

# MACH 2

Concorde  
magazine

Chasing the eclipse  
*001's flight across Africa*

Entente Concordiale  
*A meeting of minds  
in Toulouse*

Concorde watch  
*Reports from Orly and  
Brooklands*

Issue 16  
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# INTRODUCTION

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*This issue looks back at one of the more unusual ways in which Concorde was used – namely as a tool for scientific study. This month sees the 45th anniversary of Concorde 001’s record-breaking, and still unequalled, flight within the shadow of a solar eclipse. Our feature on this historic event includes an overview from the Musée de l’Air et de l’Espace at Le Bourget, where 001 is now located; we are also delighted to present articles from two of the scientists who participated in the studies of the sun’s corona.*

*Our second feature shows how the aircraft is still bringing together experts and enthusiasts even today. We report on a gathering of the British and French Concorde fraternity in Toulouse, to see their two Concorde and exchange ideas on displaying the aircraft to maximum advantage. It was also an opportunity to forge bonds across the Channel, uniting all those who care for the “bel oiseau blanc”.*

*Lastly, we have Concorde Watch reports from an anniversary event for F-WTSA at Orly, and from a visit to G-BBDG and the simulator at Brooklands.*

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## IN THIS ISSUE

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- 2 Introduction
- 3 Feature: Chasing the eclipse
- 4 Intercepting the shadow  
*Dr Donald Liebenberg*
- 7 The British experience *Dr Jim Lesurf*
- 10 Feature: L'Entente Concordiale
- 14 Concorde Watch

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Cover: Concorde F-BVFC and Air Inter Caravelle at Aeroscopia, Toulouse

Photo: Peter Ugle

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# CHASING THE ECLIPSE

*On 30 June 1973, exactly 45 years ago, prototype Concorde 001 – still carrying out test flights – was called on for a unique task. The mission was to follow a solar eclipse for over an hour, for astronomical research. We look at the genesis of this project and hear from some of the scientists who took part.*

For astronomers, a total solar eclipse is an ideal time to observe and measure features such as the sun's corona (outer layer). When viewed from Earth, though, totality is only visible for around 7 minutes, because the umbra (shadow created by the moon) only covers a limited area, and it travels across the Earth at around 2,000 km/h (1,242 mph). In 1973, though, a group of astronomers found a solution that enabled them to keep pace with the racing shadow – following it in Concorde.

## A daring plan

Several groups of scientists, in France, the UK, and the USA, all had the same idea. In France, astronomer Pierre Léna of the Paris Observatory was the first to consider it, in May 1972, when he was preparing his mission to observe the 1973 eclipse. He put his idea to Commander André Turcat, Chief Test Pilot for Concorde, in a restaurant in Toulouse – sketching his plan on a paper napkin. He estimated that such a flight could last for up to 80 minutes – ten times as long as an observation made from the ground.

André Turcat accepted and, with engineer Henri Perrier, made preparations for this unique mission. They had to determine suitable runways for take-off and landing, plot the flight path, check the weather forecast, and determine load and power. In addition, the roof of the cabin had four portholes cut into it, so that viewing equipment could be inserted through the top of the aircraft.

Concorde 001 made the flight – his 376th flight – on 30 June 1973. Commanded by André Turcat, the aircraft travelled at Mach 2.05, at an altitude of 16,200–17,600 m (53,150–57,743 ft). He took off from Las Palmas (Gran Canaria), crossing west Africa to land at Fort Lamy (N'Djamena, Chad). The astronomers were able to observe the eclipse for a total of 74 minutes. This feat has never been equalled from that day to this.

*Information courtesy of the Musée de l'Air et de l'Espace, Le Bourget.*

For further information on Concorde 001 and on production Concorde F-BTSD, please visit the museum's website: (<http://www.museeairespace.fr/en/>).

Astronomer Pierre Léna gives a full account of the flight in his book [Racing the Moon's Shadow with Concorde 001](#), available (in French and English) on Amazon.



## Direct observation

Astronomer Jean Bégot of the Centre National de la Recherche Scientifique (CNRS) operates the telescope fitted in 001's cabin roof.  
©CNRS - Institut d'astrophysique / Coll. Pierre Léna

## Inside the umbra

A unique view from on board 001 during totality.  
Photo: Fondation Maison des Sciences de l'Homme



## Intercepting the shadow

Dr Donald Liebenberg, *Adjunct Professor of Physics at Clemson University, South Carolina*, recalls the vital part that Concorde 001 played in his study of the solar corona during the eclipse of 30 June 1973.

My scientific objective was to determine the temperature in the solar corona from the broadening of the FeXIV emission line at 5303 Angstroms. To measure the emission line from the solar corona we used the Fabry-Perot interferometer, developed by Professor Julian Mack, University of Wisconsin, where I was an undergraduate and graduate student for three expeditions. This high-resolution instrument allows the whole solar corona to be photographed or video recorded for later analysis. Our observations of coronal temperatures of more than 2 million degrees (MK) and in regions of the corona increasing with distance from the solar surface were among the first to establish such temperatures and unexpected height variations.

