

1939 - 2019
Marignane

80 years
of pioneering

AIRBUS

Marignane 1939 - 2019 : 80 ans et toujours la même passion

Airbus Helicopters Thierry Poirang

AIRBUS



1939 – 2019

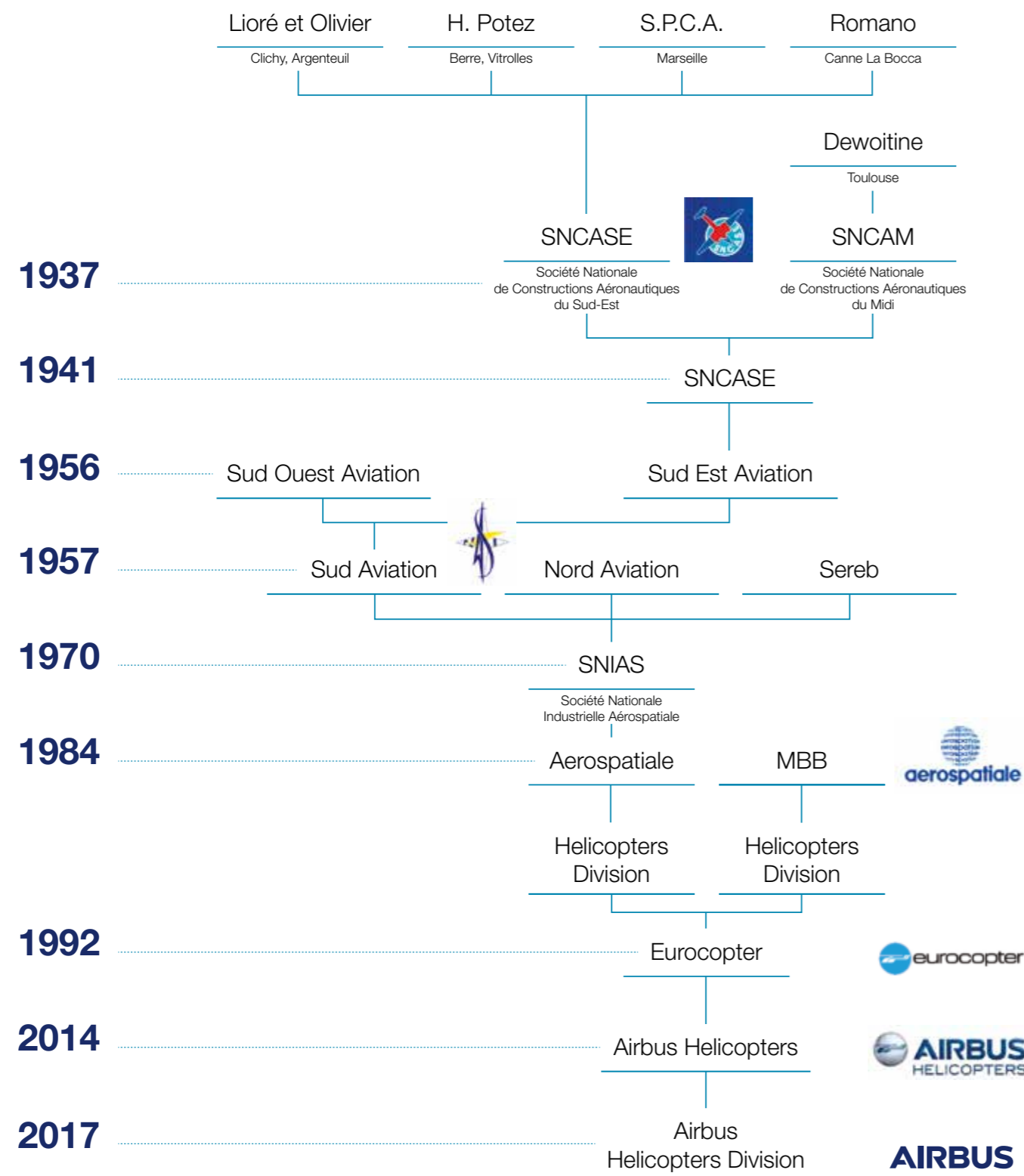
Marignane

80 years
of pioneering

Monique Colonges and Christian Da Silva

80
Years
Airbus
Helicopters
Marignane

From merger to merger...



Foreword

It gives me great pleasure to write the foreword to this book dedicated to all the employees of the Marignane site on the occasion of its 80th anniversary. I have left it to Jean-François Bigay to write the preface because, with the Tiger programme, he was the founder of our company which since the 1990s, has assumed an international dimension in an increasingly competitive global market. It was Eurocopter, the Franco-German firm, that played a key role on a European level and helped us to become the leading helicopter manufacturer in the world on the civil and parapublic market.

Today we are holding our course, determined to adapt, develop and meet our customers' current and future needs. We can do so because our strength is our business model: an activity balanced between civil and military, between mass-produced products and services, a range that covers all needs and a presence around the world.

We can face the future with confidence: we continue to upgrade our current products to make them even safer and more competitive, and prepare the future thanks to a specific effort on innovation, which is an integral part of Airbus Helicopters' DNA.

The H160, a new-generation helicopter, the Racer and the VSR700 are among the new products and demonstrators paving the way for helicopter flight of the future. All this will be done with a constant focus on improving safety, the availability of our aircraft, and their competitiveness in the field.

But this can only be achieved if we prioritise people. As in society as a whole, the men and women at Marignane are at the heart of a powerful dynamic of success, our sole guarantee for maintaining our position among the best in the world. The commitment, passion, and pleasure I see when I meet you, whether in the offices or in the workshops, give me faith in the future that we are writing together.

Rest assured of my full support in the challenges that lie ahead.

Bruno Even
 Chief Executive Officer of Airbus Helicopters

Site directors and Chief Executive Officers

Directors of the Marignane site

Mr Dumax 1938 (intérim)

Mr Avril 1939 - 1940

Mr Decorse 1940 - 1943

Mr Sauvageot 1943 - 1945

Mr Escourrou 1945

Mr Herbstmeyer 1946

Mr Perez 1946 - 1963

Mr Georges Roche 1963 - 1964

Mr Herreng 1964 - 1967

Mr Fernand Carayon 1967-1983

Mr Etienne Lefort 1983 - 1984

Mr Gilles Dousse 1985 - 1986

Mr Jean-François Bigay 1986 - 1988

Mr Jean-Paul Chandez 1988 - 1993

Mr Jean-Pierre Baudry 1993 - 1998

Mr Frédéric Agenet 1998 - 1999

Mr Raymond Lamberti 1999 - 2003

Mr Daniel Dubreuil 2003 - 2004

Mr Eric Arcamone 2004 - 2008

Mr Gérard Goninet 2008 - 2017

Mr Laurent Vergely 2017 to the present day



Marignane is not just a great establishment, it is also a site with a history that has played a key role in the global adventure of helicopter flight.

In truth, it is the Airbus Helicopters flagship, something that gives it many rights but, above all, responsibilities and even more duties. No decisions can be taken without the initiative, acceptance, and support of the Marignane teams.

This book recalls the highlights of these past 80 years that starts with the seaplane, then the plane, and the SE700 rotary wing prototype in 1943.

With the transfer of the Alouette assembly line from the La Courneuve site, the helicopter became the true vocation of Marignane.

After this, despite some highs and lows, the first range of military helicopters gave Aerospatiale a new lease of life.

The end of Puma, Gazelle and Lynx deliveries in the frame of Franco-British cooperation caused serious difficulties for the entire European aeronautical industry.

A great deal of determination and a touch of madness was needed to take the risk of launching a civil range. It is true that its success was not quite as swift as might have been hoped for, but the still much-appreciated Ecureuil, and the Super Puma with its 1,000 units, have shown that it was the right decision.

The Helicopters division was weak and the European industry was under threat. Among the different possible alliances, the foundations for Eurocopter were laid with the agreement with MBB, at the cost of considerable concessions to the Tiger but also on the structuring of capital and sharing of lines. The Tiger was launched but the NH90 also had to be secured with extensive funding by Eurocopter.

However, fortunately, orders arrived very quickly and in large numbers.

Today, the new range of medium-tonne helicopters is taking its place and strengthening Airbus Helicopters' position as the world's leading helicopter manufacturer.

We owe this success to all our staff whose skills, commitment and passion have been unflinching, even at the most difficult times when it was necessary to choose and accept what was essential.

They make us proud of the past and confident in the future of this great company.

