

VC10 G-AXLR on what was probably its first flight with the RB211-22 engine fitted, on 6 March 1970. KEY COLLECTION



THREE'S COMPANY

The RB211 engine both precipitated the near-collapse of Rolls-Royce and ensured its successful future. As this powerplant proceeded down its pivotal path, a one-of-a-kind flying testbed had a key role to play — the world's only three-engined VC10

WORDS: BEN DUNNELL

There are few photos of XR809 in its as-built VC10 C1 guise, here at Fairford in October 1966 with No 10 Squadron. ADRIAN M. BALCH



The raw facts don't lie. Fifty-four years of service, and counting. Across its two main variants, both still in daily operation, in excess of 118 million flying hours completed. A direct link to a highly successful family of present-day products. Industrial applications, too. But those statements, while all true, don't tell the full story either. With spiralling development and production costs, the RB211 was the engine that led in 1971 to the insolvency of Rolls-Royce. A government rescue, acknowledging the firm's national standing, saved Britain from an industrial calamity. It also helped secure the future of an American manufacturing giant. Seldom has an aero engine been so consequential, for good or for bad.

While Rolls-Royce was reaching its lowest ebb, the RB211 was being put through its paces in flight on a unique testbed. In some ways a Vickers VC10 was less than ideal for the role. Its configuration, after all, was very different to that of the Lockheed L-1011 TriStar, the airliner for which this high-bypass turbofan was being developed. Rolls-Royce would

just have to make it work. In so doing, it created a true one-off.

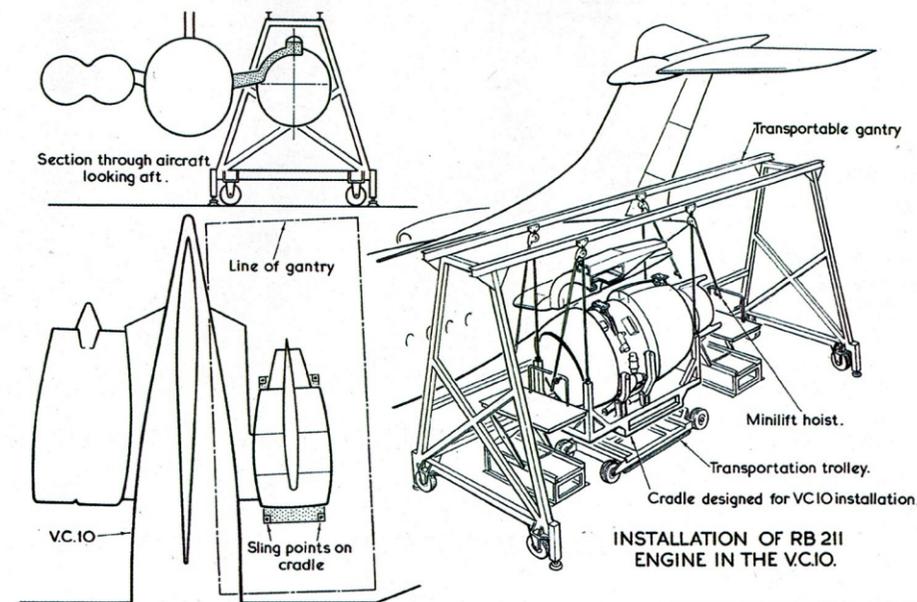
Given its interest, the fates of airframe and powerplant being inextricably linked, Lockheed unsurprisingly put forward an aircraft of its own. Rolls-Royce could, it proposed, make use of its L-300, the only civilian C-141 Starlifter built. The podded underwing engine layout was akin to that chosen for the TriStar's wing-mounted

units, whereas a VC10, self-evidently, could only have an RB211 positioned where two of its original Rolls-Royce Conways were located, on the rear fuselage below the tail. But the all-British option was preferred.

Where, then, to get a VC10? It would have to be an existing airframe, but of those there were few. According to the late Rolls-Royce historian David Birch, the first choice was a civilian

example, but it was among the airliners destroyed on the ground at Beirut Airport during the infamous Israeli special forces raid on 28 December 1968. This was Series 1102 9G-ABP, operated by Middle East Airlines on lease from Ghana Airways.

