Mach 2

Concorde magazine

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Braving ice and snow

Concorde Watch

Manchester and Duxford

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Introduction

We open this first issue of 2022 with a look at some of the unusual and challenging aspects of Concorde's early years in service. Former BAC engineer Richard Harris *recalls his involvement with a sales tour of east Asia, remarkably with one Concorde, F-BTSC, being operated by a joint French and British team – and we learn about the only Filipino pilot ever to take Concorde's controls. Richard also recounts his experience of working with the British Airways Concorde services in Washington, which included having to manage the aircraft in sub-zero temperatures.*

The former Concorde personnel are still in great demand to give talks about their experiences. BA Flight Engineer David Macdonald *gives an account of the talk that he and his colleagues John Hutchinson and Les Evans gave to the Milton Keynes Aviation Society, which ranged over a variety of subjects from the genesis of Concorde to the in-service modifications that further enhanced Concorde's capabilities.*

Lastly, we hear from Heritage Concorde on the most recent maintenance and restoration work that they have carried out at Duxford and Manchester.

In this issue

Editor: Katie John

Cover: French Concorde F-BTSC makes the sharp turn into Kai Tak airport, Hong Kong, on the Franco-British sales tour of east Asia. Photo: IDJ / gwulo.com

Journey to the East

As Concorde entered airline service with British Airways and Air France, the manufacturers continued their efforts to sell the aircraft to other customers. Richard Harris, *Overseas Engineer with the British Aircraft Corporation, describes the joint French and British sales tour of east and south-east Asia, with Air France Concorde F-BTSC.*

Tour brochure
The promotional brochure for the Far East tour welcomed passengers in each of the languages used at the destinations: French, Arabic, Filipino, Chinese, English, Indonesian, and Korean.
Photo: Richard Harris

What a busy year 1976 turned out to be! January saw us in Bahrain, in support of British Airways (BA), in preparation for the inaugural Concorde services on 21 January. Initially I was part of a small team, but the numbers reduced as confidence in the aircraft grew, leaving a Rolls-Royce and SNECMA rep and myself supporting the two return services weekly, each with an overnight.

As my colleagues were working to support preparations for the initial Washington services in May (see Mach 2, May 2016), BA agreed that it would be more beneficial for myself and an Intake Systems Specialist to fly with the aircraft for the remainder of the summer. This arrangement continued through to the September, by which time BA were confident in their ability to support the operation without further support from the manufacturers.

The team assembles

In October, I and a number of my colleagues were summoned to a meeting with the Director of Sales and Customer Support at Filton. He revealed details of a forthcoming Far East sales tour, which was to be a joint operation between ourselves and Aérospatiale.

Flight operations were to be directed by Aérospatiale Captains Jean Franchi and Gilbert Defer. Aérospatiale had made available Concorde 103, F-BTSC, for the tour. Following its first flight on 31 January 1975, 103 had been used to support the endurance and route proving programme throughout that year (see Mach 2, November 2019), before being leased to Air France in 1976 in support of their inaugural service flying. The aircraft would be operated by Aérospatiale flight crew and supported by British Aircraft Corporation (BAC) engineering and logistics personnel.

Beginning the tour

During the last week of October, those of us supporting this operation flew to Toulouse for the day to meet with our French colleagues and the members of the Toulouse Concorde Support Team.

Our initial route was to be from Paris to Manila with en-route refuelling stops in Bahrain and Singapore. We met the aircraft at Paris Charles de Gaulle on Tuesday 2 November

Arrival in Manila
The author with F-BTSC (standing at the base of the steps, by the wheels) after arrival at Manila.
Photo: Richard Harris

Joining the party
Above: F-BTSC is unexpectedly included in preparations for a ceremony to welcome the President of Egypt and his wife, as a backdrop to a display of Filipino children dancing.
Photo: Richard Harris

Guests of honour
Right: Egyptian president Anwar Sadat and his wife arrive in the presidential Boeing 707.
Photo: Richard Harris

and departed at 19:00 local time. With two transits of 1 hour each in Bahrain and Singapore, we arrived in Manila at 13:35 local time on Wednesday 3 November – an elapsed time of under 12 hours, emphasising the fantastic potential of this great aircraft.

Two demonstration flights were planned for the Philippines: one for the President and Government, and the other for Philippine Airlines, who had previously been a good customer of the British Aircraft Corporation with their BAC 1-11s.

On our arrival at Manila Airport, we were parked very prominently and it was evident that there was a huge reception planned.

The Presidents' wives
The author and his colleagues had a close-up view of the VIPs' arrival. Here, Madame Sadat is welcomed by her Filipino hosts. Just behind her, under the parasol, is Imelda Marcos, wife of President Ferdinand Marcos of the Philippines.
Photo: Richard Harris

However, it transpired that our arrival coincided with a presidential visit by the President of Egypt and his wife. A large dais and canopy had been erected, and hundreds of children in local costumes were being organised into groups – to which our parked Concorde provided the backdrop.

The Thursday had been scheduled as a 'down day' to prepare the aircraft for the next

Flying Concorde for the Philippines

One of the potential Concorde customers, in the early 1970s, was Philippine Airlines (PAL). Reports suggest that the airline was planning to buy four Concordes from Aérospatiale and the British Aircraft Corporation (BAC) in 1971 – but when the severe rise in oil prices occurred in 1973, PAL decided against the purchase.

