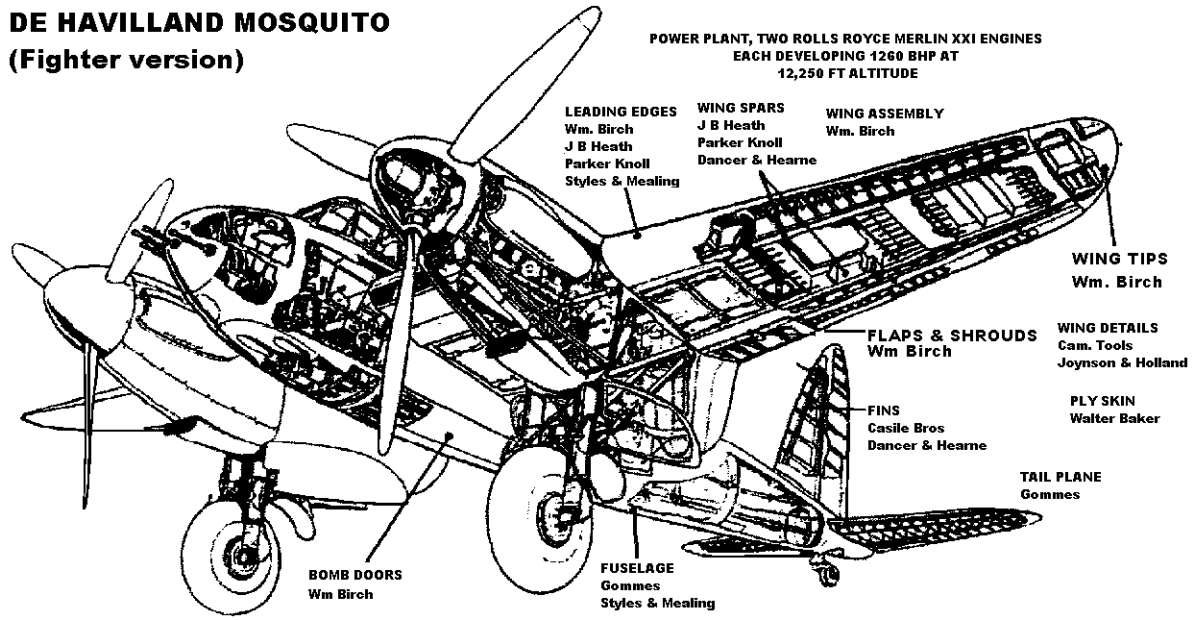
THE DE HAVILLAND DH 98 MOSQUITO

What was it that was so special about this new aeroplane? Built as a private venture, the initial concept was of an unarmed bomber capable of out flying contemporary fighter aircraft (as de Havilland had in the First World War, with the DH 4 and 9). At first those in authority viewed it with great scepticism. Built with a wooden structure (which many considered totally inappropriate), it proved to be both light and fast, capable of carrying a two thousand pound payload, equal to that expected of a medium bomber, whilst still capable of outpacing any of the opposing fighter aircraft.

Once again Geoffrey de Havilland succeeded in producing a bomber aircraft which could rely on its speed for defence. The Mosquito became probably the most versatile British aircraft of the Second World War.



The Mosquito, known to most simply as the “Mossie”, had several other names that reflect different attributes of this aeroplane. “The Wooden Wonder”, which it most certainly was. “Termites Dream”, gained from when first used in the Far East and it was discovered that the glue used, a “casein” cement (a milk derivative), was susceptible to attack by insects and fungus. On the production lines this was replaced with a new type of synthetic resin adhesive that proved far superior. Another was “Freeman’s Folly”, after Air Marshal Sir Wilfred Freeman, who was responsible for development and production at the Air Ministry, had given his whole-heartedly support and backed the project against all the opposition. Another title given by those who knew of the involvement of the furniture industry was “Flying Furniture”.

Even though initially unwanted by the Air Ministry, de Havilland’s unique concept proved to be all they had initially intended and more. Forty-three variants of this design were developed during its working life, twenty-seven being significantly different. It became a very potent multi-role combat aircraft.

Bomber Command’s overall loss figures — Stirling 4.7 %, Halifax 3.3 %, Lancaster 2.9 %, the Mosquito only 0.5 % - emphasise the Mosquito’s success in being able to carry out its task as intended and survive. With its wooden construction, the Mosquito probably had a radar signature of only 10% for an aeroplane this size, aiding its ability to enter enemy air space almost undetected.