Jean-François Bigay

Director of the Marignane site from 1986 to 1988

Director of the Aerospatiale Helicopters Division from 1988 to 1992

Chief Executive Officer of Eurocopter from 1992 to 1998 and from 2000 to 2003



Chief Executive Officers of Eurocopter and Airbus Helicopters

January 1992: Mr Jean-François Bigay and Mr Heinz Plückthun (a)

June 1992: Mr Siegfried Sobotta replaces Mr Heinz Plückthun (b)

July 1998: Mr Patrick Gavin replaces Mr Jean-François Bigay (c)

2000 : Mr Jean-François Bigay

April 2003 : Mr Fabrice Brégier (d)

November 2006 : Mr Lutz Bertling (e)

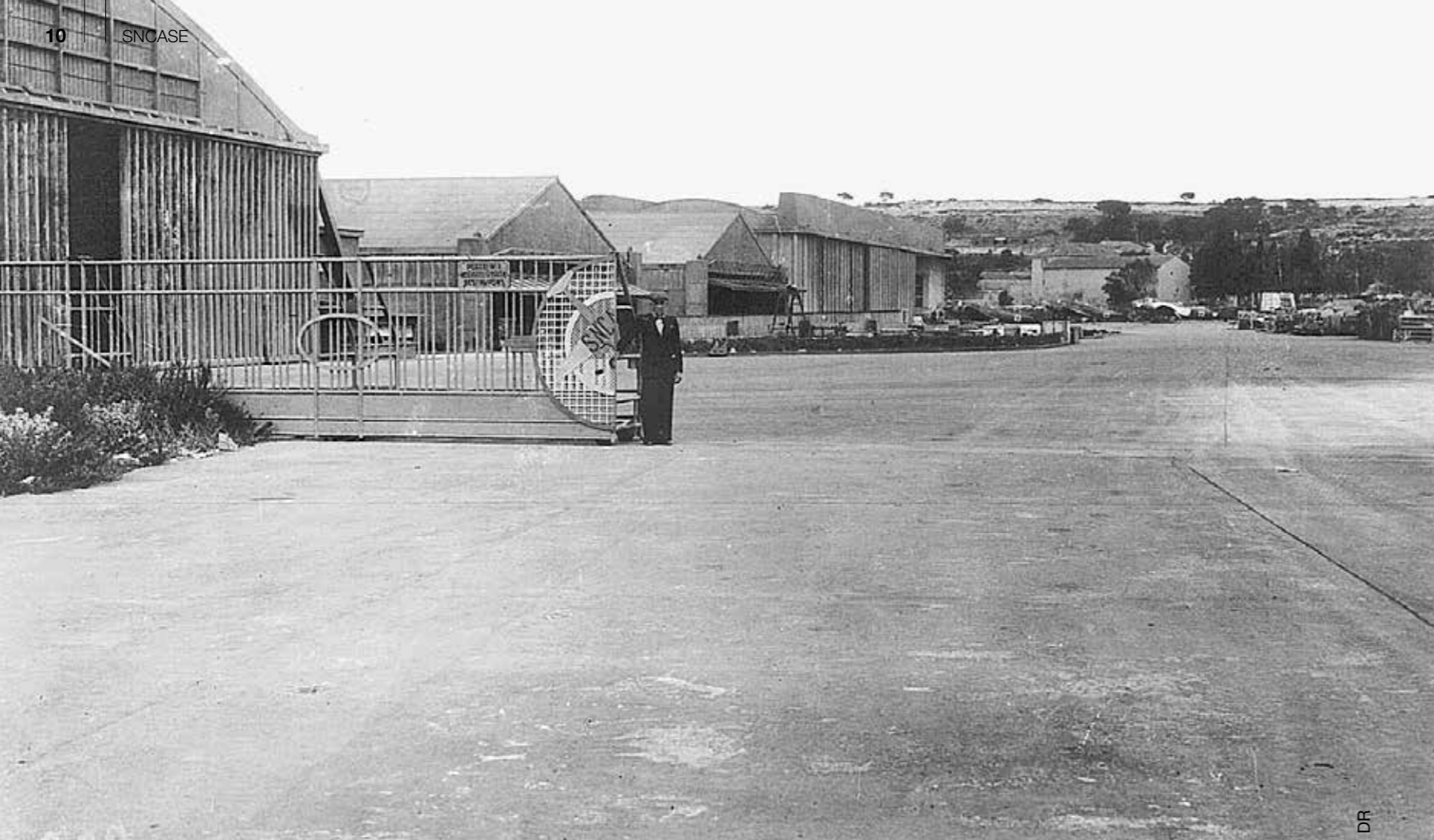
May 2013 : Mr Guillaume Faury (f)

April 2018 : Mr Bruno Even (g)

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The site entrance in 1940-1941.

Did you know?

At that time, the entrance to the factory was on the flightline side, via the road between Saint-Victoret and Berre. Its current location was not created until the late 1950s.

Birth of the Marignane site

1939 Activity at the Marignane site started in February 1939. After the construction of the water tower in December 1938, it was the turn of the first building dedicated to production, called the 50x80 due to its dimensions, to be completed in early February 1939. Equipped with sliding doors that completely opened up its 80 metre facade, the 50x80 had lifting facilities comprising four monorails weighing 1,500 kg. Almost completely destroyed in the bombing of 10 March 1944, it was demolished and rebuilt several years later. From the outset, this building

housed the production of the SE200, a long-haul transatlantic seaplane. The Twins were the next buildings to appear after the 50x80, followed by the central part of the Pavilion, devoted to the site's management: the factory quickly became a vast construction site. The Twins were ready to enter into service in July 1939, but the outbreak of the Second World War in September 1939 halted work on the SE200 to allow for the construction, assembly and finalisation of LeO 45s.

The political context

In May 1936, the Left and the Front Populaire won the legislative elections. The dissatisfaction of the working classes, in particular in the automotive and aeronautical industry, was such that a number of strikes and factory sit-ins succeeded in putting the newly formed government in great difficulty.

The aeronautical industry was in a particularly difficult situation and only the State had the means to make the necessary investments to revive it. Thus, on 2 February 1937, the nationalisation of a large number of French aeronautical factories was announced. It was based on a regional grouping of existing companies to create six national companies: SNAO (West), SNCAN (North), SNCAM (Midi), SNCAC (Centre), SNCASO (South-West) and SNCASE (South-East).

The latter comprised:

- The Aeroplanes H. Potez company (Berre and Vitrolles)
- The Société Provençale de Constructions Aéronautiques (Marseille)
- The Chantiers Aéro-Maritimes de la Seine (Vitrolles)
- The Romano company (Cannes La Bocca)
- The Lioré et Olivier company (Clichy,

Argenteuil, Rochefort, Villacoublay, Antibes) As of that date, these companies produced the LeO 257 bis, LeO HY 43 (seaplanes with folding wings), LeO HY 47 in a long-haul postal version, LeO HY 24.6 and R.80.



The management and administrative services of SNCASE were located on Boulevard National in Marseilles whereas the factories were scattered around southern France. There were many long discussions between these different companies' directors before an agreement was reached on the desired site: Marignane.

Did you know?

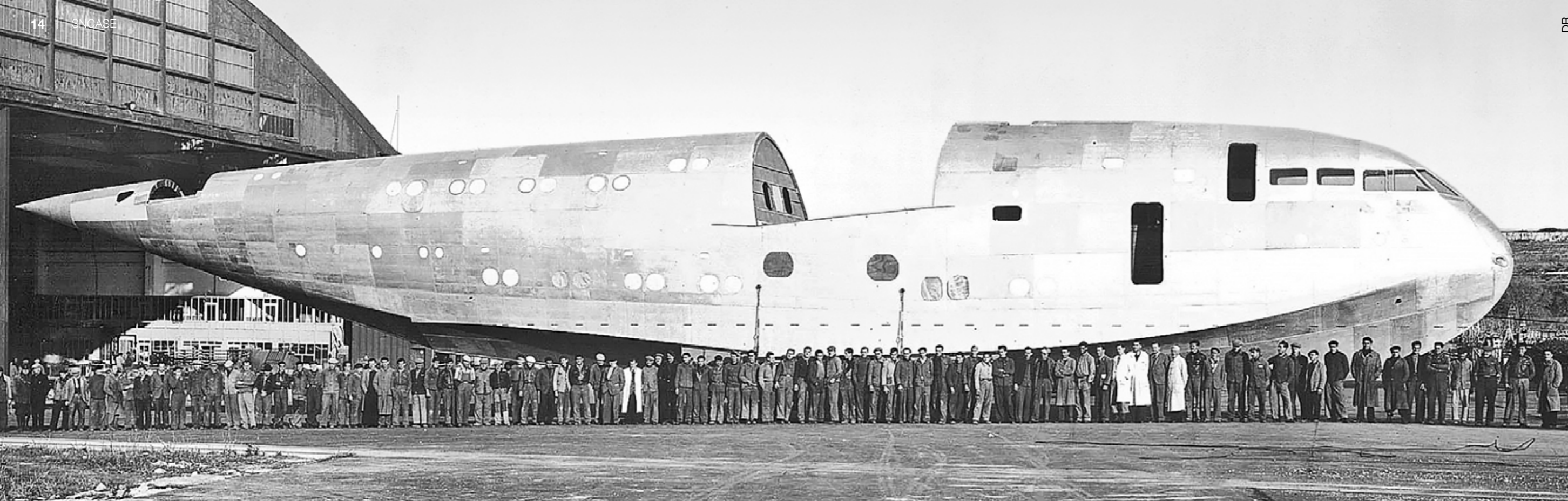
Within four months, in the frame of the aeronautical industry's nationalisation, 23 factories representing 364,000 m² of covered spaces, land, machines, stock, fittings, vehicles, etc. became the property of the State for the sum of 270 million French francs.

Lioré et Olivier factory in Villacoublay in 1935.



1939 -1956
the seaplane and
airplane years





Fuselage of the SE200-01 rollout on 12 December 1941.

Did you know?

The SE200 was rechristened Le Rochambeau.