Following the oil crisis, Philippine President Ferdinand Marcos revisited the idea of purchasing Concorde. BAC wanted to sell him two aircraft – but President Marcos wanted landing rights for PAL at Heathrow, and the British refused, so the deal was abandoned.

The French persuaded Britain to reconsider and grant landing rights to PAL. The highlight for PAL was for one of their pilots to be given the chance to handle the aircraft. The pilot chosen was Captain Jose "Pepot" Gonzalez. He flew F-BTSC from Paris to Manila; he also piloted Concorde on Mme Marcos' shopping trip to Hong Kong.

Formerly a fighter pilot with the Philippine Air Force, flying F-51D Mustangs and then F-86F Sabres, Captain Gonzalez was one of the pioneering members of the Air Force's Blue Diamonds aerobatic team (one of the world's oldest aerobatics teams) – and, flying the F-86F Sabre, the first Filipino pilot to break the sound barrier. After retiring from the air force, he flew with Philippine Airlines from 1960 to 1986. In 1976, this skilled and experienced aviator would become the first Asian airline pilot, and the only Filipino, ever to take the controls of the supersonic jet.

Katie John

A family occasion
Captain Gonzalez in front of Concorde, with his wife and daughter, who accompanied him on the flights.
Photo: Ian Gonzalez

few days' flying. This was to include two or possibly three flights for the Philippines, two flights locally, and, on the following day, a flight from Manila to Singapore and then on for an inaugural visit to Hong Kong at the old Kai Tak airport.

A secret shopping trip

Whilst we were preparing the aircraft on the Thursday, the Egyptian presidential aircraft arrived. With us overlooking the reception, we were able to be very close to the action, to witness the presidential welcome and watch the children's groups dancing.

Following the formal reception at the airport, there was suddenly a flurry of activity amongst the Tour Management Group, into which I was called. The Philippine President, Ferdinand Marcos, and his wife Imelda had requested that they wished to invite Madame Sadat on their demonstration flight the following day and they wished to go to Hong Kong "for some shopping"!

The inaugural flight into Hong Kong had been scheduled for Saturday 6 November, together with the attendant Governors' Reception circus, but as no one on the tour wished to displease President and Madame Marcos it was agreed that we would fly in and out on the previous day, and hoped that no one would notice.

As I was the Designated Crew Chief for both Hong Kong and Seoul, two (non-English-speaking) French mechanics and I were booked on a Cathay Pacific Hong Kong flight that evening, to get everything in place for handling this unscheduled transit.

The Hong Kong Aircraft Engineering Company (HAECO) were our handling agents in Hong Kong, so a meeting was hastily arranged with them the following morning, to organise GPUs, air conditioning and start trucks, etc. Then we awaited the arrival of the aircraft with its VIP guests.

The aircraft arrived on schedule and limousines arrived to swoop their VIP guests into town. Meanwhile, we got on with the refuelling and turnaround, with the crew remaining on board the aircraft – almost like a taxi with the meter running!

Low-key departure
F-BTSC preparing to depart Hong Kong, following the unscheduled shopping trip for the VIPs.
Photo: Richard Harris

Scheduled arrival
6 November 1976: F-BTSC arrives in Hong Kong for the start of the scheduled visit.
Photo: IDJ / gwulo.com

The guests returned and boarded, and F-BTSC departed without incident. We then returned to the hotel to check the news channels to see if we had been spotted! There were only a couple of items, however, saying that "there were reports that Concorde had been seen at the airport", but none of the press had any photographs or video.

The following day, then, Concorde arrived for its proper 'inaugural visit'– with all of its attendant diplomatic razzamatazz, which included a Governors' Reception with a Marine band playing. Whilst everyone was dressing in their finery, and despite receiving invitations from the Embassy, we had to move the aircraft from the commercial terminal across the road crossing, to park it adjacent to the Governors' reception on the RAF Station Kai Tak. My abiding memory of that evening was the Marine band playing 'Those Magnificent Men in their Flying Machines' whilst we were parking the aircraft and removing steps etc. to present her at her best.

Journey to South Korea

With a 'down day' on the Sunday, we had to prepare the aircraft for a further five days of demonstration flying: Hong Kong to Jakarta, back to Singapore, and then to Seoul, South Korea for two more demonstration flights.

Again I was Crew Chief for the Seoul leg of the tour. Life in Seoul, however, was a complete contrast to all the other destinations we had visited. South Korea was at the time subject to martial law under President Park, and security was exceptionally rigorous.

BAC team
The author (right) and two of his BAC engineering colleagues stand with F-BTSC at Hong Kong: "it was good that there were three former Bristol apprentices together so far from home!".
Photo: Richard Harris

Taxying at Kai Tak
Concorde in front of a Korean Air Lines aircraft. F-BTSC spent a couple of days in Hong Kong before a demanding schedule of demonstration flights around east Asia.
Photo: IDJ / gwulo.com

The airport windows were all covered, and there existed a dawn to dusk curfew for the local population. There was an exemption for visitors to the country, who were allowed to be out on the streets until 10pm, but the only local inhabitants we saw then were those given a concession to staff the bars and restaurants. The tension had been further heightened by an earlier incident when a North West Orient Boeing 747 had been shot at whilst crossing the Pacific to Japan.

Even travelling to and moving around the airport was fraught. Security was very tight, with armed military guards at every access point, some of whom appeared unable to read our security passes, and we had to be sponsored and escorted at all times, in my case by an Airbus rep working with Korean Air Lines.