### Seeking a platform

In early 1970, observations of the solar photosphere discovered a 5-minute periodicity in photospheric line intensities. I wondered if such a periodicity might be seen in the solar corona.

Although ground-based totality has a maximum duration of less than 8 minutes, our Los Alamos/Air Force NC-135 aircraft could provide 12 minutes; however, this duration was still not sufficient to secure evidence of a 5-minute period oscillation in the FeXIV emission line intensity. The French/English development of the supersonic Concorde aircraft suggested to me an ideal platform for the measurement of oscillation in the solar corona, during the solar eclipse of June 30, 1973 (see box, right).

In 1972, with Dr. Arthur Cox, an astronomer at Los Alamos National Laboratory (LANL), I wrote to Professor Pierre Charvin at the French

Pic du Midi Observatory to suggest the use of the Concorde for the upcoming solar eclipse. I received an answer in December inviting me to come to Paris and Toulouse to discuss our plans.

At the LANL I went to the Associate Director to seek permission to fly on the Concorde, if the mission was approved, and was told I could not because it was an experimental aircraft. (This was the prototype, 001.) Undeterred, I went to the manager for insurance at LANL and he said it would be no problem to add a rider to their policy with Lloyds of London.

### Concorde 001

In January, with LANL support, I flew to France for a meeting with officials of Aerospatiale and Professor Charvin. I explained the scientific interest and my ability to put together the equipment needed to make the measurements. The aircraft people noted that the Concorde 001 could be made available but that the engines had been modified and no replacement would be available. I told them that clouds interfered with eclipse observations from the ground and I was prepared to chance the Concorde engines' success. I was then told to go to the Aerospatiale

### Mission impossible: 1970

While I was Program Director for Solar Terrestrial Research at the National Science Foundation (NSF), I called a meeting with astronomers and U.S. Air Force people to examine the possibility of using the Lockheed SR-71 to observe the eclipse of 1970. However, windows in the plane only looked down – and the cost of installing windows that looked up would be very large, since the structure of the plane was maintained in major part by the titanium skin. An estimate from the Air Force of a million dollars for such a modification was considered outside of the NSF budget for my program. For the 1973 eclipse, though, I had gone to Jane's book on aircraft to learn that the Concorde was a rib and stringer aircraft similar to subsonic aircraft, and thus was more suitable for adaptation.

### An initiative too far

The SR-71 in flight. Although this aircraft had the speed to follow the eclipse, it would not take the necessary structural alterations.

Photo: Tech Sgt Michael Haggerty, USAF







LANL's NC-135 flight. Art was also calculating flight paths for the Concorde, and we communicated by phone. The French had set up a phone line at Aerospatiale that gave me direct connection to Los Alamos. The French wanted the code for calculating the flight path and Art obliged. I think the French may have flown a slight modification of the preferred path from Los Alamos. Some discussion has occurred after the flight about the Concorde flying out or very close to the edge of totality so the chromosphere could be observed, but since I had a view of the whole flight on the tracking focal plane I did not see this. To coordinate the NC-135 and Concorde, Art Cox sent the French radio frequencies to be used for voice contact during the eclipse flights.

After another practice flight on June 23 we prepared to fly to Las Palmas in the Canary Islands. At Las Palmas I saw a large French aircraft arriving and learned that it was carrying a spare engine for the Concorde despite the earlier discussion. The Rolls-Royce plant had stopped the production engine line to build a Concorde 001 replacement. With the French, English, and another American team also on board (see box, right), this represented a significant effort by Aerospatiale to assure a successful flight.

### **"This natural spectacle..."**

On June 30, we took off at 10:08 UT (Universal Time) to reach altitude and intercept the totality so that the fuel would carry us most of the way across Africa to Ft. Lamy, Chad. Totality overtook us while flying at Mach 2.08, a little faster than a normal flight. My equipment was operating well, but the tracking did not stay locked in. I collected the pressure scanning fringe data of the green FeXIV coronal emission line throughout totality.

The onset of totality was stretched by the Concorde's speed. More than a minute before total-

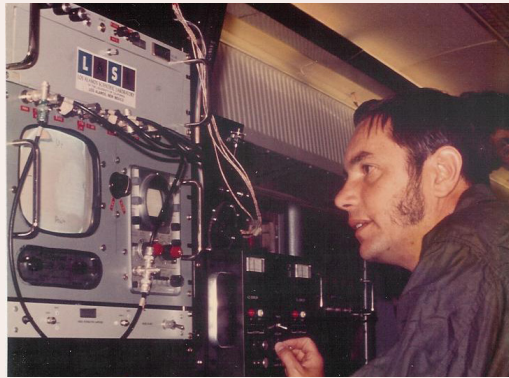
ity the corona was visible, and the chromosphere could be seen for some seconds. After totality the corona was observed even longer, due mainly to better dark adaptation achieved during totality. The corona was brilliant, especially against the deep blue sky at the 60,000 ft altitude. As I wrote in my notebook:

"(The

Concorde ready to intercept the fleeting shadow. Poised like a falcon at the runway awaiting the time 10:08 UT to fly up and snare the shadow. We have now just an hour before we shall be in the shadow gleaning what we can of this natural spectacle to quantify and describe in scientific terms what defies writers of prose to bring to their readers. The long months of preparation are about completed, the challenge nearly to be met, the corona to be viewed against the purple sky of

## **A multi-national gathering**

Four other groups were on the Concorde flight in addition to a photographer at a navigator window. Pierre Léna fielded an infrared measurement to look at the thermal corona. Alain Soufflot, also of the Paris Observatory, and Don Hall from Kit Peak Solar Observatory participated. John Beckman, Queen Mary College of London, made measurements in the far infrared of the chromosphere emission. John Bego, Astrophysical Institute of Paris, operated a camera to capture the white light corona. P. C. Wright, Aberdeen University operated an instrument to observe atmospheric changes during the eclipse using a passenger window.



### **On-board observation**

Donald Liebenberg carries out observations on board 001. His team were one of several groups from France, the USA, and the UK who took the chance to observe the eclipse.

*Photo: Donald Liebenberg*

space, darkened still further to reveal in full contrast the ethereal white of the solar corona. These raiments must only enhance the dietous nature of the sun. But will we know more about the cloth, can we feel the threads with the instruments we have? That is the challenge for we earth bound tailors. We have our tape measure."

*"The corona was brilliant, especially against the deep blue sky at the 60,000 ft altitude."*

First contact had occurred before we took off from Las Palmas and by 12:56 UT we were landing at Ft. Lamy. As we

came in for landing I could see local people waving their hands or throwing stones as in ancient times to get the moon to release the sun. (Of course this tradition could continue since it has been in every case, so far, successful.)

When the data were analysed we found several regions where there was a fairly clear 5-minute variation of intensity of the FeXIV line. The

periodicity did not last in one location for more than a few periods and the intensity variation was not large but clearly there. These observations were the first to find a periodic intensity fluctuation in the solar corona. Now some 44 years later we know there are many more periodic actions in the corona.

### A successful outcome

We packed and shipped 16 boxes of equipment back to LASL. I received a letter of commendation from Dr. Edgar Piret, the American Ambassador to France. We published preliminary results.

Before leaving for Las Palmas the LANL Director, Harold Agnew, had provided funds for me to take the several scientists and Chief Aerospatiale Test Pilot André Turcat to a dinner at a pleasant restaurant in Toulouse. And upon our return the NC-135 and Concorde observers were hosted by Dr. Agnew.

Near the 40th anniversary of the Concorde 001 eclipse flight, an exhibit opened at the Le Bourget airport in Paris. Two Concorde planes are on display there – the Concorde 001, and a second plane configured for the commercial flights. There are still markers in 001 indicating the

various locations of observers of the eclipse. Further eclipse information is provided in the hall with the two aircraft. I was privileged to join the group of observers, and Captain A. Turcat and some of the crew members, for the opening of the exhibit.

For further information on the 27 total solar eclipses Dr Liebenberg has observed, see his articles on the Clemson University website: <http://newsstand.clemson.edu/26-and-counting-the-liebenberg-eclipse-chronicles-part-1/>

## The British experience

*Dr Jim Lesurf, at the time a research student at Queen Mary College (QMC), London, looks back at the studies conducted by British teams on board 001 – and recalls the crew stretching the experimental aircraft to its maximum capabilities.*

I was in the early stages of a research studentship with the Astrophysics Group at Queen Mary College (QMC), London University. My supervisor (Dr John Beckman) and some others wished to make far-infrared observations of the eclipse to learn about the sun. He put two and two together and came up with the answer – Concorde!

He initially contacted the British Aircraft Corporation who were running the UK side of the development and asked if we could use their prototype (002). Although they initially thought it was a good idea, they backed out when they realised that we needed to make some holes in the roof and insert crystal quartz windows to observe the sun at these Terahertz frequencies. So he then approached the French and asked if we could use their prototype (001). They agreed.

I took on the task of designing and making the electronics to control the measurement system and collect the data. Having spent some

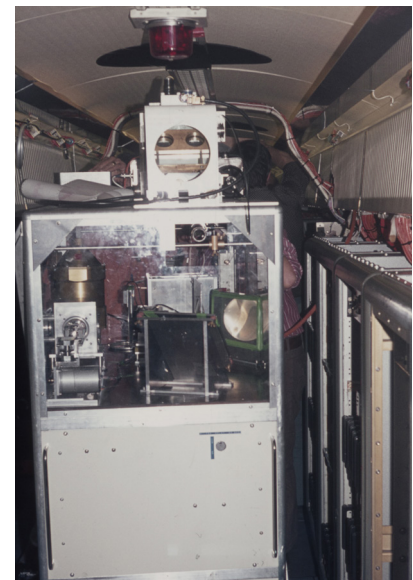
months developing and testing at QMC I flew to Toulouse, where the French Concorde was based, at the start of May 1973.

The first few weeks at Toulouse involved testing the instrument on a very-low-speed trolley outside the building. Once these tests ensured the system was working correctly, the instrument was fitted into Concorde, and connected into its electrical power systems.