A study of official records shows varying maximum speeds quoted. One obtained while assessing the prototype at Boscombe Down gave 388 mph at 22,000 ft (Merlin 21 engines).

When matched against a Spitfire, both pilots agreed that the Mosquito was at least 20 mph faster. Later development of the Rolls Royce engines helped it achieve a speed of 437 mph at 29,000 ft. (Merlin 77 engines) in 1942. It remained the fastest combat aircraft in the world for another two and a half years.

Without doubt, this was our furniture industry's major contribution to the war effort. Whilst parts were manufactured elsewhere, High Wycombe firms manufactured wooden components for the entire airframe, these subsequently being taken for final assembly at de Havilland factories at Hatfield and Leavesden (near Watford). Probably the highest percentage of the wooden airframe components for Mosquito's built in England were produced in High Wycombe.

Woods used in the construction were Sitka spruce, birch, balsa, ash, Douglas fir and walnut. An article written by Mr. J. B. Heath (owner of Heathland Furniture, one of the Wycombe firms involved), stated that they had produced parts for five thousand, five hundred and seventy aeroplanes. The total built, including those in Canada and Australia, was seven thousand, seven hundred and eighty-one.

High Wycombe was the acknowledged centre of the furniture industry in Great Britain. Its experience gained over the preceding years in the production of wood laminates and adhesives was greatly improved by the development of the new synthetic adhesives. It was this experience that bought them to the forefront when a choice of sub-contractors had to be made. Wood is a material of incomparable merits, but has some grave defects in its natural state, when used for structural members. Not a uniform and dependable material, like metal, its defects can be almost wholly overcome by the process of selection and lamination. Free from the fatigue and corrosion that occur in metal, it can also, if adequately protected, overcome the effects of degradation due to moisture and temperature.

The Mosquito was designed to be built in wood at a time when combat aircraft were designed and built in metal- The choice of wood offered major advantages. It was possible to reduce the initial design time and to build the prototype more rapidly than in metal. The use of wood avoided imposing additional strain upon metal supplies. Skilled labour was readily available, especially in High Wycombe, because of the restrictions imposed on furniture manufacturing.

The fuselage shell, a most outstanding structure, constructed in two halves on moulds, features a wood sandwich of ply / balsa / ply with local spruce reinforcement and stiffening at points where other components are attached. This helped to created a clean interior.

The wing is a single-piece construction, with main and rear spars and a stressed skin. The skin is reinforced by closely spaced span-wise stringers which, over the upper surface, are sandwiched between a double covering of skin, whilst the lower surface has a single skin. The wing spars are of box construction, manufactured mainly from laminated spruce booms with ply webs on both sides. The wing spars not only had to carry the aerodynamic loads, but also those imposed by the Rolls Royce Merlin engines and the undercarriage. Originally designed to carry a bomb load of two thousand pounds, the load was eventually doubled.

A very interesting and detailed description, "Construction of the DH 98 Mosquito", is published and available from the de Havilland Heritage Centre at London Colney, Hertfordshire.

THOSE INVOLVED

Local companies identified as having manufactured wooden parts for the Mosquito include Dancer & Hearne, E. Gomme, Styles & Mealing, Heathland Furniture, Walter Bakers, Castle Brothers, William Birch, Cam Tools, Joynson & Holland and Frank Parker. It is probable that other Mosquito parts were manufactured locally by Plastalune (Perspex canopies), High Duty Alloys (propellers, undercarriages and wheel hubs), F. Mealing (tubular steel engine mountings and exhaust stubs), and the Ministry of Aircraft Production factory in Coronation Road (undercarriage legs).

(To quote from the report of the 50th Anniversary Symposium held at British Aerospace, Hatfield, on the 24th November 1990, to commemorate the first flight of the aircraft in l94O, the Mosquito could be considered "Probably man's highest engineering achievement in timber".)

In High Wycombe one firm, that of Walter Baker, then an acknowledged leader in the production of plywood and veneer products, was soon involved in work requiring their expertise, producing much needed plywood panels and moulded ply sections. Because of his experience gained while in Germany prior to the war with the new synthetic adhesives, Andrew Oliver (the foster son of Mr. Walter Baker and by then the works manager) had become a leading authority in its use. Waterproof and very strong, it was capable of bonding a joint stronger than the parent wood, a tremendous step forward for the plywood industry: de-lamination had been one of its worst features prior to using this new adhesive.