Leaving for home

On our last day, the departure was scheduled for 08:00 local time, which necessitated us driving to the airport at around 05:30, when the curfew lifted, to prep the aircraft. Even then we were stopped twice by armed soldiers at check-points and our documents checked.

One minor episode that arose was that the Captain had flagged an intermittent P7 indicator during the last demo flight, and requested that we checked it prior to leaving for the three sectors back to Heathrow on the following day. Although not confirming a 'hard fault', we elected to replace the indicator, which was in our spares pack. This was held in the customs bond, where inbound freight is held by customs until it is either imported to the country (after import duty is paid), or exported again elsewhere. Our spares pallets were only there in case we needed them – but the import duty for South Korea at that time was horrendous, to discourage imports while the country was under martial law.

We replaced the indicator, did a quick ground run, then buttoned up the aircraft for its return flights. The aircraft was despatched on time, and I was left to wrap up the station. However, unknown to me, whilst we were preoccupied with the ground run the previous day, the mechanic who had signed out the spare had not returned it to the customs bond but put it into one of the cabin wardrobes, on the basis that the aircraft was going back to Toulouse anyway!

As a result, our instrument was booked out but not returned – therefore, ostensibly "imported" and with duty due. That left a Customs Bond Officer either looking for an instrument or for the import duty payable, which at that time was an unbelievable amount, and certainly well outside my credit card limit at the time.

Hence an extremely low-profile departure, assisted by my Airbus sponsor, and a huge sigh of relief when my departing flight was wheels up and well on its way.

An extremely enjoyable and successful tour, both Operations-wise and Engineering-wise. Did we sell any aircraft, though? Not quite so successful! However, the tour was proof that Concorde could be operated consistently and seamlessly within the existing world airline operations environment.

Winter in Washington

Richard Harris, Overseas Engineer, British Aircraft Corporation

The first year of Concorde passenger service was a time of learning for everyone involved. Richard Harris recalls the challenges that faced the engineering team who worked on the Washington service, keeping this still new aircraft running to strict deadlines in often demanding conditions.

After Concorde entered passenger service in January, I spent most of the year with the aircraft, apart from a brief break at home in March while my long-suffering wife had our third son. Then, following the Far East Sales Tour, Extreme Orient, that November (see previous article), Chief Neddy advised me that he wanted me to go to Washington Dulles (IAD).

Arrival at Washington

The British Airways (BA) team at Washington comprised a Station Maintenance Manager (SMM), an Irish ex-pat who had been with BA (BOAC) for many years; his Assistant Station Maintenance Manager (ASMM); and four well experienced airframe and powerplant (A&P) mechanics. The station was supporting two Boeing 747 transits daily, together with a Concorde arrival and a departure on the following

Getting to know the aircraft

Prior to the introduction of Concorde operations, BA had chosen to send their SMM and ASMM, together with a number of Overseas Engineers, on the manufacturer's aircraft approval courses, but the mechanics had been left to develop their own knowledge of the aircraft.

Both in Bahrain and in Washington, whilst Concorde was still relatively new to the crews, when the aircraft were overnighting we had a policy of endeavouring to work through any listed defects in order to despatch a clean aircraft, spares permitting for non-minimum equipment list (MEL) items, whilst also providing a hands-on training opportunity for the teams.

This training process was also extended, where the workload permitted, to running short courses in the mornings in the Ops room, to familiarise the mechanics with the aircraft systems etc. Later, in preparation for the opening of the New York services (see Mach 2, December 2017), BA would send down groups of New York mechanics for 'hands on' familiarisation and also systems training courses for an hour or so each morning.

Challenging weather
A winter day at Washington Dulles, showing the freezing conditions in which all of the aircraft, including Concorde, had to operate.
Photo: Richard Harris

A frozen aeroplane
Above/above right: icicles on the leading edge of the wing. Right: Snow build-up on the nose and visor.
Photos: Richard Harris

day. Departures were scheduled at 13:00 daily, with the inbound aircraft having been prepared the afternoon and evening before.

Looking back now over the previous years of ground support flying with Concorde – with the exception of the Moses Lake icing trials (see Mach 2, May 2021), with which I had not been involved, being attached to 002 at the time, and the cold weather trials in Alaska, undertaken by the French – all our other flying had taken place in warmer climes: the Middle and Far East, and North Africa. Consequently, Washington came as a complete shock to the system!

Arriving just prior to the New Year, I was able to get a 24-hour handover and introduction to the BA Engineering team from my good friend Ken Lees, and then it was straight into my first aircraft arrival on my first day at work.

A couple of days later, I had my first experience of winter operations. On the morning of 5 January it started to snow at 9 o'clock, with three inches falling whilst we were opening up and preparing the aircraft. The local engineering team was well used to this experience, of course, but to me, who had always operated in warmer countries with Concorde, this was a rude awakening to the reality of our work environment.

Our first action had been to put the heater blowers on so that we could replenish the water systems, which had been drained the previous evening. Once ground power was also on, the inside of the aircraft became more tolerable. However, the work to clear snow and ice from the exterior was a considerable challenge within the timescale needed for us to try to meet the schedule.

Refuelling and pre-flight checks were just that bit more onerous than usual, particularly those requiring

Additional work
Engineers clear a heavy load of snow from the wing – the result of just one night's snowfall.
Photo: Richard Harris

Vital equipment
Above: The author in front of G-BOAD. "All that time and courses to learn to use a shovel!"
Photo: Richard Harris

The Washington station team
The author (back row, second from right) at Washington Dulles with his BA engineering colleagues and Concorde. *Photo: Richard Harris*

access equipment such as the access to the hydraulic tanks, which at that time were a pre-flight level check inspection for every departure.