SE200

The giant of the seas

1939

From its inception, SNCASE devoted itself to finalising the completion of major projects underway at Lioré et Olivier, the most ambitious of which, without a doubt, was the giant transatlantic transport seaplane, the SE200. In November 1938, the French State ordered several of them for Air France. Owing to the surface area required, the assembly of prototype No. 1 started in Marignane in March 1939, in the newly completed 80-metres building. A few months later, at the outbreak of the Second World War, the production of the first two prototypes was halted. Work only started again after the Armistice was signed on 22 June 1940. Completed at the end of July 1942, the SE200 was launched for the first time in September of that year with Jacques Lecarme at the commands, who conducted hydroplaning tests lasting 25 minutes on the Étang de Berre. On 8 October, J. Lecarme again managed to lift it out of the water to reach a speed of 220 km/h for a flight of no more than five minutes and about a dozen metres in the air. Weighing 47 tonnes with eight people aboard, it was the largest seaplane ever to have flown in Europe.

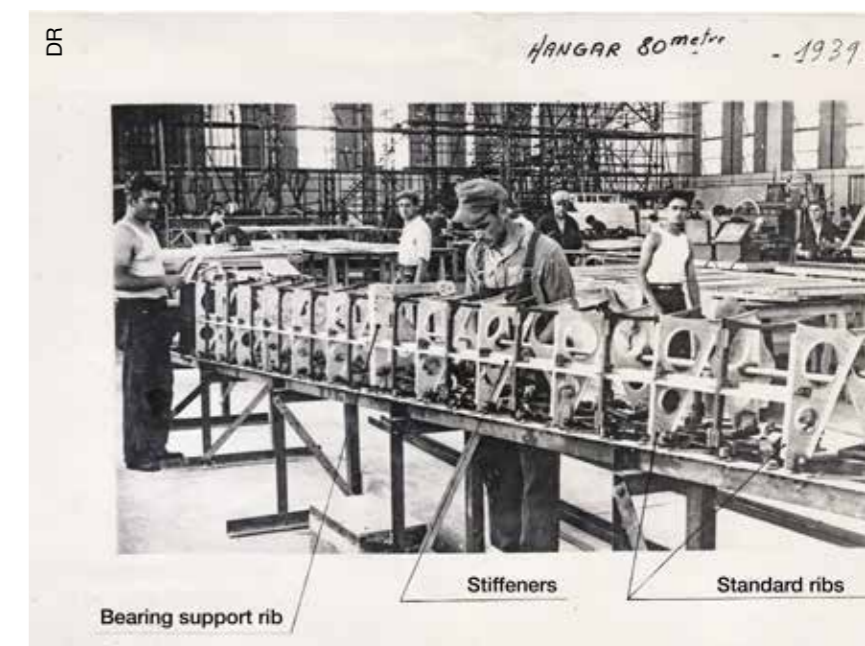
On 12 November 1942, the Marignane

factory was occupied by a detachment of the Wehrmacht. The Free Zone ceased to exist. Nevertheless, on 11 December, the SE200 made its first official flight still with J. Lecarme at the commands. The prototype completed a third test flight on 21 December and, on 28 December, the Secretary of State for Aviation confirmed the contract for the supply of two additional SE200s. This order allowed SNCASE to look to the future with confidence and the prototype returned to the water on 14 January for a fourth test. A flight authorisation request was sent to the German Armistice Commission, the response to which arrived on 15 February 1943: the CAMS 161, LATE 631 and SE200 French transatlantic seaplanes were all prohibited from flying. Therefore, the French authorities decided to transfer the SE200 to the French shore of Lake Geneva where work on a hydroplane base had commenced in December 1942. However, on 18 April 1943, the French Armistice Delegation was informed of the seizure of the two SE200s (and the two LATE 631s).



First element of the SE200-01 fuselage.

80-metre hangar.



Bearing support rib

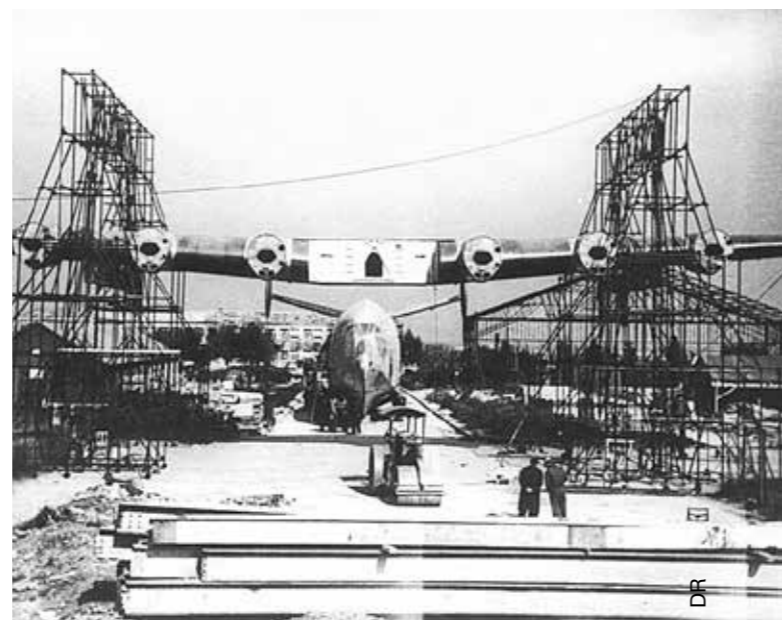
Stiffeners

Standard ribs

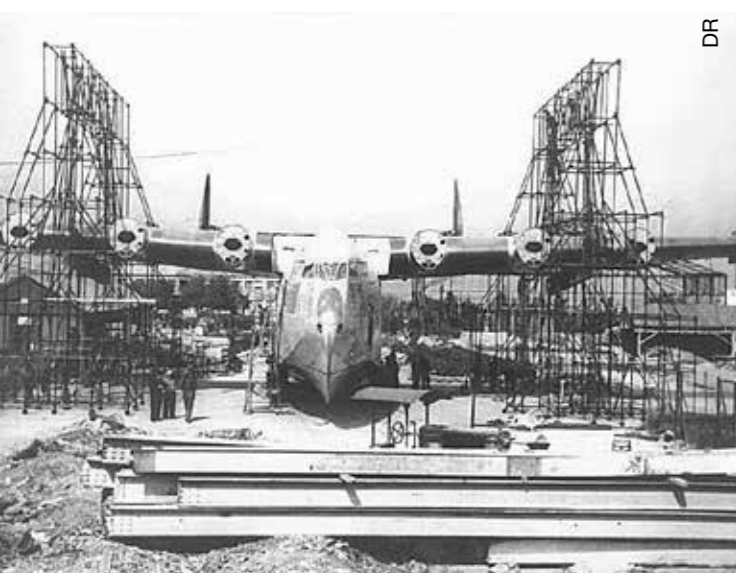
4- The fuselage is transported to the assembly site.



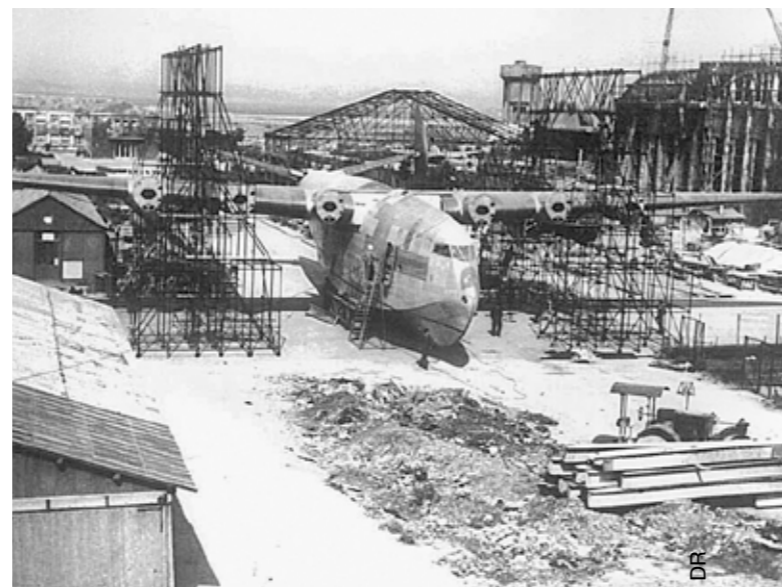
The wings were installed using giant riser platforms.



joining the wings and the fuselage.



The SE200-03 has been joined.



Characteristics of the SE200

- Wingspan: 52.20 m
- Length: 40.15 m
- Height: 9.73 m
- Passengers: 48
- Empty weight: 27,080 kg
- Total weight: 60,670 kg
- Power plant: 6 engines
- Maximum speed: 420 km/h at 4,500 m
- Rate of climb: 2,000 m in 8 min 55 sec
- Service ceiling: 5,000 m
- Operating range: 6,000 km

The next day, Lufthansa informed SNCASE that it was taking charge of the continuation of the tests with the technical team already in place. The tests eventually started again on 23 June

1943 with a one and a half hour flight, in the presence of Hans Werner von Engel, chief pilot of Lufthansa and a leading seaplane specialist. The tests continued until November 1943. On 17 January 1944, the SE200 was requisitioned and transported to Friedrichshafen where it was destroyed on 17 April in an air raid by the RAF. In parallel, work was continuing on the second prototype. It was practically finished when the Marignane site was bombed on 10 March 1944. The aircraft was completely destroyed. The fuselage and the wings of the third prototype almost met the same fate. The reconstruction took more than two years: it made its first flight on 1 May 1946 and participated in a number of flight demonstrations before joining the CEV, where it served as an engine test bench. It was then transferred to the Chamber of Commerce of Marseilles, which exhibited it and offered paying visits. The fourth prototype was almost 90% complete when it was scrapped in 1946-1947. This brought to an end the story of the SE200.

