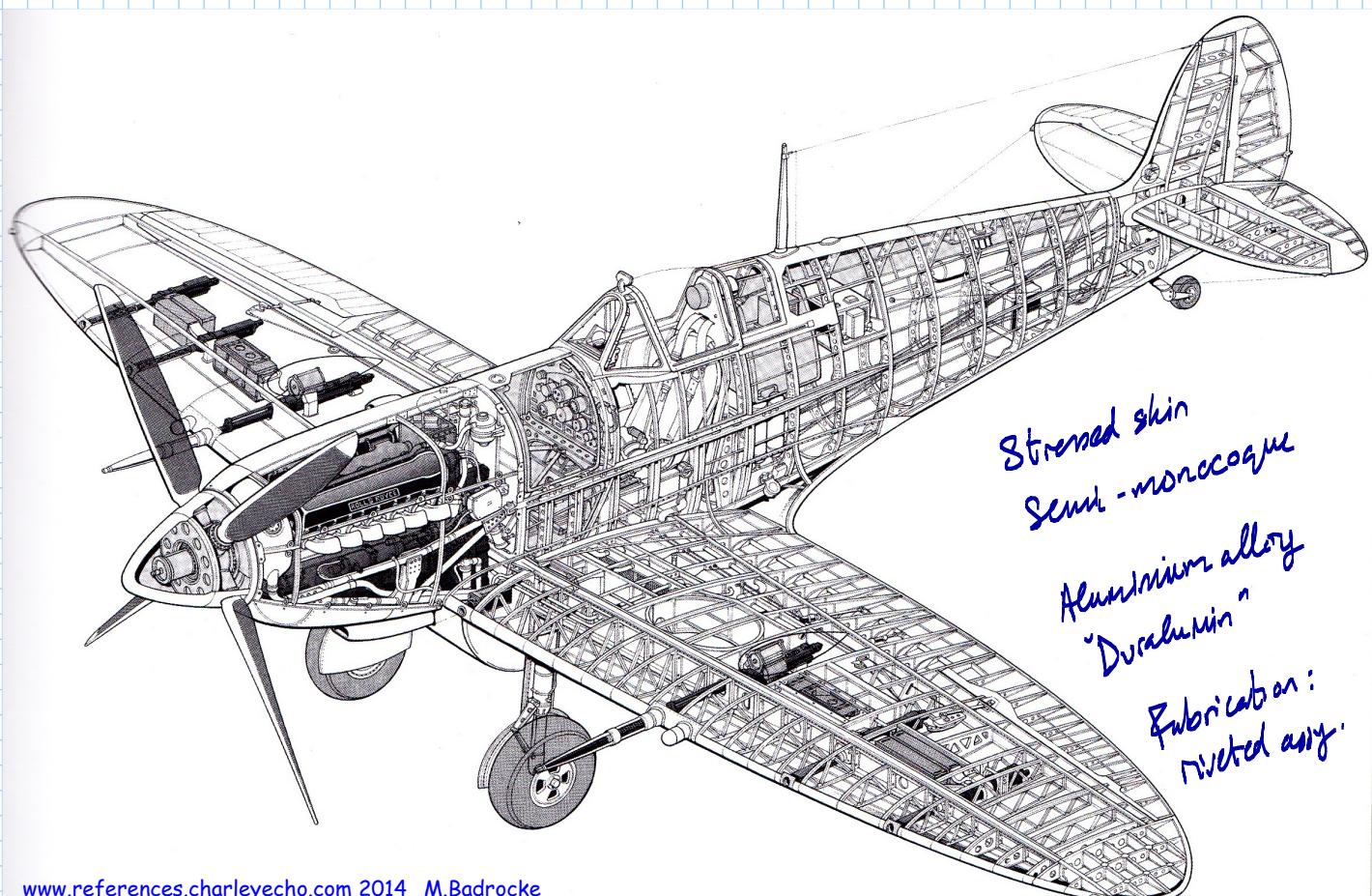
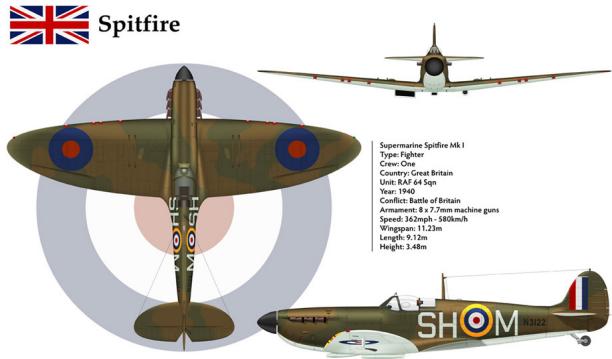
Ferry range: 991 nmi (1,135 mi, 1,827 km)

Service ceiling: 36,500 ft (11,125 m)

Rate of climb: 2,600 ft/min (13.2 m/s)

Wing loading: 27.35 lb/ft² (133.5 kg/m²)