Working under pressure

The pre-flight work-up routine had become reasonably well established, but the need to clear snow and fully de-ice the aircraft added pressure for us to meet the schedule. One morning in particular presented us with an unusual problem.

Due to the sub-zero temperatures at the time, we were draining the aircraft water systems down every night, and replenishing them the following morning, once the aircraft had some heat in it.

Each morning, when the flight crew arrived, the cabin crew would set about their routines, which included checking toilets, and the Engineering Officer (EO) would do his walk round, during which we would update him on any of the snag actions reported on the inbound flight.

This particular morning, during the pre-flight walk-round with the EO for Concorde G-BOAD, he noticed that there was water running from a fuselage drain, and asked us to investigate. By this time the cabin crew were busy with toilet water taps and drains being checked, and baggage and galley loading was well under way.

To examine the affected area we would need to get access to the sidewall panels in the forward baggage hold. On Concorde this hold is accessed from beneath the fuselage and not the easiest to load, so you can imagine how popular that request was!

Not having the courage, I asked the AMM if he could get the baggage loaders to unload the baggage that they had already loaded in the front freight hold, so that we could carry out our investigation.

Once the hold was emptied and the panels were removed, it was evident that one of the toilet water supply pipes right up under the cabin floor was leaking from a 'popped' connector union, and dripping down nicely over the three phase generator feeders for both 3 and 4 engine generators, which ran through the zone.

We concluded that, due to the attitude of the aircraft when it had been parked on the previous day, the system had not drained out fully and the trapped water had frozen overnight, 'popping' the joint. When we put the heat on in the cabin and replenished the water system, the joint had thawed and then leaked.

Our only action was to advise the Captain of an inevitable delay and then remove the cabin seats, carpet and floor panels above the area just forward of the aft toilet, in order to re-make the connector.

I thought the Red Cap (ramp coordinator) was going to have an apoplexy! "Delay boarding? How long? Should they feed the passengers in the meantime?" – whilst we are dismantling the aircraft interior with all its crew on board!

Once the joint was repaired and leak tested, it was then felt necessary to feed the heater hose into the forward baggage bay to dry out the equipment and cables below the leak, prior to re-fitting the side panels and resuming baggage loading.

It was testament to the abilities of the Washington team that, from memory, we only suffered a delay of less than 2 hours on departure.

Engine change

A further achievement by the Washington engineering team, I believe, was the first engine change done outdoors – in unpleasant weather, and with no support except from the local Rolls-Royce reps and myself.

G-BOAA had departed on time at 13:00 hrs, and, as was our routine, we went to lunch before starting work on the turnaround of the inbound aircraft. Whilst we were at lunch, word came that the aircraft was returning, having suffered a surge and an engine shutdown. Although G-BOAA had gone transonic quite normally, without any limitation out of Washington, it took them over two hours to get back subsonically on three engines.

By late afternoon the Rolls guys had done their intrascope checks

and confirmed, I recall, a turbine failure. The decision was taken to remove the engine. Washington held a neutral spare engine, available to both BA and Air France; whilst the hoist and removal equipment was being prepared, the spare engine was pulled out of storage and readied to fit the accessories being changed to 'hand' the engine. ('Handed' engines were the right-hand and left-hand engines of each pair on one side. For example, two engines had two hydraulic pumps and two had only one, so the three hydraulic systems had two pumps each.)

The weather was appallingly wet, so working on the wing, even with matting, was quite hazardous for the team, but by 4.00 am the engine was freed and ready to drop.

However, in view of the rain and having only portable lighting equipment on the stand, the team was then stood down to get a couple of hours rest, and to await daylight and hopefully an easing of the weather. In the meantime, the BA station in New York had despatched some of their mechanics to enable work to continue without any further break.

As an aside, I was interested to see that the maintenance manuals we had been involved in validating whilst I was at Fairford, including the Engine Change Manual, could be used effectively by a BA team, none of whom had actually seen an engine removed before.

With the engine dropped, handed accessories, generator, hydraulic pumps, etc. were transferred, and the new engine prepared to be hoisted into position. The change was completed during the following evening and, following an engine run on the ramp with only chocks and brakes, the aircraft was declared seviceable and London contacted to reschedule its return flight.

Positioned as we had been on the end of the remote ramp at IAD, our ground run had included a check of reheat light-up. This had impressed people in the Tower and attendant fire truck (who had been forewarned), as it was carried out in the dark. However, after shutting down and going back under the strutted engine bay, looking for leaks, we could see a large swathe of burnt grass behind the aircraft. The airport management, on the other hand, had a major sense of humour failure when they saw this in daylight the following morning, and was not impressed by this desecration of their lush green grass. In consequence, we were never allowed permision to run on the ramp again.

Whilst all this work was happening on the Saturday, the team had also despatched G-BOAB, which had required a hydraulic pipe change. As a result, on the Sunday morning two aircraft were despatched back to London.

Final thoughts

I believe the BAC engineers' work gained the Washington station an extremely high and well-deserved reputation. The downside was that when New York services started, BAC and BA could not agree funding, and in consequence there was no British Aircraft Corporation presence in New York.

This attachment for me was extremely enjoyable and rewarding; testament to the relationships built at this time is that I am still in regular contact with the ASMM.