First launch of the SE200-01 in September 1942 flown by Jacques Lecarme.



In October 1945, prototype No. 3 of the SE200 was built outdoors because the building in which it should have been produced was undergoing reconstruction following the bombing on 10 March 1944. This third prototype flew for the first time on 1 May 1946.



LeO 45

the fastest medium bomber of its generation

1939

The LeO 45 is a twin-engine bomber that could carry two tonnes of bombs. This modern, versatile and robust aircraft equipped the French army during the Second World War but was available too late and there were too few examples.

In 1938, the French Air Force placed an order for 749 LeO 45s and asked SNCASE to start production without further delay. The first series aircraft left the factory in 1938.

When war was declared in September 1939, manufacturing of the SE200 was halted to allow for the construction and flight of the LeO 45. Marignane was designated as a factory cooperating in the manufacture of the LeO 45. The assembly line started at the end of March/beginning of April 1940 with the help of a technical

LeO 45 with a modified nose (German version) allowing for an additional machine gun for attacks.

group seconded from Villacoublay specialising in the assembly of LeO 45s. In May 1940, the Marignane factory was producing one LeO 45 a day. Following ultra-rapid development, the LeO 45s manufactured in Marignane that had not yet made their first flight were sent to North Africa. In total, 124 LeO 45s were convoyed between 1 and 26 June 1940.

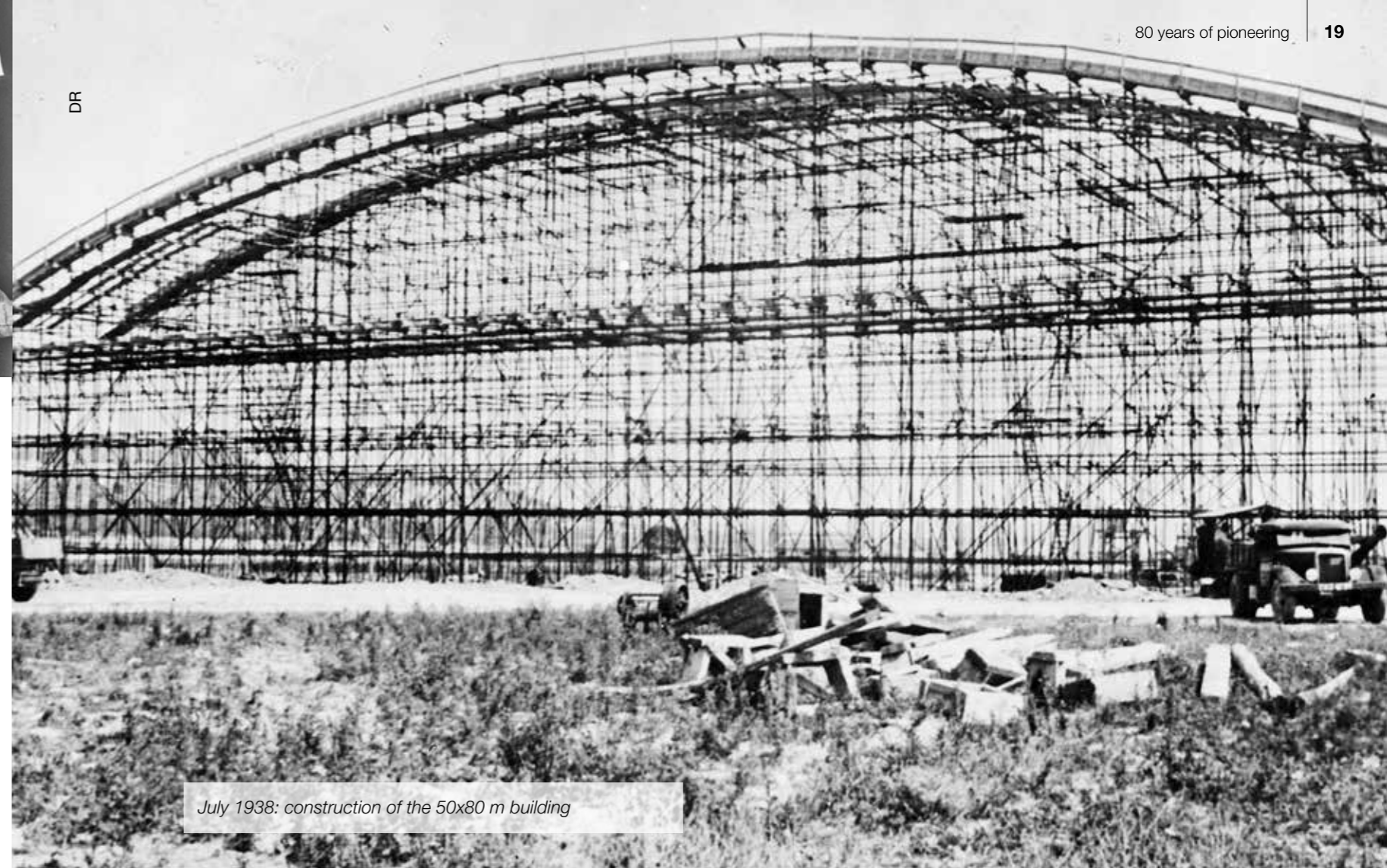
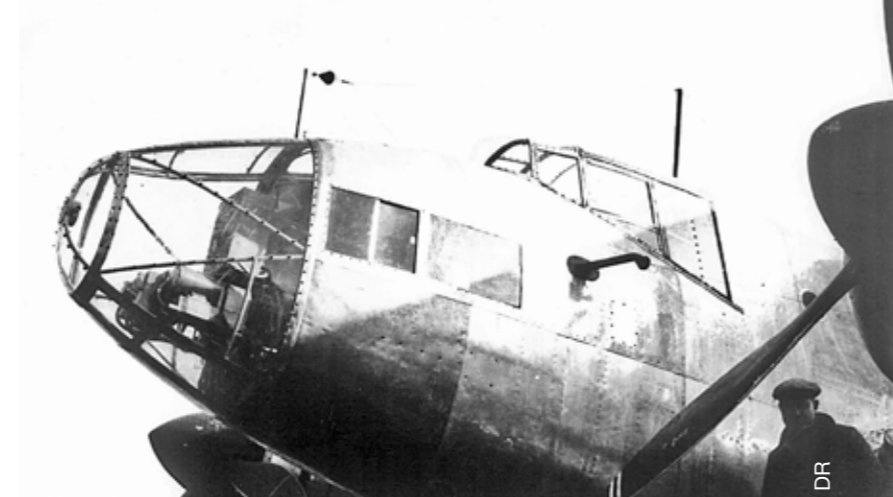
The Germans only became interested in the LeO 45 in 1943. They used it for fuel and troop transport missions, and modifications on standard aircraft commenced in order to accommodate 23 men with their weapons, or six 200-litre drums of petrol.

67 LeO 45 aircraft remained at the end of the war and it was kept in service until September 1957. None of the total 561 aircraft built remain today.

In May 1940, the Marignane factory was producing one LeO 45 a day.



DGA essais en vol



July 1938: construction of the 50x80 m building



The Marignane site seen from the roof of the 50x80 m building (the present-day E1) in 1940-41 with the building «Le Protégé», with its very characteristic shape, on the left.

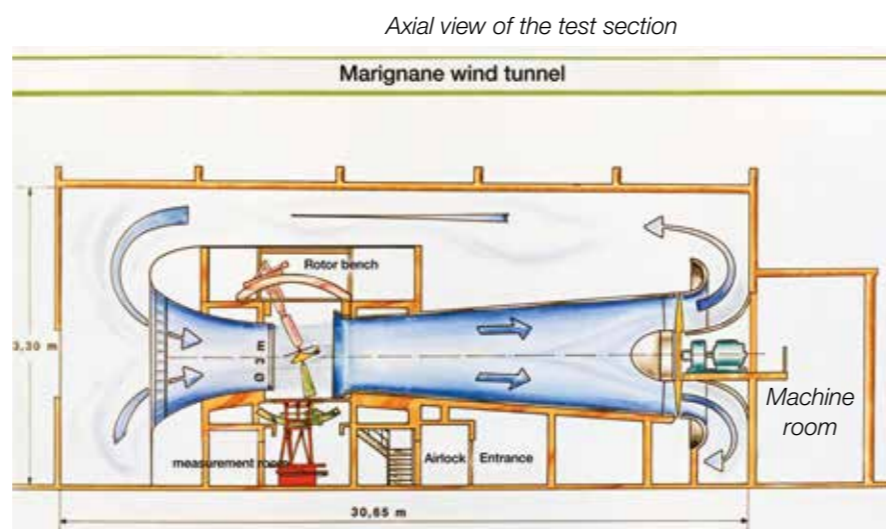


The wind tunnel

1942

Built in 1942, the wind tunnel was especially adapted to study aircraft shapes and fuselages (seaplanes, airplanes, engines, etc.). Mock ups, usually motorised, are the exact scale model of existing aircraft. The upper part of the test section is equipped with a bench fitted with an adjustable rotor 1.5 m in diameter simulating the airflow of a real rotor, and the lower part with a test bench model that can be adjusted to simulate different flight configurations. Thus, it is possible to measure aerodynamic forces on the mock up, the maximum span of which is 2.2 m. The test equipment was validated in 1946-47 and commissioned in 1948 (tests of the SE1010). It was then refitted in 1964 for helicopter testing. An annex building houses offices and test model production workshops.