QMC weren't the only research team using 001 at the time (see box, opposite page). There were also researchers from Los Alamos in the USA, two groups from France, and one group from Aberdeen University. The UK work was also supported by RSRE, which was one of the UK's government research laboratories of the period (now amalgamated into the Rutherford Appleton Laboratory).

In addition there was already an ongoing project run by Dr Jim Birch of the UK National Physical Laboratory. Rather than observing

the eclipse, though, Jim Birch was making observations on the upper atmosphere because some people



### Ready for use

QMC's infra-red observation instrument installed in 001's cabin. The dark circle in the cabin ceiling is one of the observation portholes.

*Photo: Jim Lesurf*



had worried that routine supersonic civil flights might damage the stratosphere and lead to an environmental problem. So the NPL were investigating this to see if there was anything to worry about.

### Parlez-vous Concorde?

This was my first trip out of the UK. When I went, I had no knowledge of French so I had to pick up the words and phrases I needed by trying to communicate with the people around me. John Beckman did speak French. However, after a few weeks some of the workers used to turn to me to find out what he had said! This was because he spoke with a well-educated – i.e. posh – French accent, whereas I had just learned how the words sounded when spoken by the people in Toulouse. I am still not sure how much this was because I had adopted the local way of speaking, or if they were just French workers enjoying winding up an English ‘professor’...

### Testing conditions

I went on a number of test flights in Concorde 001 from Toulouse. These tended to head out over the Atlantic, and go supersonic above the ocean. For our tests Concorde then flew along the horizontal towards or away from the sun while I worked on the instrument.

In service, Concorde became the symbol of luxury travel. But working on the prototype was rather less luxurious. The plane only had a few seats in the main cabin. These were rear-facing ‘military style’ seats with full belts to aid protection in the event of a crash. (Although I doubt they’d help much if you hit something at Mach 2!) When the plane took off, the thrust from the Olympus engines gave it a high acceleration. It also rotated to a steep angle of attack to get enough lift. The result was that I’d hang out of the seat as if it were attached to the ceiling! And when working on the instruments I’d find that the pilots

### Support aircraft

Members of the QMC group with the lovingly cared-for Caravelle used to carry the equipment.

*Photo: Jim Lesurf*



would have fun putting 001 through semi-aerobatic moves to test the plane itself. Once I was trying to undo a bolt with a screwdriver. The pilots put the plane into a zero-g fall. The bolt didn’t rotate – I did. My feet came off the deck and I went through about 30 degrees before the pilots pulled back on the controls and I fell onto the deck! On another occasion the rest of the experimenters had failed to get the signal detector working, but decided not to tell me. So I spent over an hour working in this funfair environment, worried that something was seriously wrong. I was told that I looked green when I came down the boarding gangway at the end of the flight. In level flight, Concorde was like a magic carpet with almost no turbulence or wagging. But the test flights were sometimes rather more ‘entertaining’.

During the project we were able to fly to and from home whenever we wished. Because we were using Concorde for the experiment the UK/French Governments and their then state-owned airlines made travel easy. If there was a free first class seat we were given it if we turned up at the gate. Alas, the Paris-London hop was so short that it was a rush to eat the excellent meal before landing!

### Preparing for the eclipse

On 27th June we flew down to Gran Canaria Airport (Canary Islands), which was where the actual eclipse flight would commence as it was near the track of the total eclipse. Concorde flew down from Toulouse

first, carrying the instruments. We followed in a Caravelle airliner that Aerospatiale used as a transport for the engineers who accompanied 001 in its flights around the world. Although that Caravelle was old, it was very well maintained. Some of the best aviation engineers in France would give it a careful check-up before each time they flew in it. This included senior engineers going round kicking the tyres, etc, to make quite sure!

The flight down to the Canaries in the Caravelle was livened up by the pilots playing a trick. Half-way there they reduced engine power without warning and announced (in French) that we’d run out of fuel due to the headwind. Fortunately I didn’t know what the fuss was about as my French wasn’t good enough to find out until the joke was over. But there was indeed a strong headwind as there was also a huge dust storm over Africa, which we could see from the Caravelle.

One of the first tasks when we arrived was to find somewhere safe to put 100 litres of liquid helium. This was needed to cool down the InSb Far-Infrared Detector used for our measurements. However, it had to be kept out of the sunlight and not be disturbed. We did spot a shed near the runway with a jeep in it. Since this was the only nearby shelter we duly started shoving the jeep out of the shed. At that point some uniformed military guards started running towards us and pointed their guns at us! It turned out that the jeep belonged to the Commander of the airport. (This





**Window cleaning**

One of the strangest ever episodes of window cleaning – scientists clean the observation portholes in 001’s roof before the eclipse flight.  
*Photo: Jim Lesurf*

was in the days when Spain was essentially a military dictatorship under General Franco.) Fortunately, after some discussions in a weird mix of English, French, and Spanish we got permission to use the shed. This was helped along by us pointing out that if left in the sun the container might explode. If not, it might still lose all its contents and the high-publicity project would then have been ruined. So a lack of co-operation might not have looked good for the governments involved.