While we were in Washington, I was able to go to a Beach Boys Concert in the Washington Capital Centre. After my wife Joyce arrived, I was able to take her to see Elvis on what would turn out to be his last but one concert before his death.

The day the King died was a Wednesday, which was my day off each week. We were driving round the Beltway with the kids, heading for Kings Dominion Pleasure Park; the moment Joyce heard it on the radio she asked if we could go to Memphis. If we had done that, though, we would not have been back for the following day's arrival and departure – and you know how devoted we were to our aeroplane!

Recognition for a job well done

Following the author's time with Concorde in Washington, British Airways (USA) awarded him this plaque in recognition of his services.
Photo: Richard Harris

MK Aviation Society lecture

David Macdonald, Concorde Flight Engineer for British Airways

On 14 September 2021 the Milton Keynes Aviation Society (MKAS) hosted a lecture evening entitled "Memories of Concorde". They invited Captain John Hutchinson, First Officer Les Evans, and Flight Engineer David Macdonald to give their perspectives on this unique aircraft. David Macdonald *recalls the evening.*

The aviation society had invited John Hutchinson and Les Evans to give this talk on Concorde, and in turn they invited me – so we made up a full "flight crew". Our presentation involved teamwork, very much like our professional work on board the aircraft.

For my contribution I chose, as an introduction, the rather arcane subject of crew transport – the wheels, and sometimes wings, that ferried us crew members between 'planes and hotels. Some were an absolute pleasure; others, less so.

Take Barbados, for instance. Exiting Arrivals around 11.30 am local after a 4-hour flight, just in time to see our cabin crew heading for the Hilton in a smart people carrier. Next 'cab off the rank' was a Toyota, well used, seen better days, but featuring the 'key-less' starting device – just touch the two dangling wires together and away she goes! (I had something similar at the time on my yellow Citroën 2CV.) In a reversal of roles, my two pilot chums bagged the rear, so I took my place up front, in the left-hand seat. Thus, when our driver discussed rum, bars and the best on the island I made the executive decision. It was a piece of old Barbados, probably not there now: a timbered, tumbledown shack with a veranda, a £10,000 view and three 'old geezers' passing the time of day. I could have made it my local!

Less savoury was getting stoned in Singapore. The population seemed cross with the UK over something, and a small Bedford crew bus with BOAC (British Overseas Airways Corporation) emblazoned on the side made a good target for the rocks of discontent.

Whilst in Georgetown, Guyana, our driver tried to explain why a night drive to town was to be part of a 'parade'. The word should have been 'convoy', and with a military escort – not in ceremonial uniform, but in full combat kit and with automatic weapons. Here the population was a bit cross with their own government – makes a change ...

But no memory can compare to 14 September 2021, when John Hutchinson, Les Evans and myself – two Concorde pilots and a Flight Engineer – were whisked up Watling Street in a 1953 Rolls-Royce Silver Wraith! No stones, no escort, just pure, stately luxury!

Arriving in style

We three had been engaged to give an evening lecture to the Milton Keynes Aviation Society (MKAS), a dynamic, vibrant group that for 16 months had entertained their members with a range of Zoom lectures. (In fact, the original date for "Memories of Concorde" was smack in the middle of lockdown 1; thus to say that 14.9.21 was a bit of a celebration would not be too far from a classic litotes!)

Rendezvous point with our hosts was The Old Beams pub and restaurant within a stone's throw of the top secret, yet world famous, Bletchley Park. An early dinner and a pint of McMullen's splendid IPA – what a fine way to prepare for an evening's lecturing.

And the venue itself? The Henry Royce Memorial Foundation at 'The Hunt House', Paulerspury, a trust that houses the wealth of archive material accumulated by the Motor Division of Rolls-Royce. Modern facilities provide for conferences of up to 110 people in a purpose-built suite of rooms, and it was ours for the night. Would that we had something like that for Concorde ...

As a long-serving 'roadie' for the Marlow branch of the National Association of Decorative and Fine Arts Societies (NADFAS) – now re-branded as The Arts Society – I am very familiar with the buzz of a hundred or more friends meeting, the rising crescendo of conversation, sound checks, lighting checks,

The service to Barbados
Concorde climbs out of Heathrow, heading for Barbados. On arrival, though, the crews found that the mode of transport from the airport was rather less exalted.
Photo: Gordon Roxburgh

setting up the visuals, the tension as 'show-time' nears. Actually, it is not altogether unlike preparing a Concorde for departure – the same targets and urgency, the same satisfaction felt as the last door bangs into place and I call, "pressure on the right – starting three", the signal for the three of us to swing into a well-polished routine (not that a Concorde flight was ever routine!).

Step-change in aviation

An Air Atlantique Douglas DC-6 next to Concorde at Heathrow. The first DC-6 flew in 1946; less than 25 years later, Concorde would take to the sky. *Photo: David Macdonald*

From evolution to revolution

In this case it fell to myself to launch our three-part lecture by inviting the audience to consider 1954, the year Morien Morgan – a Deputy Director of the Royal Aircraft Establishment – called a meeting to "put some order into the scattered thoughts concerning a supersonic transport". A quite outrageous summons, considering that the de Havilland Comet 1 was still warm after having been grounded permanently following a series of accidents and structural failures.

It was impressed upon the audience at MKAS that here was the beginning of a **revolution** in airliner design – a step-change away from the 50 years of **evolution** following the first flight of the Wright Brothers' Kitty Hawk in 1903.