The wind tunnel is used for research, in particular on the fuselage and the working of the main rotor and the Fenestron® or tail rotor, as well as the definition of aircraft: optimisation of forms, aerodynamic characteristics (stability), or the study of internal airflow (air intake, etc.), the adjustment of prototypes and optional equipment (weapon systems, floatation equipment, etc.), and various studies such as demonstrators (X³, etc.).



The SE700, first steps towards rotary wings

A wooden gyroplane drawn by Pierre Etienne Mercier

In 1934, the engineer Pierre Renoux was entrusted with gyroplane studies within the Lioré et Olivier company, which had just acquired the licence for the gyroplane La Cierva C30. P. Renoux drew inspiration from this 800 kg two-seater and the SE100, a twin-engine fighter plane, to design the SE700, a wooden gyroplane by Pierre Etienne Mercier. The construction of the first prototype started in 1942 in the new prototype workshop on the ground floor of the «Le Protégé» building in Marignane. Flight tests started in 1943. This was the Marignane site's first step in the field of rotary wings. However, the aircraft was involved in several accidents, notably in January 1946 during a gear retraction in-flight test. Engine cooling problems seriously hampered the SE700's career. Its engine was finally approved in January 1947 even though

the French Minister of Armaments ordered the halt of all the studies and works in progress. Only the second prototype (SE700A), equipped with a more powerful engine (Béarn 6D-07 developing 330 cv), was spared to finalise the engine transmission endurance tests. This decision was accompanied by a threat to terminate the contract. Two accidents that occurred during ground run-ups in the following months sealed the fate of the SE700 once and for all. The contract was terminated. The SE700A never flew again. The SNCASE realised that the gyroplane was now obsolete in relation to helicopters and undertook the design and production of the SE3101 and SE3000 prototypes, presaging the advent of the future Alouette.

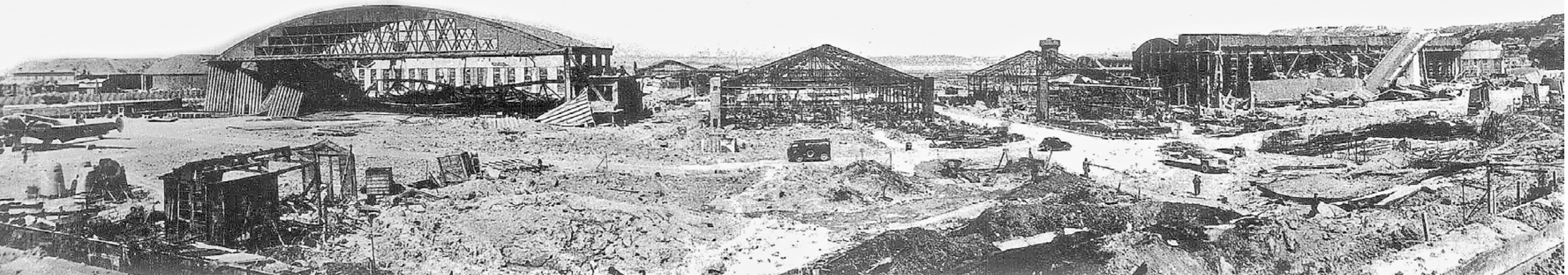
1943



SE700 flight tests started in 1943.

Did you know?

For fear of bombing, two airframes of the SE700 that were being assembled were stored temporarily in premises rented near Berre.



General view of the destroyed factory.

Dark times

On 10 March 1944, between 1:30 am and 2:00 am, AVRO Lancasters from the No. 5 Group of the Royal Air Force bombed the SNCASE Marignane factory where LeO 45s destined for the Luftwaffe were produced. They dropped 95 explosive devices and a thousand explosive bombs. 80 strikes were counted within the factory's perimeter. Aircraft being tested, especially LeO 45s, were completely destroyed. The Twin hangars were 50% destroyed and the concrete main beam crushed the front part of the SE200 No.2. The «Protégé» hangar was hit by two bombs. The first cut through the northwest

arch, the second pierced the vault and concrete blocks destroyed the floor, and some of the machine tools in the basement were damaged.

Miraculously, the water tower was spared and very quickly repaired, whereas the surrounding buildings were almost completely wiped out. The west wing of the management pavilion was partially destroyed. In the early hours, it was almost completely impossible to recognise the factory or identify buildings, such had been the violence of the bombing.



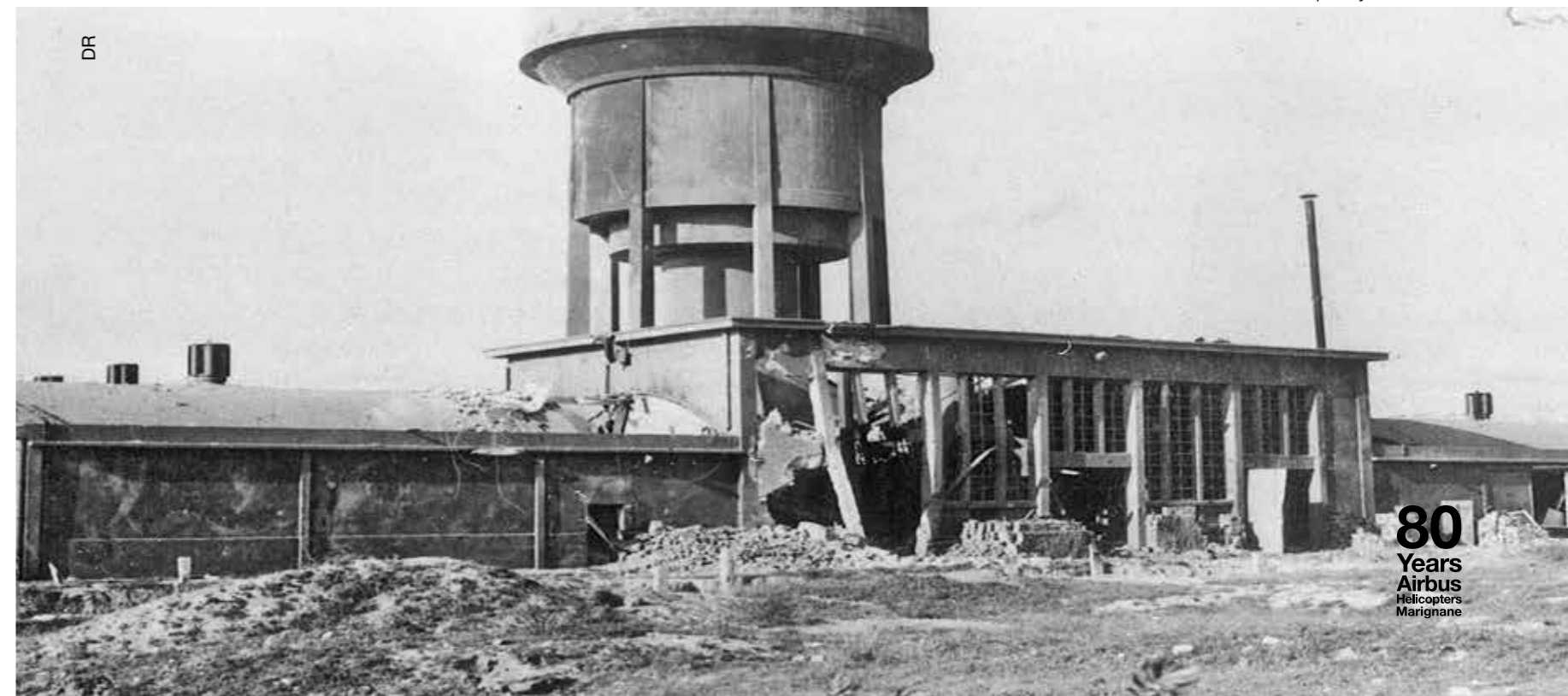
DR

M hangar destroyed by 250 to 500 kg bombs.



DR

The hangar housing the garage was completely destroyed, whereas the wind tunnel in the background appears not to have suffered.



DR

The water tower was miraculously spared, which allowed the site's reconstruction to get underway very quickly.

The Vampire

More than 400 units made

1949 Upon the Liberation of France, French aviation, which did not have any jet aircraft, had to equip itself with effective aircraft, whether imported or, if possible, manufactured under licence. Manufacturing was entrusted to SNCASE at its Marignane site.

The first fighter jets mass delivered to France were the DH 100 "Vampire", designed by the British manufacturer De Havilland. This twin-boom fighter jet was a single-seater aircraft built mainly out of wood. These aircraft very quickly met all expectations despite their relatively low speed, and allowed for a development that was much simpler and very useful to the French army.

The first 90 aircraft were delivered directly to the French army by the RAF between 1948 and 1950. Fourteen ready-to-assemble kits, 31 structural elements, and 22 sets of parts were delivered to us by De Havilland. In total, 210 Vampires were to be convoyed via Marignane between June 1949 and September 1951. In actual fact, more than twice that number (434) were built at Marignane.