A short time before the eclipse flight, my supervisor and some of the other experimenters climbed up onto the top of Concorde’s cabin and proceeded to give the observation windows a final clean and polish. Perhaps one of the strangest episodes of window cleaning in the history of astronomy or aviation!

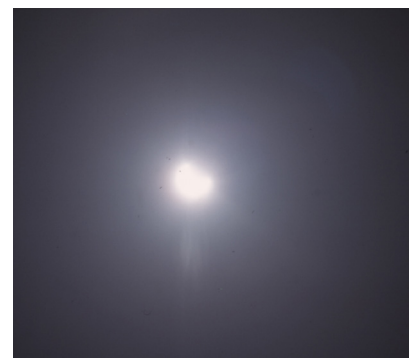
As 001 taxied out to take off on the day, the runway became busy with a series of Spanish Air Force fighters. These were Messerschmitt fighters of the same design as used during World War II. One after another these took off. At the time it seemed like the Spanish were saying, “We could delay your take off if we wanted to, you know!” However despite this, Concorde took off at the correct time. It then flew along the eclipse track, eventually landing in Fort Lamy, Tchad some hours later. Shortly after 001, the Caravelle took off carrying the service engineers.

**Good results**

Overall, the QMC experiment was a success. There was a minor mechanical problem with the scanning system in the interferometer used to collect spectra. But it was still

possible to get good results, which were duly published in *Nature*. These show some of the first Far Infra Red observations of the limbs of the sun and demonstrated a behaviour called ‘limb brightening’. (Beckman, Lesurf, and Ross. Submillimetre brightness spike at the solar limb. *Nature* V254 March 5 1975, pages 38-39.) How much impact that had on understanding the Sun, I can’t say – I was just an engineer. By then I was well into making systems for other measurements. I still know the French words for ‘screwdriver’ and ‘inverter’, though...

A full description of Dr Lesurf’s involvement with the eclipse flight can be seen on his website: <http://jcgl.orpheusweb.co.uk/history/concorde/ChaseTheSun.html>



**The eclipse begins**

Above right: a view from the ground as the eclipse begins over the Canary Islands.

*Photo: Jim Lesurf*

**Preparing for rendezvous**

Concorde 001 takes off on his mission to intercept the path of totality over West Africa. The crew and scientists on board witnessed 74 minutes of totality – the longest duration directly seen by humans.

*Photo: Jim Lesurf*



## L'ENTENTE CONCORDIALE

*The weekend of 8–9 April 2018 saw a unique gathering of the Concorde fraternity. Led by Paul Evans, former team leader of the volunteers who worked with Alpha Foxtrot at “Concorde at Filton”, members from all parts of the Concorde community, both British and French, came together to visit French Concordes F-BVFC and F-WTSB at the Musée Aeroscopia, Toulouse.*



### **Concorde super-group!**

British Concorde lovers from across the UK and France gather beneath Fox Charlie.

*Photo: Peter Ugle*

Group members included former volunteers from Concorde at Filton, members of the Duxford Aviation Society, volunteers from Brooklands Museum and the Runway Visitors Park at Manchester, Heritage Concorde, the Save Concorde Group, and Mach 2 magazine. The attendees also included Iain Gray, former head of Airbus UK; Fred Finn, holder of the Guinness World Record for the most flights on Concorde; and former BA Concorde engineers Peter Ugle, John Dunlevy and Paul Caswell.

### **Musée Aeroscopia**

Our visit began on the Saturday with a tour of the Musée Aeroscopia, the aviation heritage museum situated beside Toulouse-Blagnac airport. We were collected from our hotels and taken to the museum by a coach kindly provided by Airbus Heritage.

Our tour guides, Matthew Lord and Ludivine Visec, outlined the history of French aviation on this site – starting with the bat-shaped aeroplanes of pioneer Clément Ader, credited

for the first powered take-off of an aircraft, then developments in the First World War, when the French government moved aircraft production to the south to keep it safe from German attack, then the growth of aircraft companies Dewoitine and later Airbus.

We saw some of the aircraft representing highlights of aviation history, such as a replica of the Blériot XI (famous for making the first cross-Channel flight in 1909). We also had a close-up view of the Super-Guppy, the outsize transport aircraft originally built for NASA to carry parts for the Apollo space program and also used to carry parts for Concorde between Britain and France. The museum displays the Super-Guppy with its nose section open, so you can see inside the vast fuselage; looking towards the flight deck, you can still make out the shape of the Boeing Stratocruiser that formed the basis for the aircraft's structure.

We passed along a walkway into the Airbus A300, the first airliner produced by Airbus.



### Sierra Bravo

Displayed in the main hall, F-BTSB carries the original logos of the British Aircraft Corporation and Aerospatiale. Both this aircraft and Fox Charlie were re-painted in their last livery before going on display, and look immaculate.

*Photo: James Cullingham*



It was strange to see such an “old” flight deck, complete with flight engineer’s station, on an Airbus aircraft. Also fascinating was the way in which part of the cabin floor had been replaced with glass so you could see the hydro-mechanical cabling beneath. In addition, the cabin had been fitted with samples of various seating layouts – plus, more unusually, a meeting room and a bedroom!