I took the image at the top of this page on the 'Romeo' stands at Heathrow (now built over by Terminal 5). All of our Heathrow to Heathrow local charters used this remote area – valuable terminal and gate space being reserved for the main business. We, or rather our passengers, appreciated being able to walk around and photograph the aeroplane before boarding. In the background is a typical 1954 airliner, whilst the foreground shows, not the 1954 dream, but the actuality – revolution indeed.

I imagined that the first item for discussion at that meeting would have been choice of wing: not just any delta capable of a Mach 2 adventure, but something altogether more sophisticated, more comfortable in that role hour after hour, year after year. I compared the simplistic lines of the Convair B-58 supersonic bomber and the complexities of Concorde's sweep, curves and twists; sweeps to reduce drag, thinness to persuade airflow to separate at the leading edge and roll up into strong vortices, camber to optimise lift distribution, and even leading edge twist and droop to manage airflow to the engine intakes.

Simple delta

Right: The Convair B-58 Hustler, showing the simple delta wing. *Photo: US Air Force*

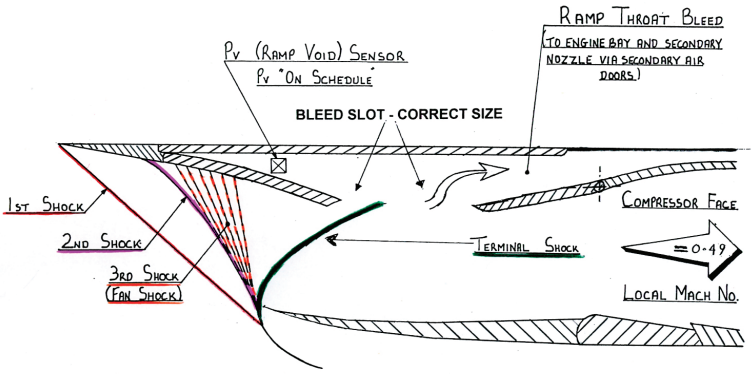
Curves and camber

Concorde's wing shape enabled efficient flight at both low and high speeds: a case of form beautifully following function. *Photos: David Macdonald (below); iStock (bottom)*

The thinned and lowered intake lower lip

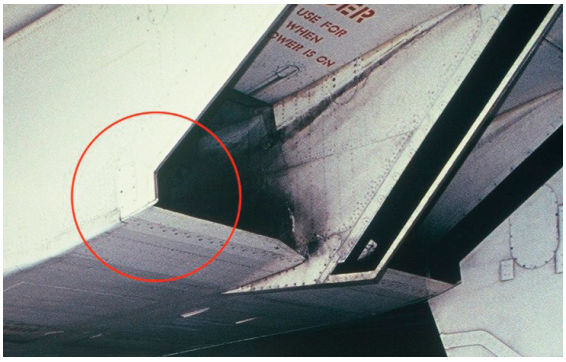
Air intake system

The diagram to the right shows the air intakes and internal ramps, with the shock waves that slowed the incoming air to a speed that the engines could accept.
Image: David Macdonald



In-service modification

Below left: the pre-modification intake, on which the edge of the lower lip meets the base of the intake's side wall (ringed in red). Below right: the change to the design. The lower lip has been lowered and set back by about an inch from the base of the side wall.
Photos: David Macdonald



Considering the air intakes

Intakes were next up for our discussion: the wizardry that reduced Mach 2 airflow from 1,350 mph at the intake mouth to just 350 mph at the engine face whilst compressing it eight times over – just what the engine needed.

One of the most significant post entry-into-service modifications was to the intake; termed the 'thinned and lowered intake lower lip', it involved cutting the lip back by about an inch. The effect was to increase the intake capture area, allowing the intake ramps to take up a more efficient position during supercruise, thus reducing trans-Atlantic fuel burn by 1,500 kilos. The intake structure is shown in the box above, together with the modification to the lower lip. The audience was invited to spot the change; it appears to be so slight for such a major improvement. Just as with any highly tuned engineering system, small changes can reap huge benefits – but you have to get it right, or else …

Precise measurements

The theme of revolution continued with temperature. Atmospheric temperature at 50–60,000 feet across the North Atlantic is about –50° to –60°C, but the kinetic heating effect at Mach 2 will heat Concorde's structure to beyond the boiling point of water. In the long term this creates a significant additional work load for our maintenance staff as hydraulic seals, tank sealant and electrical insulation begin to harden. It is a fact of supersonic life that new-builds will have to take note of.

In closing, the audience was teased when it was pointed out that the maximum permitted structural temperature was 127°C – not 125 or 130 or any other 'round number', but specifically 127 – such accuracy must be important. In fact, it equates to the lovely round number of 400° Kelvin! (I first encountered the Kelvin scale a lifetime ago in a night-school 'Applied Thermodynamics' module; the scale is, I believe, still used in engineering.)

Likewise, it was pointed out that we crew were obliged to remember that maximum permitted take-off weight was 185,070 kg and for landing, 111,130 kg – but the factories built to pounds (avoirdupois) for the American market, those numbers converting to 408,000 lb for take-off and 245,000 lb for landing.

Thanks to MKAS

The author thanks MKAS for hosting such a splendid and convivial evening. This is an excellent aviation society, presenting lectures and articles on a wealth of subjects, many with significant relevance to Concorde's history.
To find out more about MKAS, visit their website:
www.mkas.co.uk

Concorde watch

Concorde G-AXDN — British pre-production aircraft

Location: Imperial War Museum, Duxford, UK
Reporter: Graham Cahill **Date:** 25 January 2022

The team was James Cullingham, Peter Ugle, John Dunlevy and myself for Heritage Concorde, and Katie John (Mach 2).