The assembly line was set up in building L. At the request of the Air Ministry, the Design Office studied the replacement of the Goblin jet engine with a Rolls Royce "Nene 102" built under licence. The new aircraft powered with this engine was called the MK 53 Mistral. It attracted the interest of the French navy (a hundred units) and the French air force. There were then talks of a series of 535 aircraft. Eventually though, production was suspended in 1954 after the 150th aircraft was manufactured. At full pace, production reached 15 aircraft per month for the Vampire-Mistral and seven for the Aquilon, a version with folding wings designed for the French navy. This pace was equivalent to one aircraft per working day a performance which staff were able to achieve thanks to their ability to adapt to mass production.

Did you know?

Ejector seat : On 23 January 1953, the Mistral No. 98, the first equipped with an ejector seat, crashed. The ejection command worked perfectly and the pilot, who was none other than Jean Boulet, reached the ground safe and sound. He had just carried out a real-life test on the ejector seat!

Records :the double achievement of Jacqueline Auriol

The famous test pilot Jacqueline Auriol beat the world record in a closed circuit, first aboard a Vampire in May 1951 (more than 618 km/h) and in December 1952 aboard a Mistral (about 856 km/h), with both aircraft having been produced by the Marignane lines.

We should also remember that it was aboard the Vampires assembled in Marignane that the "Patrouille de France" performed its first acrobatics using jet planes at the start of the 1950s.



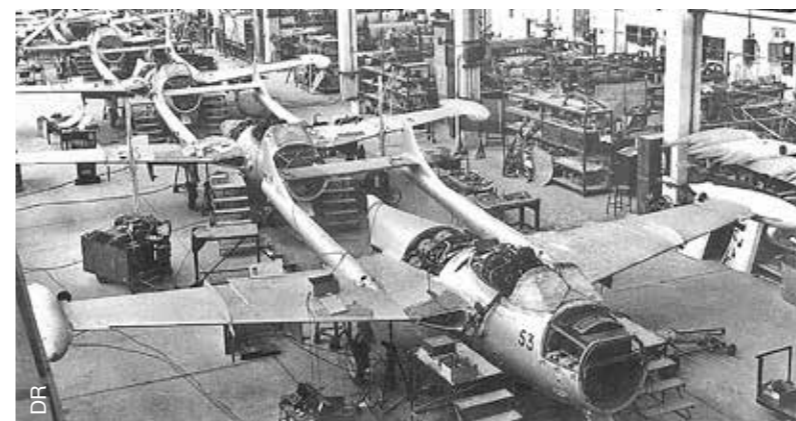
Vampires as far as the eye can see in front of the Twins (present-day building C).

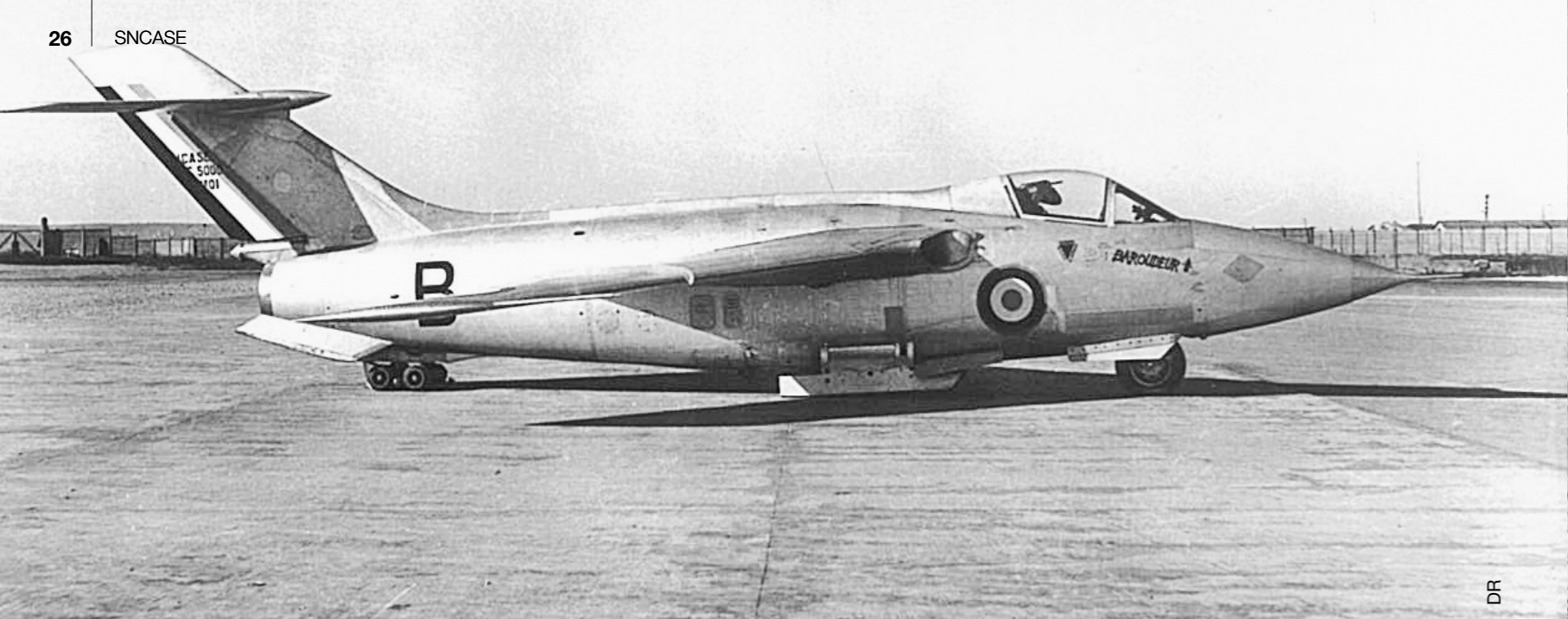


The Vampire assembly line was installed in building L (present-day building N).



The Aquilon, the Navy version of the Vampire.





DR

The objective of the Baroudeur was to be able to take off and land on all types of terrain.

The SE5000

known as the Baroudeur

1953

The first flight of the very first prototype of the SE5000 took place on 1 August 1953 in Istres. Flown by Pierre Maulandi, the plane took off 21 months after the start of its design project in October 1951 in La Courneuve. A remarkable achievement! The second prototype took to the air a few months later on 12 May 1954. It was followed by three pre-series aircraft ordered by the French official services.

The Baroudeur was a single-engine light bomber capable of taking off from a trolley which it left on the ground, landing on skids in the same way as a glider. The trolley was attached to the aircraft up until take off speed and it then separated and self-braked from the aircraft after being released by the pilot. It was designed to be able to take off and land on all types of ground, which was demonstrated in particular on sand and snow.

The complete wings, the stabilisers, assembly, tests, development and flight tests for this aircraft were all produced and performed at the Marignane site.

The five prototypes performed a number of flight demonstrations in France in 1955 and 1956. However, despite its outstanding participation in the NATO lightweight fighter competition, the Baroudeur lost out to the Fiat G.91 and the project was abandoned.

Pierre Maulandi, known as Tito, at the commands of the Baroudeur.

