

Marshall – the “accidental” RAF C130 Service Centre

A paper prepared for the RAF Historical Society by Alan Paul October 2019

Introduction to Marshalls

The Marshall company was founded by David Marshall in October 1909 as a chauffeur drive company in Cambridge for undergraduates and dons. It grew rapidly into a garage selling and servicing cars in addition to the original chauffeur drive business.

The founders son Arthur Marshall learnt to fly in 1928 and bought his first aeroplane, a DH60 Gipsy Moth in 1929. Needing somewhere to keep the plane, he seeded 45 acres on the outskirts of Cambridge for a landing strip and built a small hangar. The aviation business grew rapidly like the car business, with people wanting to learn to fly, buy an aeroplane and have it hangared and serviced.

The first airfield quickly became too small for larger aircraft and in 1937 was relocated to the current site of Cambridge Airport.



Cambridge Airport today.

The war years and aftermath

The company grew rapidly during the war, repairing over 5,000 aircraft as part of the nationwide Civilian Repair Organisation run by the Air Ministry. In addition the company trained over 20,000 pilots for the RAF and introduced the “ab initio” instructor scheme which continues in the RAF today.



Mosquito night fighters



Dakota mods and repairs



Albemarle



Whitley

Repaired over 5,000 Aircraft during WW2

After the war, work dropped off the edge of a cliff as the country faced bankruptcy and all war related contracts were cancelled. The workforce dropped from over 3,000 to about 1,200.

Arthur Marshall went round all the major aircraft manufacturers offering his services to do all the small jobs that they were not interested in doing themselves. This was at a time in the 1950s when British aircraft manufacturing entered a boom period. Marshalls worked on virtually all the new aircraft types including Vampires, Canberras, Viscounts, Britannias, Valiants and VC10s.



550+ Vampires



350+ Canberras

Post war Marshalls did all the "odd jobs" that the main manufacturers didn't want



BOAC Britannia



350+ Viscounts

The RAF C130 contract

By the mid 1960s, work was beginning to dry up. Although initially not invited to tender for the C130 work, much lobbying was done by the company and in October 1965 Marshall received the invitation to tender.

The tender document contained 2 remarkable understatements –

- Not much work was expected under the contract
- The C130 was expected to stay in service for 10 years

53 years later and with 1.7 million flying hours and a lot of “not much work” completed, this is a remarkable testament to the endurance of Fat Albert!!

Also remarkable in todays climate is the speed of decision making at both Marshall and the Ministry.

- Invitation to tender received – October 1965
- Tender submitted – November 1965
- Contract awarded – January 1966

Entry into service

The first aircraft XV177 landed at Cambridge on 19th December 1966 for a series of modifications and painting. Over the next 18 months all 66 aircraft entered RAF service via Cambridge.



XV177 arrives at Cambridge.

As this was the first of a new type for the RAF to arrive on British soil, there was quite a reception party on a very cold and misty day.



The reception party for XV177.

2 months later XV177 was ready and was delivered to RAF Boscombe Down on 18th February 1967. The first paint scheme was the brown and yellow camouflage markings with black underneath and a distinctive white cap above the cockpit.



XV177 ready for delivery 18th Feb 1967

Wing Corrosion

The first of "not much work" started 2 years after the first aircraft entered service. An inspector at Marshalls noticed a fuel weep under the wing and after wiping it dry, the weep reappeared. He then examined the underwing surface and his probe went through the wing plank and into the fuel tank.

An immediate inspection of all aircraft was carried out and 11 needed major repairs. The damage was caused by fungal contamination due to the use of fuel without fungal inhibitor added.

At the seminar there was some discussion about why the USAF, who had been using the C130 for many years, had not seen this problem. The conclusion was that the Americans must have been using a fuel with inhibitor as standard.



Wing rectification.

Major and Minor servicing

This was contracted to Marshalls in the early 1970s. The company became world experts in this type of work and ultimately attracted C130 work from over 40 other nations which helped to increase knowledge and importantly keep costs down for the RAF.

At times there were more Hercules in the Marshall hangars than the 14 the RAF have in service today!!

Marshall were awarded the servicing contract without open tender for the first 15 years of service, but from the late 1980s have won the repeat contracts on a competitive tender basis.



RAF C130s in the Marshall Hangars c1975.

C130 W Mk2 "Snoopy"

This was the first major modification carried out by the company for the Meteorological Research Flight.