News of its demise came as a significant blow. The first RB211 ground run had been carried out in Derby on 31 March

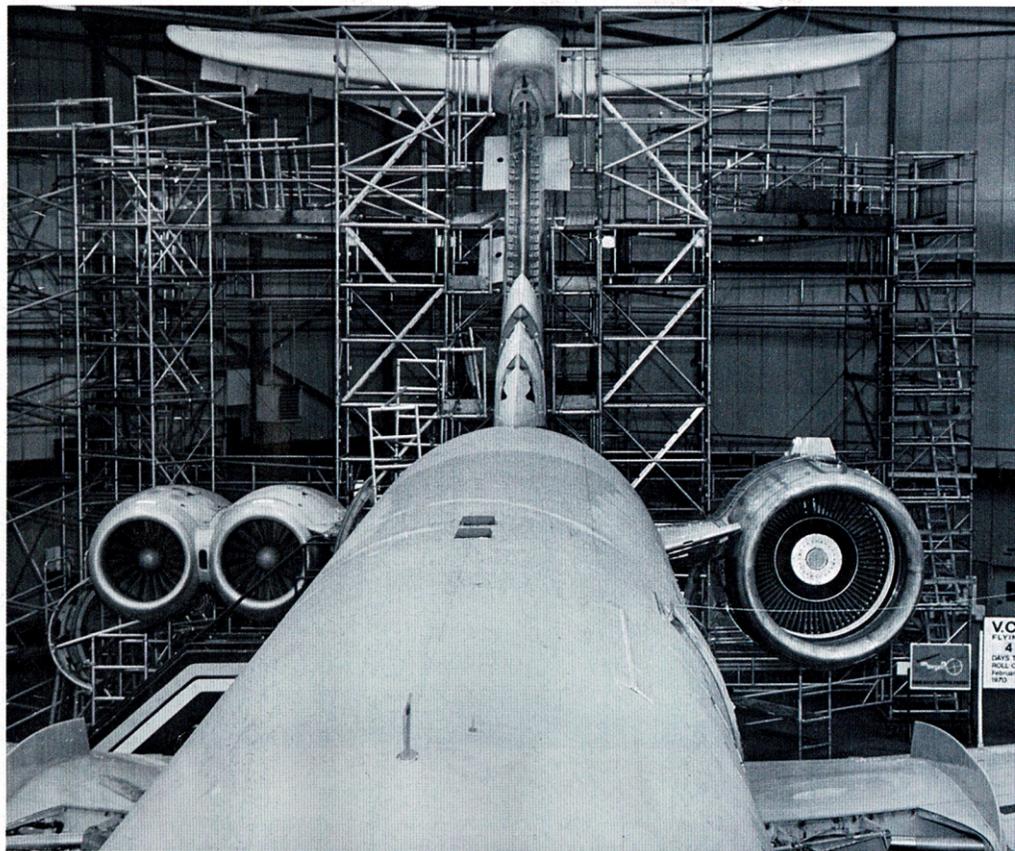


HUCKNALL TEST FACILITY ILLUSTRATION N° 1009.

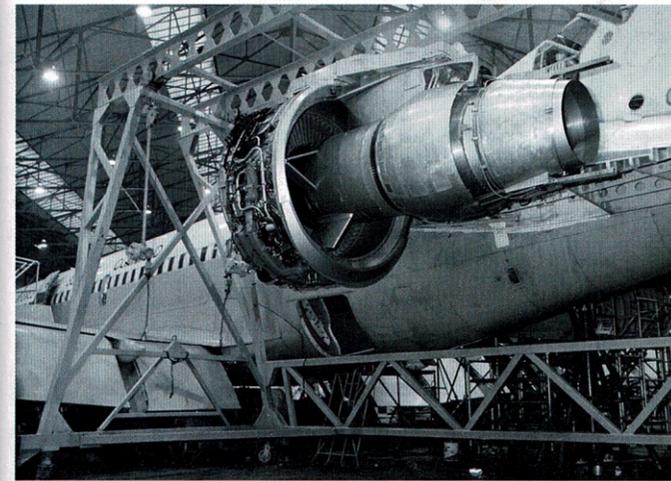
VIA HUFTM

1967. Just under a year later Lockheed formally announced selection of the -22 model for the TriStar, and in-flight trials needed to begin as soon as possible. In what might be termed a triumph of ambition over reality, Rolls-Royce had promised this advanced new powerplant — with a three-shaft layout to shorten the engine's length and increase simplicity, and a hoped-for 25 per cent reduction in fuel consumption over its predecessors — would be ready for service in 1971.