### The two Concorde

The highlight of the display, though, was our tour of Concorde F-WTSB (production aircraft 201). This aircraft was used for test and demonstration flights; we were able to tour the forward cabin, to see the flight test station, and to see the rear cabin, which was fitted with seating so that the aircraft could carry passengers (such as former French president Valéry Giscard d’Estaing). The aircraft had been re-painted before being moved to Aeroscopia when the museum opened a few years ago, and was in immaculate condition.

We were honoured to be joined by Dudley Collard, former aerodynamicist for Sud-

Aviation, who helped to develop Concorde’s wing. He told us a little about the complex and subtle series of changes that had been made to the wing between the prototype and the production versions, in order for the wing shape to work at all speeds; apparently, just a slight re-shaping of the leading edge made the difference between the aircraft having a maximum safe speed of Mach 1.6 and Concorde flying effectively beyond Mach 2.

We were then led outside to see the museum’s other Concorde – F-BVFC, the last Air France Concorde ever to fly. Fox Charlie had also been re-painted before being put on display, and despite the dull, rainy weather he was gleaming. The museum had arranged a special treat for us – we were actually allowed to board the aircraft, which had not been opened to visitors since 2003. The flight deck

### Dazzling display

Fox Charlie is shown to stunning effect in the sunshine on the second day of our visit.

*Photo: James Cullingham*



### Return to life

Inside the Air France Concorde simulator, with some of the lights and instruments active.

Photo: Paul Evans



was sealed off with Perspex, but we could walk through both cabins. We noted that a dehumidifier had been installed on board to keep the interior dry. It was also interesting to see how the cabin layout differed from that in British Concordes; following the crash in 2000, Air France reduced their seating from 100 to 92 to compensate for the added weight of the new Kevlar fuel tank linings, while British Airways addressed the weight problem by re-designing the seats in much lighter materials.

We were also shown the Air France Concorde simulator, which is currently being restored by the French heritage group Association Virtu'Ailes. The group is still working to bring the simulator's systems back into operational order, using more up-to-date technology that can supply greater power and capacity; group member Jean-Pierre Salsenach showed me one of the new circuit boards that they had had specially made for the simulator.

I enjoyed Aeroscopia, as there was plenty of room to get a good view of Sierra Bravo and the other aircraft. The museum also greatly



impressed the team from Duxford, who praised the display of all the aircraft and admired the way in which the museum guided visitors and pitched information to different groups of people.

We were then taken to lunch at the "Sky Trotter" restaurant beside the museum. The delicious meal, kindly laid on by Airbus Heritage, was based on an actual Air France Concorde menu.

### The elements of Concorde

That afternoon we visited a very different Concorde exhibition next door to Aeroscopia, at the "Ailes Anciennes" museum of historic aircraft. The "Espace Concorde" exhibition, run by the enthusiasts' group Cap Avenir Concorde (CAC), is housed in a small space but is highly impressive. This exhibition space, inaugurated last year (see Mach 2 issue 10, June 2017), has areas dedicated to people who were involved in each area of the Concorde operation – development, test flights, commercial flights, and cabin crew.

The lower floor holds shelves where components from each of Concorde's systems are simply and cleanly displayed. The upper floor houses a display showing aspects of Air France's Concorde service. Despite being so compact and simple, this exhibition had a powerful effect on the Concorde engineers with us; they were profoundly moved to see these parts, which they had worked with so closely, being displayed with such care and respect. In fact, the engineers said they actually enjoyed the Espace Concorde more than the dazzling displays of the Musée Aeroscopia.

We were made very welcome by Cap Avenir Concorde. We were touched by the party that Louis and Suzon Paulus laid on for us, with CAC members Laurence and Kevin Keniston; Fred Finn spoke for all the British enthusiasts when he paid tribute to the years of hard work and all that CAC were doing to pay tribute to the memory of Concorde.

### An A380 is born

Monday morning held a further new experience for us – a tour of the Airbus A380 final assembly line. Going from the scale of

### Ailes Anciennes heritage collection

The varied collection of aircraft at Ailes Anciennes. The site was not open that day, but we saw the aircraft on our way to Espace Concorde.

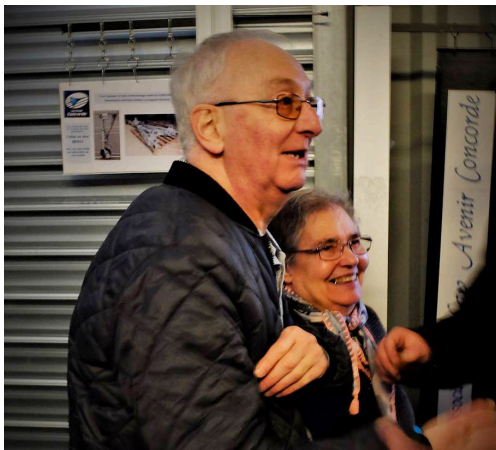
Photo: Peter Ugle



Concorde to this giant was an awesome leap. Our guide, Matthew Lord, told us that the assembly hangar was the largest building in Europe by volume: 490 m long, 250 m wide, and 46 m high (1,608 x 820 x 151 ft). The main sections of the aircraft – three fuselage sections, wings, and tailplane sections – are brought to the site by rail and road. The first stage of assembly involves fitting all of these parts together and adding the engine pylons and landing gear; this takes just 10 working days and is done manually. The second stage involves fitting of the engines and testing of the systems, as well as testing of the fuel tanks to make sure that they are airtight. The aircraft is then taken outside for the final tests, including engine tests, before it makes its first flight to Hamburg, where it is painted and fitted out for airline service.