The aircraft returned to the UK from Changi in 1973 with a damaged main spar. It was repaired and modified into the C130 W2 better known as 'Snoopy'. It was based at the Royal Aircraft Establishment at Farnborough from 1974 until experimental flying ceased. It then moved to Boscombe Down where it was operated by DERA until the aircraft was taken out of service in April 2001.

As well as the obvious 18ft probe to house sensors and the weather radar relocation to above the cockpit, there were many other major mods including –

- Drop sonde ejector
- Air sampling sliding boom
- Hygrometer
- Air sampling pipes
- Temperature sensors
- Pressure sensors
- Radiation sensors
- Rain research radar
- Cameras
- Interior mods for the research crews



Snoopy on the engine running bay at Cambridge.

Snoopys airframe was later used for the A400M flying test bed

In 2005, XV208 was purchased by Marshalls for use as the A400M flying test bed. This involved extensive mods to accommodate the A400M engine in the No2 position. The A400M engine delivered over 12,000HP compared to the existing C130 engines 4,000HP, so the one engine fitted had the same power as the other 3.

Uniquely, on engine runs this meant that XV208 had to be tied down as the brakes alone were not enough to stop the aircraft moving.



XV208 tied down on engine runs with the A400M engine.

This was the largest engine ever fitted to a Hercules and completed over 50 hours of test flying in 2008/9 to pave the way for the A400M to enter service.



The A400M engine fitted to XV208.



There was not much clearance for the 8 bladed prop when fitted and the engine nacelle required bracing struts to counteract engine torque.

Sadly XV208 met its end in 2015 at the hands of the crushers after engines, wings and other components were removed and sold.



XV208 Snoopy meets an untimely end at Cambridge.

Centre Wing replacement

In 1975, less than 10 years after the aircraft entered service, fatigue problems on the centre wing were discovered in a test specimen by Lockheed. The entire fleet had to be retrofitted with an improved centre wing section.

This was the first major fleet wide modification and involved a complete teardown of the aircraft. Maybe that's why the planned fleet life was expected to be no more than 10 years?



Centre wing removed from the aircraft.



May 1975 – the first upgraded centre wing is installed. Arthur Marshall observes the process 4th from left on the platform.

The new C130J subsequently required a similar replacement of the centre wing after 20 years in service in 2019 – twice the length that the old models centre wing lasted. The first of the C130J centre wing replacements is currently underway and the rest of the fleet will follow.



The first of the replacement C130J centre wings awaits installation in 2019.

The first major repair scheme XV181 in 1975

XV181 crashed after a practice asymmetric overshoot at Thorney Island in 1975. The company was tasked to repair the aircraft and notes from the time in the Marshall archive record that the company viewed this as “a useful exercise for the future in preparing major repair schemes”.



XV181 after the incident at Thorney Island.

Outer wing repairs

After the centre wing replacements, problems were discovered in the outer wings in 1977. This required modifications to the outer wing sections, wing joints and engine mounts. All the aircraft were progressively routed through Cambridge for these mods.



The outer wings were completely disassembled for the mods.



A special jig was made to turn over the reassembled wings.



This was a major job completed over 5 years and a whole Hangar at Cambridge was devoted to this task.

The "stretch" 1980 to 1985

The RAF required more cargo space on the fleet, so 30 aircraft were stretched. The first mod was carried out at Lockheed with Marshall engineers assisting, after which a further 29 aircraft were modified at Cambridge.



The fuselages were extended by 15ft with the insertion of 2 plugs. This gave a 37% increase in cargo compartment volume – the equivalent of adding 9 new aircraft to the fleet. The aircraft were designated as Hercules C Mk3.

Falklands in flight refuelling capability mods 1982

On Thursday 15th April 1982 Marshalls were tasked with providing an inflight refuelling capability on an urgent basis. Round the clock work ensured that the first modified aircraft XV200 was delivered to RAF Boscombe Down within 14 days of being asked to start work. It was on operations in the Falklands 7 days later.

The mods included fitting a new probe on top of the fuselage on the right hand side above the copilot, pipe runs along the fuselage and into the wing tanks plus numerous other minor modifications to the fuel system and electrics.

At the same time, most of the aircraft were fitted with the Omega long range navigation system.



The probe and external pipe run.