Casein cement had been the approved adhesive in the aircraft industry during the 'thirties and at the start of the war. It had seemed eminently suited at the time, but was definitely inferior to this new synthetic adhesive. This was proven when early de Havilland Mosquito aircraft, in which casein cement was used, were sent to the Far East. They began having serious problems. The casein cement in humid atmosphere soon started to attract mould spores that caused it to deteriorate rapidly. Termites and insects also enjoyed making a meal of the timber where it had become impregnated with the starch rich glue.

At the start of the war, Andrew Oliver had been drafted into the Royal Air Force and posted to the Royal Aircraft Establishment at Farnborough to help with research projects. It was only a short stay. One morning he was told to report to his Commanding Officer: he was to be demobbed immediately to return to High Wycombe to take up a new appointment. He was to report directly to Lord Beaverbrook, the Minister of Aircraft Production. This sudden development had been brought about when the firm of Venesta, a large specialist plywood manufacturer based in the East End of London, had been badly damaged during bombing raids early in the war. Quantity plywood production was almost at a standstill. It was decided that any equipment that could be salvaged would be relocated immediately to High Wycombe. Further specialist plywood presses were also to be relocated from Duxford and the Bristol Aeroplane Company. Equipment already available in Wycombe would be put at his disposal, and this included any from his foster father's company.

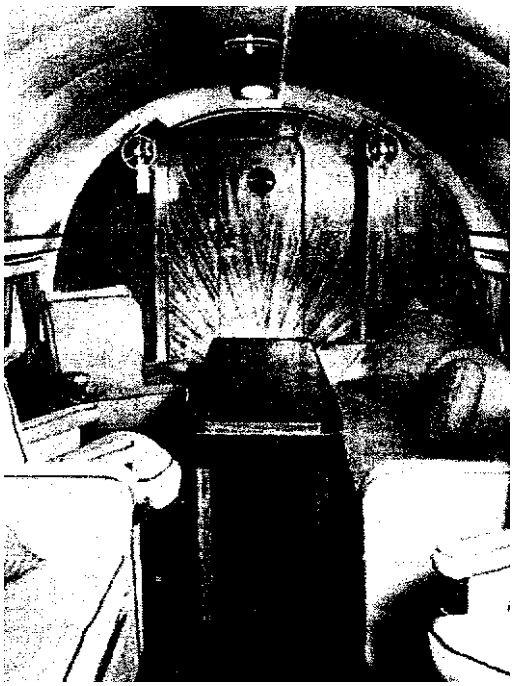
He found suitable premises for production at Kingsmead Road, Loudwater, on the site more recently occupied by Lintafoam. Some employees from Venesta were relocated to the town to help establish production.

Andrew assisted directly in some wooden aeroplane development, advising on the best utilisation of plywood in design and manufacture. This included spending many' hours at Salisbury Hall on the early development of the prototype de Havilland 98 Mosquito. (The prototype can still be seen at its birthplace in the de Havilland Heritage Centre at Salisbury Hall.) He was able to assist in the pre-manufacture of plywood panels that could be made ready to fit, generating savings in time and cost

and also minimising material wastage. Many aircraft ply panels, for reasons of strength, are made with the grain running diagonally, typically as seen on the rear fuselage of the Mosquito.

Some work building gliders, for which ply would form the major part of the structure, was undertaken at factories in Wycombe. One type was the Airspeed Hotspur, a small training glider, another the General Aircraft Horsa, a much larger glider, capable of carrying twenty-five fully equipped troops, or a light tank or field gun. Many curved ply sections, typically leading edges for the wings and tailplanes, were pre-formed for these and also for the Miles Magister and Master as well as the de Havilland Mosquito. As the war continued, Andrew became involved in crash inspection of any aircraft having timber construction. This also enabled him to keep track of German developments.