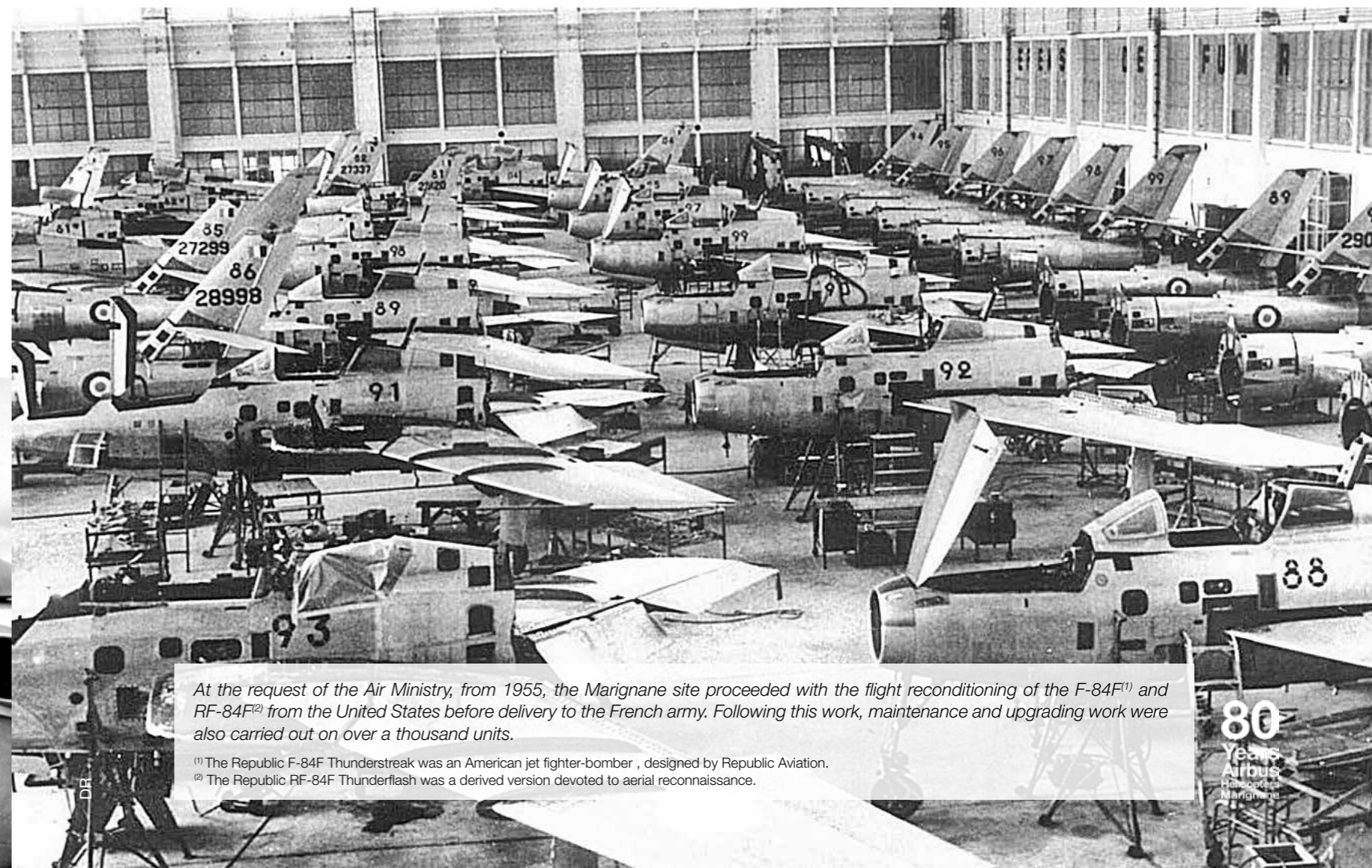


DR



Aerial view of the Marignane site in 1953..

DR



At the request of the Air Ministry, from 1955, the Marignane site proceeded with the flight conditioning of the F-84F⁽¹⁾ and RF-84F⁽²⁾ from the United States before delivery to the French army. Following this work, maintenance and upgrading work were also carried out on over a thousand units.

⁽¹⁾ The Republic F-84F Thunderstreak was an American jet fighter-bomber, designed by Republic Aviation.
⁽²⁾ The Republic RF-84F Thunderflash was a derived version devoted to aerial reconnaissance.

Did you know?

The Baroudeur's trolley weighed 1.3 tonnes and reached a speed of 200 km/h at the moment of its separation from the aircraft. During the tests it was equipped with JATO (Jet Assisted Take Off) rockets.

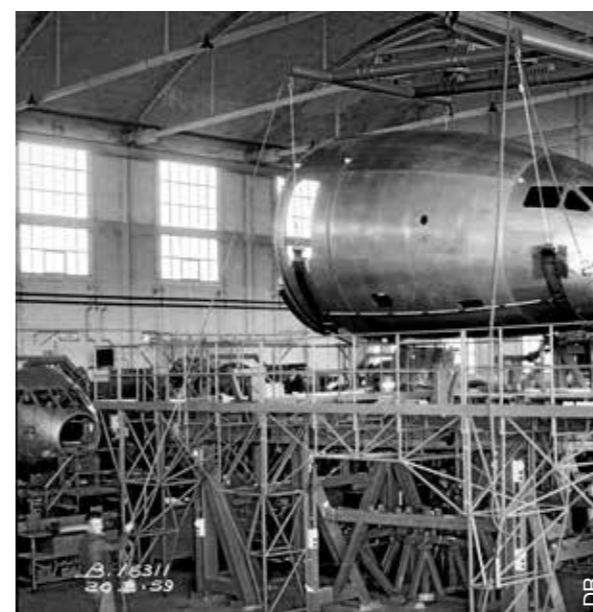


Le SE210 Caravelle

The Marignane site has made a significant contribution to the manufacture of the Caravelle – and in more than one capacity. It all began in 1955 with the construction of the first 28 equipped nose sections (up to part 7). Production of the engine nacelles, including their titanium and stainless steel air intakes, also started here at the end of 1955. Subsequently, in view of the workload at the Toulouse site, the next section (up to part 16, after the passenger door) was transferred to Marignane. The first fixed plans manufactured at Marignane were then subcontracted to Fiat. In January 1957, 277 operators were working on the Caravelle, thus occupying the majority of the production staff.

The nose sections of series III and IV, including all their equipment (flight controls, engine controls, instrument panels, hot and cold air conditioning, complete hydraulic system, extinguishers, electricity, radio, soundproofing) were all built in Marignane. In April 1964, this

In January 1957, 277 operators were working on the Caravelle, thus occupying the majority of the production staff.



Did you know?

282 Caravelles were built (including two prototypes), which were used by more than 100 airlines around the world.

distribution of workload was reviewed in favour of Toulouse and, after that, the structures were delivered bare. They were transported by special convoy from Marignane to Toulouse at a rate of one per week. It should also be noted that all of the Caravelle's plexiglass windows were manufactured in Marignane. The operators referred to them as "Olida" after the shape of the cans of ham produced by this company.

1956

The Fouga Magister

or the story of the «small train»

1956

It all started in February 1956 when the Ossun factory was put in charge of manufacturing 20 equipped Fouga Magister fuselages for the CM.170. The Marignane factory took over from the 21st unit in April 1956. In total, 228 assemblies were produced by Marignane up until September 1960. The assembly line was set up south of hangar L which registered up to 100,000 hours of work a month with a pace of eight. The fuselage was made up of three sections assembled on trolleys that were

brought together for jointing. The operation was called «the small train». For the last phase of the process, an operator, preferably one of small stature, was enclosed in the fuselage during jointing and was released only once the final operation was complete. The fuselages were then installed on rotating structures that allowed them to be tilted in order to provide better access for the operators employed on this workstation.

Did you know?

Two prototypes were produced: the first with «V»-shaped stabilisers and the second with standard stabilisers. Despite the crash of the prototype with «V»-shaped stabilisers, this aerodynamic solution was selected for the series versions because, in the event of a serious problem, it would allow the pilot to be able to escape from the aircraft by jumping directly from the cockpit without any risk of being struck by the fins. It would also help to avoid disturbing the flow of gas produced by the engines.

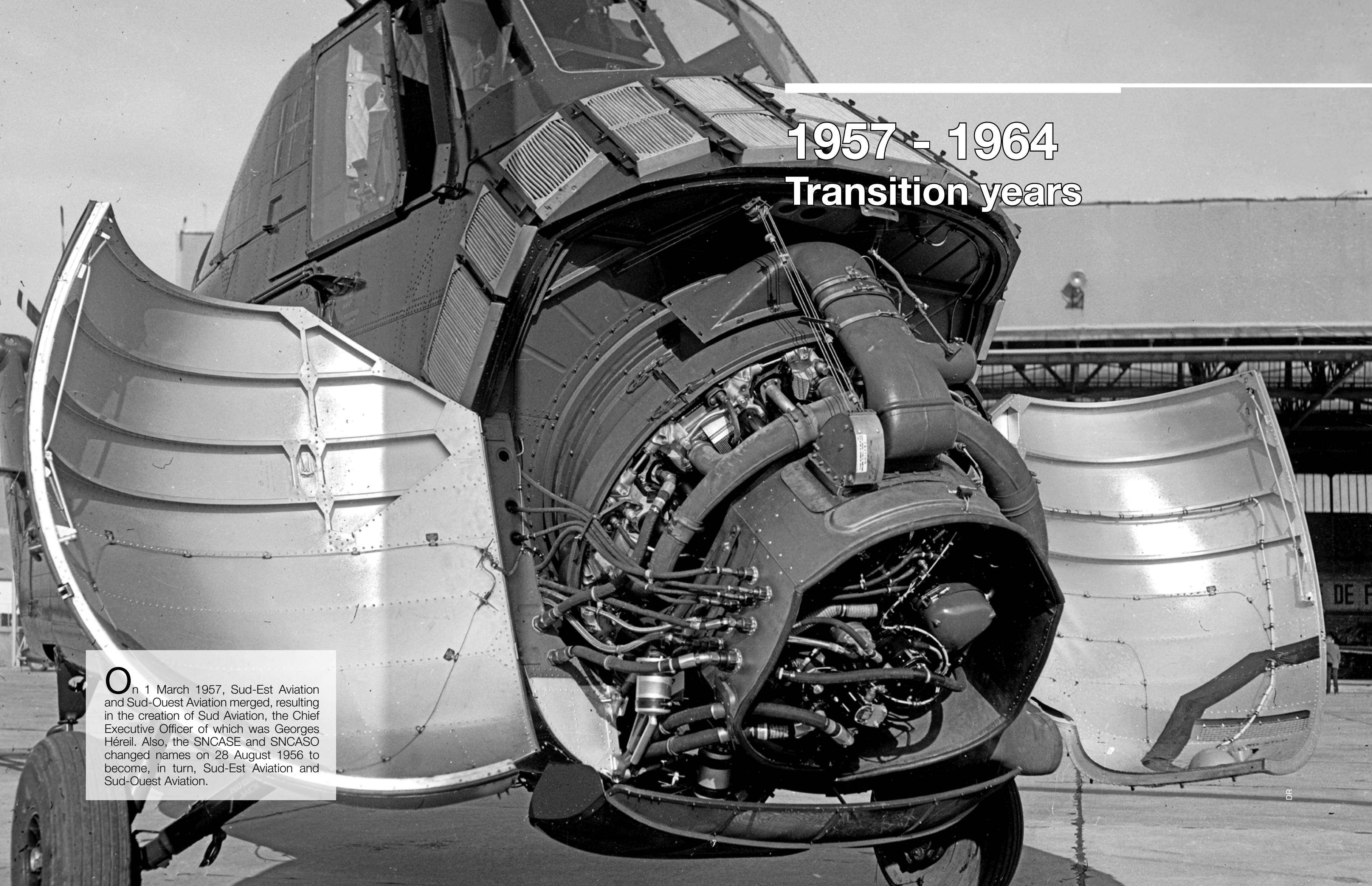


Construction of building L (upper factory) in September 1957.