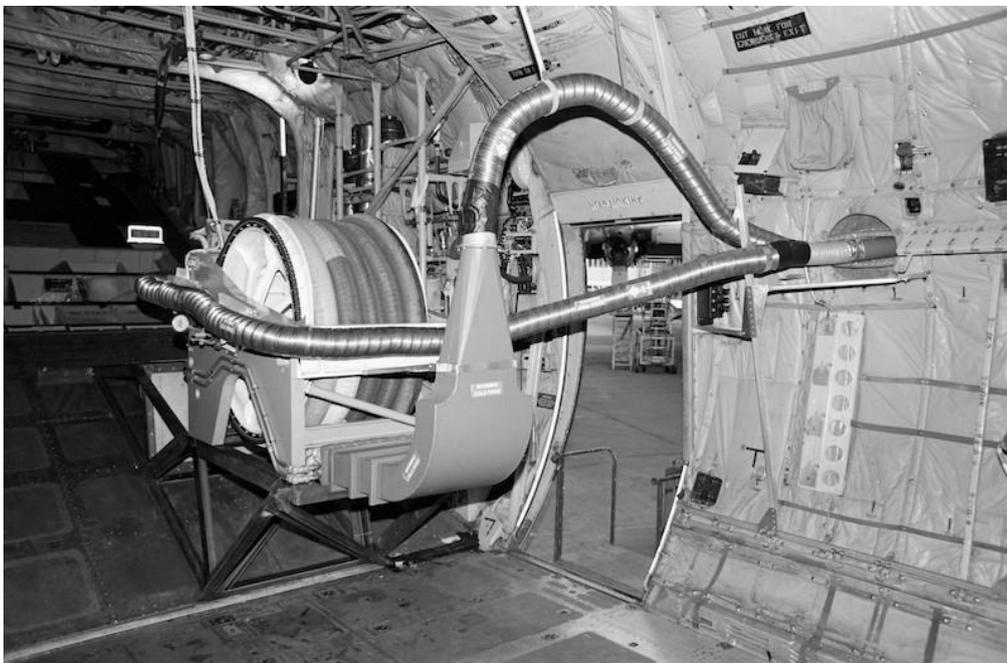
This was an emergency "belt and braces" job, but it stood the test of time and eventually 30 aircraft were fitted with the probe including the wooden nose fairing and external fasteners as fitted to the prototypes during the Falklands war.



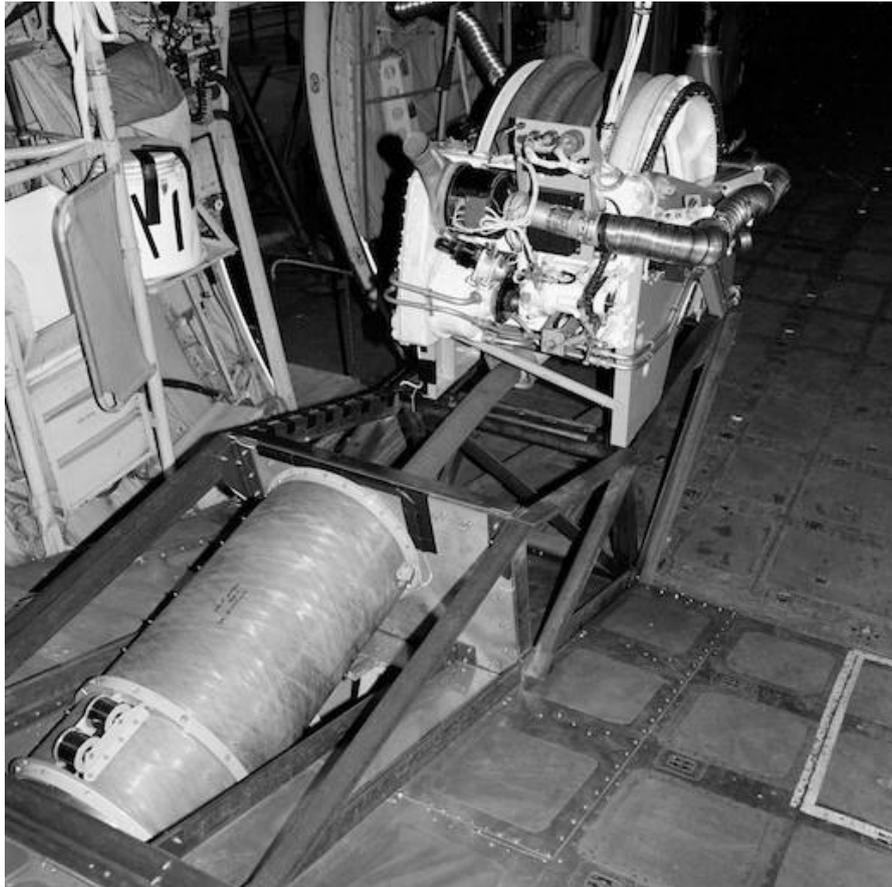
The external pipe run is installed from the probe to the wing tanks with little apparent regard for "Health and Safety" as would be the norm today.