The speed of assembly seemed especially amazing when we saw the size of the sections. One wing stretched across most of the floor space. A front fuselage section reared high above us, the red nose jutting out from a complex nest of scaffolding. The place seemed very quiet and light, with almost no noise except a low electrical hum and occasional voices – I would almost describe it as a cathedral for aircraft. We were not allowed to take photographs, but the sights were memorable enough in themselves.

We ended our weekend with a final lunch in the Sky Trotter restaurant. The current and former museum guides among us greatly admired the décor – an appealing mixture of retro cool and bleeding-edge modernity, with 1930s metal and aluminium seats, plus stylish aviation photographs and actual Airbus aircraft parts on display. Even the ceiling had silhouettes of Airbus aircraft, with basic facts



### The planners

Paul Evans and Laurence Keniston; their hard work paid off handsomely over this fascinating and enjoyable weekend.

*Photo: Paul Evans*

about each. As an aviation-themed café, it was very nicely done.

### Cross-channel connections

Paul Evans, who had organised the whole weekend for us, excelled himself in arranging these experiences – a feat that took him many months, starting in summer of last year. He even liaised with guide Matthew Lord to get us one last photo opportunity with Fox Charlie in the sunshine. His work has already begun to bear fruit in the friendships that were formed over the weekend, and the information shared about Concorde and how best to present the aircraft to the public. For example, CAC were raising funds to display a complete nose leg assembly, and, after our wonderful weekend, the British group were very happy to help. We are glad to report that CAC achieved their target!

Many thanks also to Jacques Rocca, curator at Aeroscopia, and Sarha Fomba from Airbus Heritage, who helped organise the itinerary for our trip to Aeroscopia and the Airbus site. Thanks to Airbus Heritage for the meal at the restaurant, and to those from Aeroscopia, Airbus Heritage, and Air France who arranged our visit to Fox Charlie. Finally, many thanks to Louis and Suzon Paulus and Laurence and Kevin Keniston of Cap Avenir Concorde, who made us so welcome at Espace Concorde. We hope this will be just the first instance of what Louis aptly called the “Entente Concordiale”.

For information on Musée Aeroscopia and Ailes Anciennes Toulouse, see their websites:

<http://www.musee-aeroscopia.fr/en>

<http://www.aatlse.org>

### Louis and Suzon Paulus

Our delightful hosts at Cap Avenir Concorde welcome us to the Espace Concorde.

*Photo: Peter Ugle*



## Concorde F-WTSA

French pre-production aircraft

**Location:** Musée Delta, near Orly Airport, Paris

**Reporter:** Athis Aviation-Musée Delta **Date:** 22 April 2018

On Sunday 22 April, more than 650 people came to visit Concorde F-WTSA to celebrate the 30th anniversary of his arrival at the Musée Delta site, on 12 April 1988.

In the morning, 19 visitors attended a talk by Monsieur Claude Monpoint, former Chief Steward for Air France. M. Monpoint began working with Aerospatiale in 1973; he organised the cabin service on Sierra Alpha for demonstration flights and for the first supersonic crossing from Washington to Paris Orly. That flight, carrying 32 passengers, took just 3 hours and 33 minutes.

This talk was followed by a contribution from M. Yves Pingret, flight engineer for the test flights. M. Pingret was part of the crew for the first flight of Sierra Alpha on 10 January 1973, with the “boss” Jean Franchi and a crew composed of pilot Jean Pinet and flight engineers Claude Durant and Jean Belson.

### Premium service

M. Claude Monpoint (right) enlightens visitors to Sierra Alpha’s cabin on his experiences of life on board.

*Photo: Athis Aviation-Musee Delta*



### Celebrating Sierra Alpha

More than 650 visitors attended the anniversary celebrations for F-WTSA.

*Photo: Athis Aviation-Musée Delta*

M. Pingret very concisely and effectively described his job and the life of Sierra Alpha, on which he made 158 flights (out of a total of 314 completed by the aircraft). However, he was clearly more comfortable in “his” flight engineer’s post, where he explained to Laurent Dupessey at length about the different breakers he had to operate

during the flights to “get it to work”. He made us a gift of an original parameters card that he had completed himself, for the occasion; it has replaced the photocopy that we had.

### Back in the comfort zone

M. Yves Pingret, at his familiar flight engineer’s post once again, explains some of the systems to a visitor.

*Photo: Athis Aviation-Musée Delta*







**Meeting the team**

Left: Mme. Rodier, the mayor, meets Bonamy, who published the book *La Vie du Sierra Alpha*. Right: The cake donated by the town.