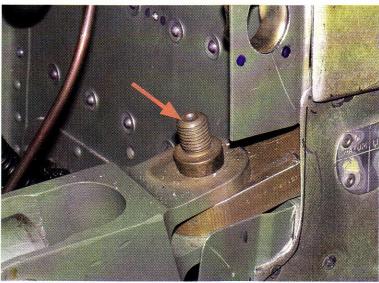
Power/mass: 0.22 hp/lb (0.36 kW/kg)



Wing LE joint
at end of stub spar

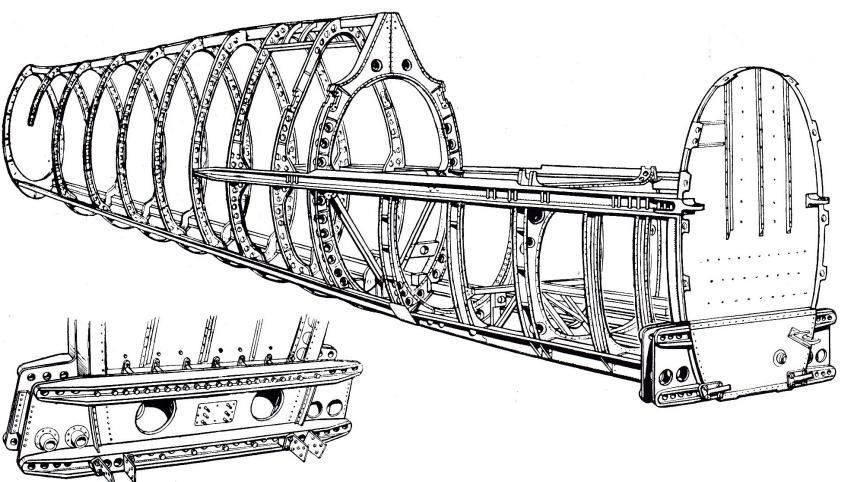


Engine mounting
steel bulkhead members
"truss"
Double shear legs
Pin joints

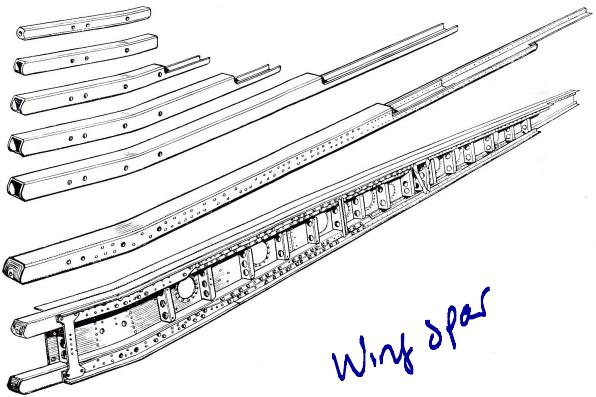


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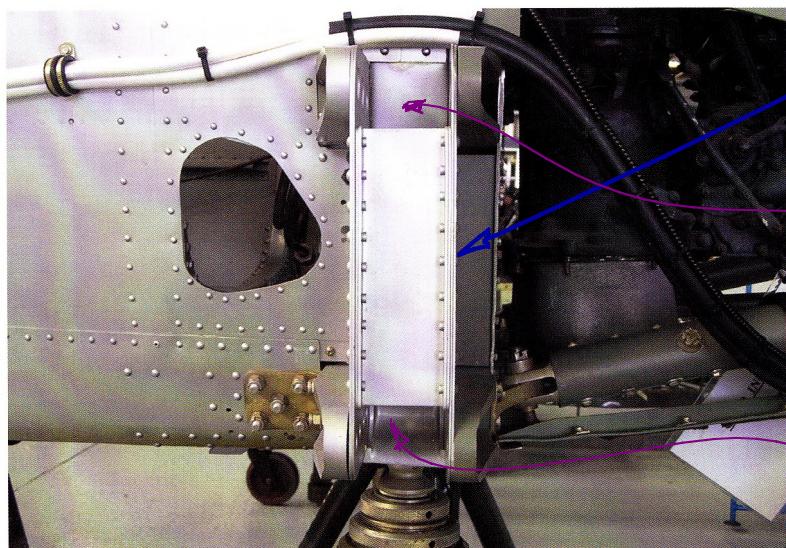
Stub spar
showing firs to
wing LE joint



RIGHT: A drawing showing the wing spar construction. The lower view shows how the upper and lower spar booms are braced by the spar web that runs the full length of the wing, from root to tip. The upper views show how each spar boom is made up of concentric tubes, making it progressively stronger as it runs from the wing tip to the root.
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End on view of
wing LE spar joint



Concentric alloy tube spar caps!

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References / bibliography:

[1] Price and Blackah "Supermarine Spitfire - Owner's workshop manual" Haynes Publishing 2007, ISBN 978 1 84425 462 0



[2] David Curnock "Little Book of Spitfire", ISBN 978-1-907803-02-4
G2 Entertainment Ltd.

[3] Nigel Cawthorne "Britains finest hour - Spitfire" Abbeydale Press,
Anness Publishing Ltd. 2010, ISBN 978-1-86147-283-0