Tanker modifications

On 30th April 1982, shortly after starting work on the probe installations, the company was instructed to convert 4 aircraft to the tanker role. The modification included fitting 2 ex Andover ferry tanks in the fuselage and a Flight Refuelling Hose Drum unit with an 80ft hose on the cargo ramp.



The HDU installation is shown with the ram air cooling system which proved to be one of the major problems during the flight test phase requiring many adjustments to get it right.



HDU installation showing the hose entering the drogue tunnel



A C130 tanker refuels a probe equipped aircraft.

The first aircraft was ready for testing on 8th June and declared operational on 30th June. 4 aircraft were completed in 76 days and remarkably remained in service till the early 1990s.

Test rigs

A complete wing "tip to tip" test rig was operated for 20 years from 1982 keeping the flying hours one jump ahead of the fleet to identify any fatigue problems early.



The wing is put under considerable strain during testing.

When the C130K life was extended, the company also ran a full fuselage test rig which was pressurised and bent to ensure that any problems were picked up well before they occurred in the fleet at large. This ran from 2002 until the fleet was retired.



The C130K fuselage test rig at Cambridge in 2002.

The introduction of the C13J into RAF service

In 1994, Marshall worked with Lockheed to carry out risk reduction flight trials on the new C130J engine. An RAF C130K was converted to carry the new engine on the No2 position and was instrumented for the flight trials programme.



The new engine and 6 bladed Dowty propeller in position ready for test flying.

This flight testing paved the way for the introduction of the new C130J into RAF service and the first of the new C130Js arrived in Cambridge for storage and preparation in 1998.



The first C130J arrives at Cambridge in an unpainted state ready for introduction to service.

Amongst other mods including painting like the original Hercules in 1967, a new probe was fitted. This probe was manufactured by Marshall and was an altogether more streamlined affair than the Falklands probes back in 1982!

This time the probe was fitted over the left side of the cockpit unlike the Falklands probes which were fitted over the copilots side.

At the seminar, Bob Tuxford explained that the captain usually does the refuelling flying so the logical position for the probe is on the left hand side of the aircraft. The reason it was fitted on the RH side during the Falklands crisis was engineering expediency, however it did require close cooperation between captain and co pilot when doing the actual refuelling to get the approach line up right.



The first C130J awaits delivery in November 1999.

ELINT and defensive aids mods

Marshall installed a version of the Orange Crop ESM system called **Maroc** (**Marshall Orange Crop**) which was fitted on the 1312 Flight aircraft in the Falklands garrison.



Maroc installation in progress.

The company also installed Directional Infra Red Countermeasures equipment (DIRCM) on many aircraft to give additional safety in operational areas against the increased ground based missile threat.



DIRCM installation on a C130J.

Afghanistan

The use of unpaved landing strips in Afghanistan imposed significant wear and tear on the aircraft including many belly skin and fuselage skin repairs and replacements. This was due to stones being thrown off the wheels and also from the propwash.



A C130 takes off from a rough strip in Afghanistan.

In 2013, 5 aircraft were severely damaged by a large hailstorm at Kandahar airfield – some of the hailstones being 2 inches in diameter!! A team from Marshall assessed the damage and carried out field repairs before the aircraft were permanently repaired back at Cambridge.



One of the damaged C130Ks showing the size of the hailstones!!

Aircraft painting

Painting has always been a major part of the depth maintenance programme and this is not just cosmetic, but a chance to have a detailed inspection of the aircraft structure.



A paint stripped aircraft ready for major inspection.

However over the years several special tail fins have been designed and painted to celebrate special events such as the 100th anniversary of the founding of 47 Squadron and the 25th and 50th anniversaries of the Hercules in RAF service.



The "incognito" Special Forces tail fin celebrating 100 years of 47 Squadron.



A C130K celebrates 25 years of service.



A C130J celebrates 50 years of RAF Hercules service.

Summary

Marshalls have been proud to support the RAF C130 fleet over the last 53 years and look forward to continuing this excellent partnership well into the future.

Alan Paul
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