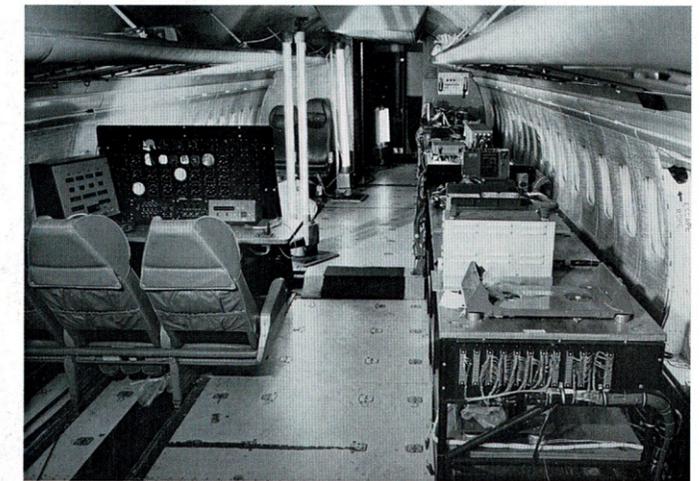
In some desperation, given the pressure of time, Rolls-Royce turned to the RAF. Its whole 14-strong fleet of VC10 C1 transports was now operational with No 10 Squadron at Brize Norton, the last delivery having occurred in August 1968. The government needed the RB211 to succeed — it had committed £47 million in launch aid, equal to more than £1 billion in today's money. This was, said a subsequent statement by the Secretary of State for Trade and Industry, "to be recovered from the sale of production engines".



By the end of 1969, the RB211 installation was nearly complete, offering a clear comparison between it and the aircraft's existing Conways. VIA HUFTM



RB211 number 14 in its fitting cradle awaiting final installation onto the VC10 in Hucknall's Hangar 9 during February 1970. VIA HUFTM



Inside the cabin was installed a variety of data-recording equipment. VIA HUFTM

And many jobs depended on it. So important was the RB211 programme considered in industrial terms that the Ministry of Defence acceded to the request for an aircraft to be loaned, in return for a daily rate. On conclusion of a 1,000-flying

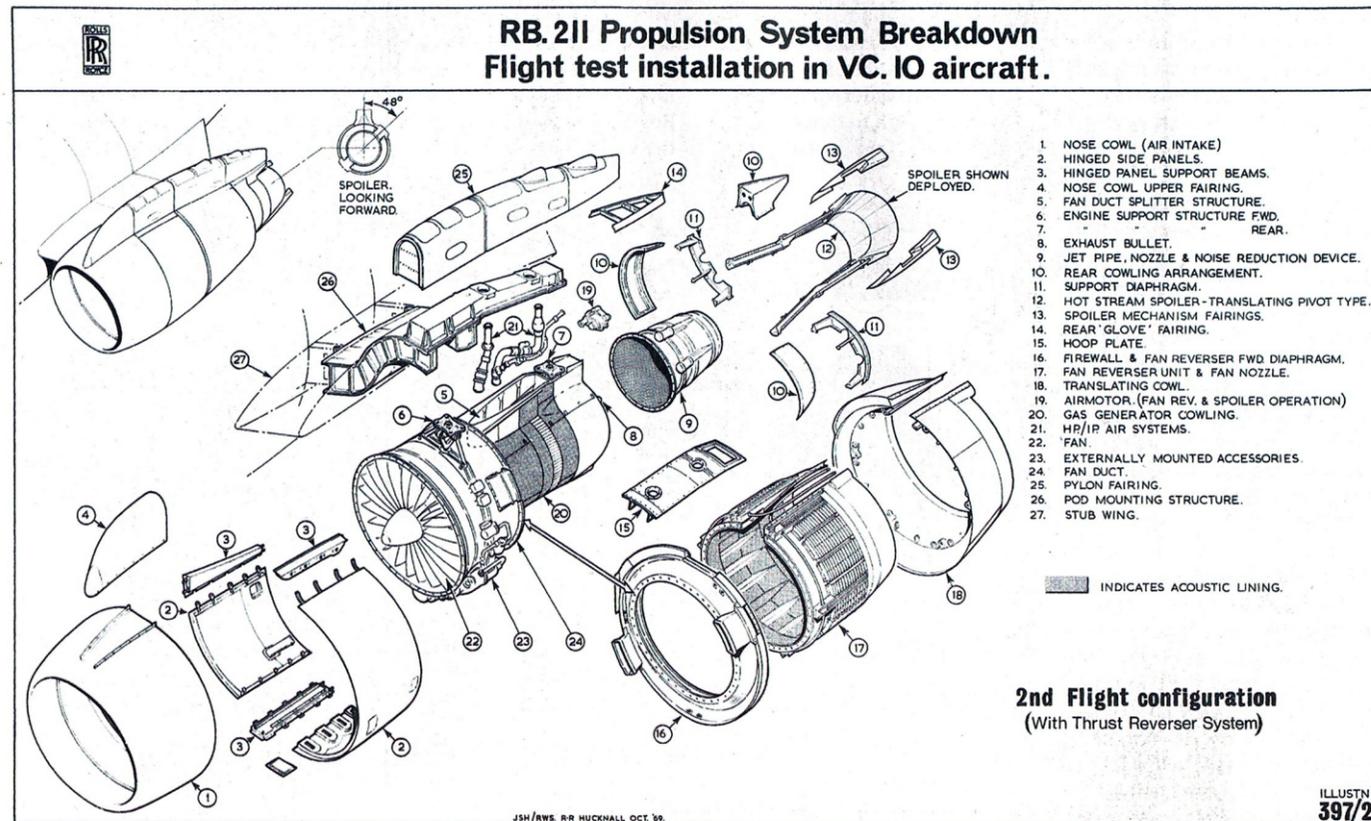
hour programme, it was to be returned to the RAF in its original condition. Thus it was that, on 17 April 1969, VC10 C1 XR809 completed a ferry flight to Hucknall. Manoeuvred deftly into Hangar 9, its doors not