Towards the end of the war, a standard Dakota aircraft (KG 782) was converted into a flying office and conference room for Air Chief Marshal Sir Arthur "Bomber" Harris, G.C.B. He was Commander in Chief of R.A.F. Bomber Command, a position he had held since February 1942. Andrew Oliver led a team from Walter Baker, fitting it out with a luxury interior, using Indian laurel veneered ply panels with white mottled sycamore window surrounds and pelmets. The complete conversion, with a galley at the forward end, a central large saloon and a rear baggage compartment, was completed in four weeks and two days.



THE LAVISH INTERIOR OF THE DAKOTA AIRCRAFT
Photo TRADA

In a letter to Messrs Walter F. Baker, the Air Chief Marshal complimented them on their fine craftsmanship, making special reference to Mr. Andrew Oliver. This lavishly furnished interior had taken him full circle; back to doing the job he knew and loved. He continued in the quality ply and veneer trade for the rest of his life. Even in retirement, still respected as a fine craftsman, he continued to enjoy producing fine marquetry work.

THE LATE ANDREW OLIVER IN RETIREMENT.
Photo Mrs. Oliver

Understandably, an aura of secrecy, which continued long after the war, surrounded all the Mosquito work. Those who had worked so hard producing all the parts required had learnt never to talk about it. In many of the factories there were posters warning them not to talk about their work when outside the factory. Signs declaring CARELESS TALK COSTS LIVES were prominently displayed.

"An example of this secrecy and how well it worked was to become obvious when a friend showed me photos they had found amongst the belongings of a deceased relative. He had been one of the Styles brothers at Styles & Mealings factory in Ogilvie Road High Wycombe. I was told they were "photos of the gliders made in Wycombe during the war". To emphasise the point while being shown a photo of a lorry ready to leave the factory with a fuselage on the back, I was told 'Look it hasn't got an engine on the front so it must be a glider.'

To me even at this stage the beautiful streamline shape of the Mosquito fuselage was easily recognised (See Styles and Mealing photographs.) Other photos taken inside the factory show fuselages being made in two halves. This was a very clever and convenient production method facilitating the installation of many interior components before they were put together. Electrical cables, hydraulic pipes and flying controls, all so much easier to install than having to crawl down the confined interior of a fuselage."
(I.C.S.)

Hamilcar glider parts were made in Styles & Mealing. Was this deliberately used to mislead anyone trying to find out exactly what was going on? To the enemy, a rumour that they were employed in making gliders held none of the threat when compared with the destructive power of the new and top secret Mosquito.

Even alter the war was over, the reluctance to talk about it remained. A man who had worked in the Dancer & Hearne factory throughout the war explained, "When it was all over and many of our old comrades returned, we did not like to talk about it. What had we really done compared with those who had been in the thick of it. What had we to be proud of in our protected jobs'? So many who joined the fighting forces never returned."

Heathland Furniture in Copyground Lane, High Wycornbe, the firm owned by J. (Jack) B. Heath, specialised in manufacturing the Mosquito wing rear spar, probably one of the more demanding tasks undertaken on this aircraft. The finished spar was over 50ft. in length and swept forward and upward from the centre. The booms, top and bottom members of the box section, were made with vertical laminations of Sitka Spruce 0.4" thick, travelling from wing tip to wing tip. A laminated ash reinforcing member was fixed to the centre of the inside face of the top boom. The top and bottom booms were placed into a jig, then the spacers fitted between them and the ply facings glued and screwed to the booms competing the box structure. (See J. B. Heath or J. Parker photos of the rear spar to appreciate the size and shape of this component.)

Throughout the war there was always pressure to increase production. A typical example of this and how it can go tragically wrong was at the Heathland works. A new method was suggested, to help reduce the time taken shaping each spar boom after laminating. Its gradually tapering shape was originally done by hand, planing the spar boom to size, a long and laborious process. In principle, using the new method, the surplus timber could be removed in one pass, using a specially adapted spindle machine. It required special large cutters and large guide bearings fitted to the spindle. Shaping templates were fitted to the laminated booms to guide it onto the bearings and past the cutters. The first time this was tried all was made ready and the templates fitted to both sides of the spar to guide it past the spindle. A team of men was assembled to feed it past the spindle (remember, it is fifty feet long). Their best spindle operator was responsible for ensuring it travelled past those lethal cutters accurately. Something or somebody slipped! The spindle operator lost his four fingers in those lethal cutters; they were all badly shaken. (Wood working machinery can always be dangerous and the spindle machine especially so.) No doubt at the time, some very choice words were used about the people who thought up that new method.