*Photos: Athis Aviation-Musée Delta*



M. Pingret. Throughout the day, 337 people came on board Sierra Alpha and listened to the talks given by Jean-Pierre, our guide.

For this celebration a new functionality had been restored – the single stroke gong, which sounded when a Master Warning (MW) alarm came on. On the day it was activated by pressing the MW's test button, as it would have worked back in the flying days.

ment, active life, retirement, and life on display – from the guided visits at Orly in 1976, to his arrival at Athis-Mons in 1988, and the events over the following 30 years.

A second conference attracted 19 people to hear M. Monpoint and

There was a lot of emotion during the day – amicable meetings between all our lovely guests, evocation of memories, and long-held questions finally answered by some of our renowned speakers.

**Mayoral address**

The afternoon began with a welcome address by Madame Françoise Payen and Mme. Christine Rodier, Mayor of Athis-Mons, to the participants. Guests were invited to share the cake offered to them by the town, in the company of the deputy and the general councillor of Essone Département.

The Mayor finally presented a book entitled *La Vie du Sierra Alpha*, written for the occasion, telling the story of this aircraft and all those who participated in his develop-



**Honoured speakers**

Above: The Mayor, holding the commemorative book, poses with (from left) Mme. Françoise Payen, M. Yves Pingret, and M. Claude Monpoint. *Photo: Athis Aviation-Musée Delta*

**Not so fast ...**

Left: Some of the visitors to the supersonic F-WTSA arrived by a rather slower mode of transport. *Photo: Athis Aviation-Musée Delta*



For further information on the work being carried out for Sierra Alpha, see the website: <http://museedelta.wixsite.com/musee-delta>

## Concorde G-BBDG

## British development aircraft

**Location:** Brooklands Museum, Surrey, UK

**Reporter:** Katie John

**Date:** 16 May 2018

On 16 May I attended one of Brooklands Museum's "Concorde Technical Flight" tours. This included a guided tour of Concorde G-BBDG (Delta Golf), and a visit to the British Concorde simulator.

The morning began with an introduction from Michelina Caliendo-Sear, the Concorde Operations Manager at Brooklands. She handed over to volunteer guide Vic Goddard, who began with a short talk on the history of the Brooklands site.

From the beginning the site hosted some very famous names in aviation. A.V. Roe tested his first aircraft here. The Vickers Vimy and Sopwith Camel took shape at Brooklands, and the Hawker Hurricane first flew from there in 1935. During the Second World War the Wellington bomber was built there. After the war, Brooklands produced some of the greatest names in British airliners, including the Viscount, the VC-10, and of course Concorde.

### Introducing Concorde

Vic then outlined the history of Concorde, starting from the 1956 meeting of the Supersonic Transport Aircraft Committee in London, and covering the collaboration with the French. He explained about the various versions of the Concorde design – from prototype to pre-production to development aircraft to the fleets that went into airline service.

Vic and Michelina then took us to Delta Golf, for a guided tour of the exterior and then the cabin. As an enthusiast who has been around Concorde for some years, much of the information was familiar to me, but there were still snippets

that I had not heard before. One was that Neil Armstrong had flown the Handley Page HP115 – the experimental aircraft that the British used to explore delta wing shapes. Another was that Concorde's outer skin is only 2mm thick.

Once on board, we viewed videos about Concorde, then Vic invited two visitors at a time to sit in the pilots' seats while he gave an overview of the flight instruments.

### The simulator

Another volunteer, John Carter, showed us the simulator. The sim was operating in "demo" mode, showing a sample flight doing a circuit from Heathrow over London and Brooklands. The flight deck lights were on, but the instruments were not active. Still, we had a real sense of how true-to-life the sim was. The landscape views were so realistic that I actually had a moment of vertigo as my brain tried to register what it was seeing!

John said that visitors for the "Silver" or "Gold" experience, with a full simulated flight under the guidance of a Concorde pilot, have a choice of four locations: London, New York, Sydney, and Hong Kong.

### Concorde central section

A section through the centre of Concorde's airframe, showing the integrated wing/fuselage/wing structure.

*Photo: Katie John*

He said the Hong Kong option – flying into Kai Tak airport at dusk – was spectacular.

### Interactive displays

Once our Concorde tour was over, we were free to explore the rest of the museum. I was particularly interested to see the "Aircraft Factory" display in the Bellman hangar. This had examples of Vickers' work from the beginning (a replica of a Royal Aircraft Factory SE5a) to a wing from an A320, representing the last work done by Vickers, in the 1990s, including a section of Concorde's wing/fuselage structure. There were also displays showing what it was like to be a worker at the factory – cards to punch, fabrics to touch, mechanisms to push or pull or turn. Here again, the volunteer guides were very helpful and knowledgeable, bringing a personal insight to the objects on display. I noticed a troop of Scouts in the building – they seemed to be having a lot of fun with the exhibits.

In short, I would recommend this tour as a reasonably priced introduction to Concorde. Alas, there was no champagne – but there was plenty of food for thought.