being wide enough for a VC10's wingspan, conversion could begin. Here David Birch takes up the story: "To hurry the job assistance was provided by engineers from Rolls-Royce at Bristol, the British Aircraft Corporation and draughtsmen

brought in from outside, some of whom had never worked on an aviation project. Normally Hucknall's drawing office would have done all of the installation and design work, but it was already operating at full capacity designing the RB211 production powerplant features — cowlings, nose cowl and core fairings, for which it had responsibility... A special mounting for the RB211 was constructed enabling it to hang from its mounting points as per the TriStar installation for which it was designed. This was



Touching down at Hucknall, the first RB211 flight completed. GETTY



“Many jobs depended on the RB211”

an enormous forging that was bolted to the original Conway fuselage mounts." A period description in *Flight* added, "The RB211 has been mounted so as to reproduce the correct intake conditions during cruising flight. Powerplant shape is identical to the wing-mounted units of the TriStar, except where it is affected on the VC10 by the special mounting structure over the starboard top quarter of the fan cowl. To make the thrust reverser compatible with the VC10, the hot-stream spoiler

set up for a landing which had to work, as throttling up for a go-around would have been impossible. It passed off without incident. A new pressure switch fitted to the underside of the RB211's cowl, intended to ensure no unintentional reverse thrust deployment could take place, had functioned incorrectly.

As the VC10 went otherwise efficiently about its business, so the RB211 matured. Not before time it had attained the long-promised 42,000lb thrust mark, and the successful accomplishment of certification heralded service entry on the TriStar with Eastern Airlines in April 1972. While the delays meant the rival McDonnell Douglas DC-10 beat it into revenue-raising operation, the quietness and fuel economy of the Lockheed tri-jet were much commented-on. More powerful versions and further applications, most notably the Boeing 747, were in the pipeline. The flying testbed had made an important contribution, even if it was less than the original plan.

The figures quoted by David Birch lay it out starkly. Rather than 1,000 flying hours over nine months, the RB211-equipped VC10 spent just 216 hours 45 minutes in the air during the course of five-and-a-half years. Its final flight took place on 26 September 1975, a brief ferry to Kemble where it was stored with No 5 Maintenance Unit before being scrapped. Conversion back to standard RAF transport configuration was not deemed practical, so the air force had in effect lost one-fourteenth of its VC10 fleet. Hopefully it was well-recompensed.

But at a point when so much hinged on the RB211, and with time of the essence, other factors were at play. The success of this British project mattered, and the instruments the state had at its disposal were brought to bear. Most fundamentally, nationalisation ended up being one. The VC10 had been another.

With thanks to Nigel Gibson, Gordon Riley and Alan Spray.

“THE WORK OF OUR HANDS”



The engine room at the Hucknall museum, with a Griffon Universal Power Plant from a Shackleton prominent at one end. ALL KEY/BEN DUNNELL

“There were an awful lot of families that worked here generation to generation — fathers, sons, brothers. The same in my own family. My grandfather started with Rolls-Royce in 1916...” Nigel Gibson, volunteer curator and creative lead at the Hucknall Flight Test Museum, is very proud of his association with the historic Nottingham site. Now he’s among those ensuring proper tribute is paid to its myriad achievements.