The following tasks were carried out on this visit.

1. Nose
We completed several nose moves and the nose performed well.

2. Nose landing gear (NLG)
We solved a small leak on the NLG pipework caused by a bad coupling on one of the pipes; the leak was showing just aft of the NLG but was not serious. We have a small amount of fluid going down the now disconnected yellow return and suspect this is caused by the standby valve. This is a system that literally has not been used since 1977 so we expect a few small problems. We were most pleased with the performance so far.

Inspection of service bay
A view inside the service bay just aft of the nose hinge.
Photo: Heritage Concorde

Adjusting the NLG doors
James Cullingham (left) and Peter Ugle (right) at work on repairing the mechanism for the nose landing gear doors.
Photo: Katie John

3. NLG doors
We adjusted the NLG doors so they lock properly (this has been outstanding for quite some time). The door locks had been locking the doors too tight and one lock was springing open, causing an "unlock" warning in the cockpit. We now notice the landing gear door caption is extinguished in the cockpit, which means the doors are locking properly and functioning OK. We still have some work to do on them, but things are moving forward.

4. Hydraulic power pack
John Dunlevy has replaced a faulty switch in the cockpit used to activate the power pack for nose operation. The lack of use was causing multiple start–stop signals to the power pack control; this was probably due to dirt so it was better for us to replace it. He also did some small touching up of grey paintwork in the cockpit.

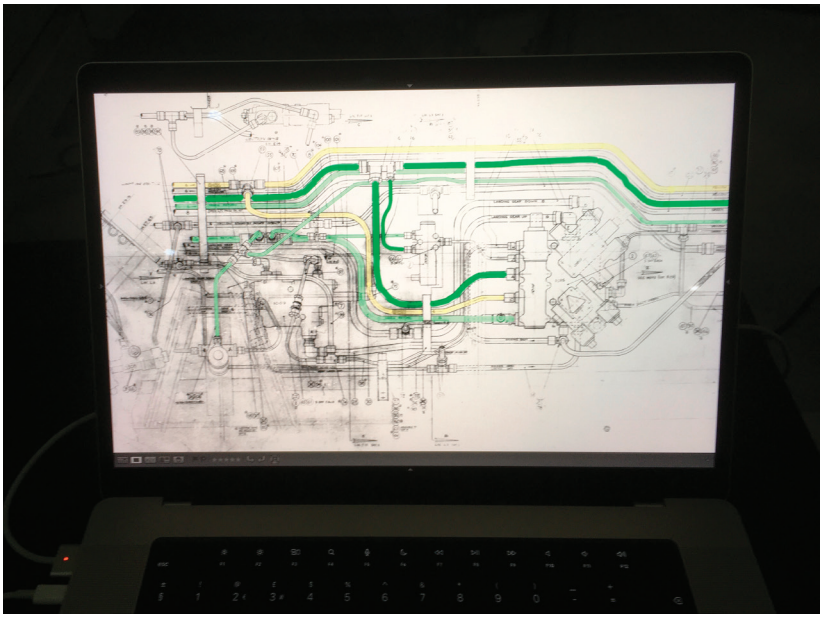
5. Observer's station
Regular maintenance on the observer's desk was completed. We replaced some bulbs; we go through around 10 filament bulbs in every 2 months because the desk is in operation daily for guests.

6. Service lights
The service lights are mostly working now, which adds a little life to the aircraft. This again is ongoing, but it's a nice step forward and a similar project to the one completed on G-BOAC at Manchester. We

will look at these being active for visitors to see on a day to day basis. We also plan to activate the fuel panel inspection light.

We also had the pleasure of visiting the new addition of the BAe 146 from the Royal Flight – most impressive and a great addition to the British Airliner Collection. In addition, there was a large collection of Spitfires in the conservation hall, which is well worth a visit.

As always, thanks to the Duxford Aviation Society (DAS) for their usual hospitality – it was a most enjoyable day.



Observer's station
Above: instrument lights restored to working order on the flight test observer's station in the cabin.
Photo: Katie John

Original plans
Left: James Cullingham has uploaded all the design drawings for G-AXDN from microfiche to his laptop; the team now uses them for reference while carrying out the repairs.
Photo: Katie John

The DAS collection – ongoing work

Despite the challenges posed by COVID-19 and the reduction in visitor numbers, the Duxford Aviation Society (DAS) are continuing to improve and add to their collection of exhibits.

The most recent acquisition is ZE701, the BAe 146 that was used for the Royal Squadron (formerly the Queen's Flight). ZE701 is one of two BAe146 Statesman VIP models that were owned by the RAF. Not only is this aircraft notable for being a royal aeroplane; the BAe 146 was the last fully British airliner ever manufactured – and the most successful. This should be a fascinating display once it is open to visitors. Another new development was a display of Spitfires in the hangar area where DAS often carry out their maintenance work.

DAS greatly appreciates all donations, whether given at the museum or on line, so that they can carry on their maintenance of the collection. For further details, see:
DAS: www.duxfordaviationsociety.org
British Airliner Collection: www.britairliners.org

A selection of Spitfires
Spitfires on display in the former maintenance area of the AirSpace hangar. The aircraft are visible from the mezzanine level as well as from the ground.
Photo: Heritage Concorde

Concorde G-BOAC

British production aircraft

Location: Runway Visitor Park (RVP), Manchester, UK
Reporter: Graham Cahill **Date:** 26 January 2022

Heritage Concorde (HC) have made three recent visits to G-BOAC – on 14 September and 19 October 2021, and January 2022. The team, comprising John Dunlevy and Graham Cahill, have carried out the following maintenance and restoration tasks.

1. Cabin lighting
The entire forward cabin is now LED lit with correct colour temperature for the period; the improvement is significant. All the reading lights are now completely restored to use for tours, "No smoking" and "Fasten seat belt" lights all work – G-BOAC looks as though she is about to take off.

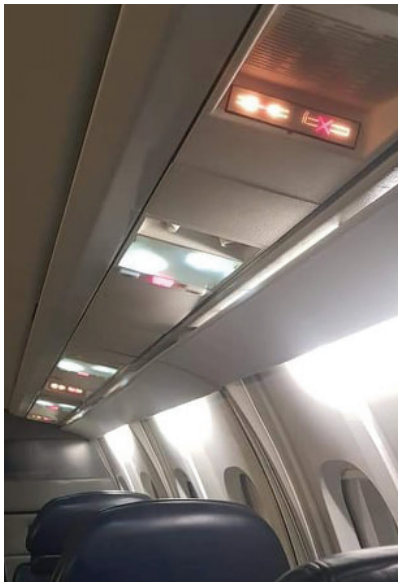
In addition, all the trims that we had to remove were neatened up before being put back in place.

Next time we have some money we will also do the rear cabin; it is larger and a little more complicated, but some of the preparation work has already been done for this and we already have some of the equipment required.

2. Further testing of 115v supply
John Dunlevy (longest-serving Concorde engineer) spent the day adding navigation lighting, strobes, taxi lights and landing lights to the active circuits. For the most part this task is now complete, although we still need to convert the taxi land lights to LED.

We intend to make it possible to leave the landing lights on in the hangar (if required for functions); this will add life to the aircraft for special occasions, especially with the already completed ground service lights now fully in use. I have to say this was impressive to see and I look forward to a further update on its completion. Due to limited service time (and access restrictions) for the filament and strobe lights it is not planned to activate them for all events, but discussion is ongoing.

The flight deck looks impressive with the instrument lighting now activated and will add another dimension to technical tours.



Renovated cabin lights
Above: the forward cabin with the "warm" LED lighting installed. Right: the "No smoking" and "Fasten seat belt" lights restored to working order, looking just as they would have done when G-BOAC was in service. *Photos: Heritage Concorde*

3. Nose landing gear (NLG) tyres
The tyres were inflated to raise the front of the aircraft, as the door was close to the steps. This is actually the first time we have done the NLG tyres since 2011, so they have held up well. Ultimately, though, we would like to see the aircraft on axle stands as has been done for G-BOAF at Filton, so we will work on a solution to complete this.

4. Nose hydraulics
The nose hydraulics need inspection every 6 months. This is a regular task. We checked the hydraulics; there is a tiny leak, but this has got no worse since the last check. Concorde did leak significantly during service due to the constant expansion and contraction of joints; this leak was obviously there during

service as this part of the nose has not been touched since retirement. The cause is a seal that has failed on a bobbin. The leak does not worry us, but eventually we will repair it. Otherwise the nose hydraulics and associated electrical circuits are working perfectly.

5. Rear hydraulic bay
We investigated a leak in the rear hydraulic bay. Residual fluid from inside the hydraulic system was leaking from a small pin hole in a pipe; this has now been resolved. The leak was due to corrosion to the alloy pipe; we are unsure of the reason for this, but it is a return line and there is nothing touching the pipe that could cause it to corrode. However, we need to keep an eye on leaks like this happening at this and other locations.

6. Cabin ventilation
We finalised the plan and tested a fan unit for ventilation to the cabin. We have most of the hardware for this project and it should be completed in the next few visits. This will enable Manchester to pump cool air from the lower portion of the hangar into the aircraft. The fan provides 1,850 cubic metres of air per hour so should completely refresh the air each hour from the lower, cooler portion of the hangar.

In all, a busy and productive few visits. As always, I would like to thank the Runway Visitor Park (RVP) and The Aviation Society (TAS) for their support in this work, as well as John Hepple at Manchester.

TAS have offered to help with the cost of this work on G-BOAC, and we are grateful for their support as it is always a problem for us raising the money for this fantastic aircraft. In addition to this generous support TAS are also allowing Heritage Concorde and Mach 2 to attend the TAS aviation fair on 5–6 February; this will allow us to raise further funds. Don't forget your donations also support this work.

Editor's note: 8 February 2022
Unfortunately, it was not possible for Mach 2 to join Heritage Concorde at the Aviation Fair, but HC still made around £500 profit from sales of memorabilia. This will enable HC to carry out the work on G-BOAC's rear cabin, as well as to do some work on the visitor presentation for G-AXDN at Duxford, and pay for more paint for G-BBDG at Brooklands.

Supporting the work

Heritage Concorde welcomes donations to support their maintenance and restoration work. For details, see their web page: https://paypal.me/Heritageconcorde

For further information on G-BOAC and the Runway Visitors Park, please see the RVP website: www.runwayvisitorpark.co.uk

For information on The Aviation Society (TAS), including information on forthcoming aviation fairs, please see the TAS website: www.tasmanchester.com

Landing lights in operation on G-BOAC. *Photo: Heritage Concorde*