It was in 1934 that Rolls-Royce took over two empty Belfast truss hangars at the bottom of the RAF site at Hucknall, offering greater privacy, more space and a location closer to the company’s Derby headquarters. Its presence grew and grew. A concrete runway was built in 1953, four years before the RAF left, along with the large Hangar 9 which still stands. Cutting a very long story short,

Rolls-Royce flight-testing there ceased during 1971 and ground-testing finally moved out in 2007, but the present-day industry link remains. The ex-Rolls-Royce facility adjacent to what is now the museum site has been operated since 2021 by ITP Aero, which continues to make aero engine components.

It’s the so-called wing hangars which the museum calls home. Two of them were built in 1944 for testing Merlins and subsequently Griffons in respect of Universal Power Plant development — a forward-thinking move by the company’s then head of aero engines and future managing director Ernest Hives, with peacetime applications in view. As Nigel Gibson explains, “In each one there was a wing section, basically, with one engine mount on it. It was the centre-section of a Lancaster wing before it went into the dihedral.”

The UPP was not hugely successful, and with the dawn of a new era of propulsion the number two cell was converted for jet development. It had the rear ‘up-and-over’ door removed and filled in, except for an aperture for a large detuner which emerged from the back of the building. Then number one was brought back into operation circa 1969 as the Griffons in RAF Shackletons needed recertifying for the type’s new role as an airborne early warning aircraft. The last engine testing in that building took place in 1972, following which it became a low-speed wind tunnel.

Gradually the facility fell into disuse, being used for storage. This started to change when the Rolls-Royce Heritage Trust took it over. Former aero engine engineers put the core of a collection together — including engines — and made Hucknall a branch of the trust, which



The exterior of the wing hangar complex.

already existed in Derby. A corporate reassessment towards the end of the 2010s saw many loaned artefacts hitherto displayed in Derby returning to museums and the rest put into store there. Some of these items came to Hucknall, including an RB211 engine actually test-flown on the VC10, plus a rare Welland loaned by the RAF Museum. It led to a considerable rejig of the exhibition.

All this might have been for nothing had Rolls-Royce pursued a plan to knock the building down. Concerns were raised at a high level, and the time used

to formulate a proper museum. Rolls-Royce allowed the trust another three years, during which support was built up, the Hucknall Flight Test Museum charity established and, crucially, grade II listing obtained for the wing hangars. It helped secure its future, and to solidify co-operation with Rolls-Royce, which owns most of the exhibits and has donated more.

The COVID-19 pandemic put a spanner in the works, with a long period of no access and the deterioration of the buildings. Gradually things started getting back on track, and the museum

leadership presented a business plan to the Rolls-Royce chief executive Warren East just before he left in late 2022. He accepted it and made a very generous £450,000 donation. “It was very much a game-changer”, says Nigel Gibson. “A lot of that money went on getting the building back into the condition in which you see it now, which is considerably better.”

The main displays take as their over-arching title ‘The Work of our Hands’, the wording taken from the stained-glass Battle of Britain memorial window originally located in Rolls-Royce’s



Introductory displays detail Hucknall’s important test programmes and pay tribute to those lost in the course of them.



This RB211-22 was among those tested on the VC10.

factory on Nightingale Road, Derby, and which is now in the company’s Learning and Development Centre. Tribute is paid on a memorial board to pilots who lost their lives in service with Rolls-Royce at Hucknall, while superb models hand-carved by John Housley depict all airframes used to test the company’s engines, and there are countless relics and mementos. Upstairs the control room area makes for an impressive sight.

But it’s the engine hall which is the primary focus. It contains a very fine range of powerplants, dominated by an ex-Shackleton UPP Griffon at one end and the RB211 at the other. In between are a Merlin 24, Griffon 57A, a very early Welland, a Derwent 1, Nene 103, Derwent 5, RA3 and RA14 Avons, Dart Mk528, Tyne Mk801, RB108s, an RB162, Conway Mk201 and a Spey. Many other associated items join them in this space, such as a thrust-reverser unit from an Avon on a Caravelle.

The workshop area is not yet accessible, but there are intentions to make it so. In there are the tail sections of the sole complete aircraft in the collection, Harrier GR1 XV798, which was used by Rolls-Royce in the 1980s for gantry-mounted trials of an experimental plenum chamber burning version of the Pegasus engine. Most of the airframe is stored away from view. Placed on loan by The Helicopter Museum at Weston-super-Mare in 2020, restoration work will be undertaken and a shelter built to house it.

It’s one of the ways in which the Hucknall Flight Test Museum plans to move from strength to strength. In recalling both industrial history and the test world, in the air and on the ground, it occupies a unique place among the UK’s aeronautical attractions.

The museum is open on Wednesdays and Saturdays from the beginning of April to the end of October, by prior booking only. For more information, visit hufm.com

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