Construction of the Marignane site's new entrance in September 1957.





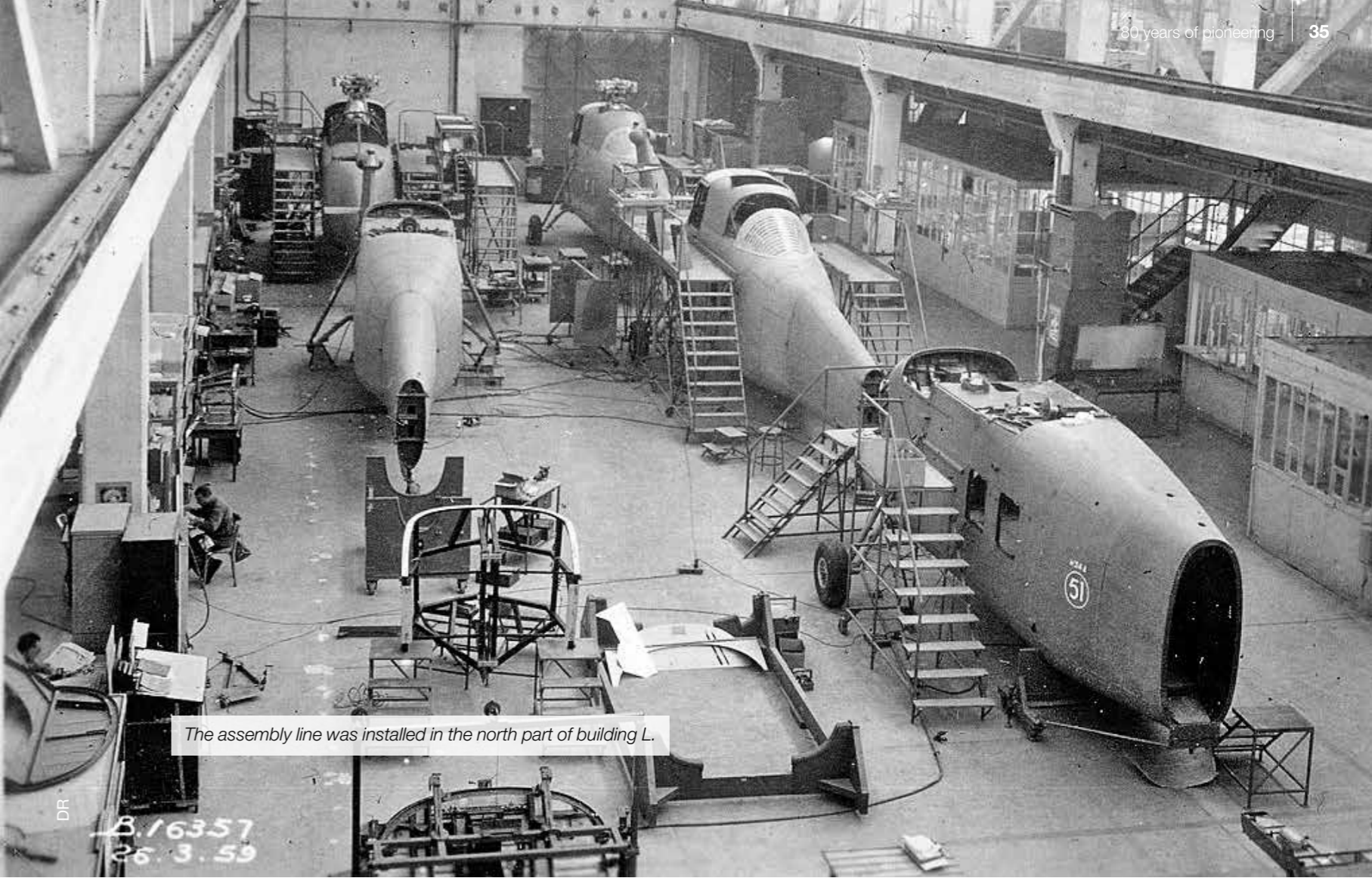
1957 - 1964

Transition years

On 1 March 1957, Sud-Est Aviation and Sud-Ouest Aviation merged, resulting in the creation of Sud Aviation, the Chief Executive Officer of which was Georges Hérel. Also, the SNCASE and SNCASO changed names on 28 August 1956 to become, in turn, Sud-Est Aviation and Sud-Ouest Aviation.



DR
B.16405



The assembly line was installed in the north part of building L.

DR
B.16357
26.3.59

The S58, the first mass-produced helicopter in Marignane

1957

Everything started in October 1956 when a mission comprising technicians from Marignane visited Sikorsky in the United States. Objective: to study the production in France under licence of the S58 (called H-34 in the American army). The French State had bought some from Sikorsky, but it wanted to free itself as soon as possible of the potential problems of this solution, or at least some of them, with the supplies needed to produce certain assemblies coming from the United States.

With almost all of this aircraft being made with magnesium and laminate, the implementation of new forming and hot stamping means was required for these materials. Laminates were becoming better known and their development allowed them to replace the American supplies, which were expensive. About 200 aircraft were built between 1957 and 1962 for ALAT (French Army Light Aviation) and the Navy under the

name H.S.S. The assembly line was installed in the north part of hangar L. For the first time, the Marignane site welcomed the series production of a helicopter.

Did you know?
The S58 made its first flight on 8 March 1954. Its different missions included utility transport, anti-submarine warfare, search and rescue missions (SAR), and VIP transport. In the standard transport version, the helicopter could carry between 12 and 16 soldiers or eight people on stretchers.

In order to improve its capacities, the French Air Force commissioned a feasibility study from Sud Aviation for the re-engineing of the H-34 (aka S58). The study on coupling two interconnected turbine engines to the same shaft was carried out. The first aircraft was named H-34 BB (for BiBastan). It made its first flight on 5 October 1962.



DR

The SE116

known as the Voltigeur

1958

During the first quarter of 1956, discussions were held on production of the SE116, a twin-engine ground support aircraft, the study of which was conducted entirely by the Marignane design office. On 11 June 1956, these led to an order for two prototypes, one with French turboprops (Turbomeca), the other with American engines (Wright). The SE116-01 flew for the first time on 13 December 1958. But on 9 January 1959, the second prototype crashed near the Alpilles Mountains killing the three crew members. The production of its successor, the SE117, to which certain improvements had been made, continued. It flew for the first time in December 1959 and although it met expectations, production of the Voltigeur was stopped because of the lack of a market.

Did you know?

In January 1957, 67 employees were working on the SE116 at Marignane.



DR



DR

From left to right: Jean Poitou, the «father» of the Voltigeur, and Roger Carpentier, pilot of the SE116.

The SE116 flew for the first time on 13 December 1958.

DR



Marignane moves to nuclear

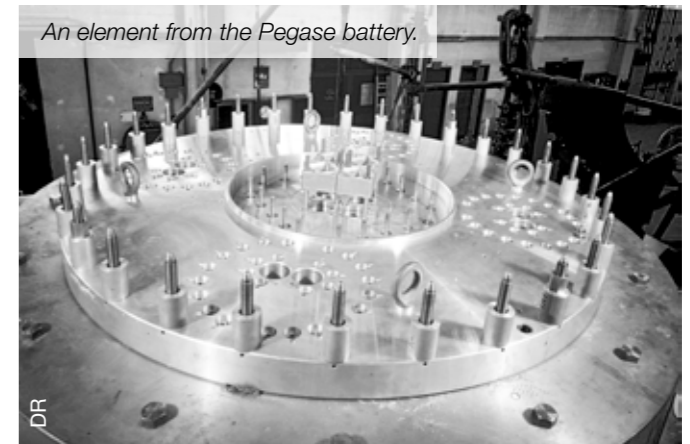
From 1961, the French State commissioned studies and special productions from Sud Aviation for the CEA (French Atomic Energy Commission) and its nuclear plants: the Pegase, Isis, Osiris batteries; and the Célestin and EL4 reactors for Cadarache, Saclay, Marcoule, and Brennilis. These orders provided Marignane with work up until 1968.

The Marignane factory was awarded the production contract for the Pegase battery on 17 May 1961. Sud Aviation was in charge of the design, the production in a thick alloy, and the installation of the battery at Cadarache with Propeg, the industrial designer. The conditions imposed by the CEA for nuclear security were drastic and new for Sud Aviation. The Pegase atomic battery was put into operation on 4 April 1963.

Following this success, Sud Aviation received an order for the Isis and Osiris battery containers for the CEA in Saclay. The cylinders and mechanisms for these batteries were designed and produced in Marignane, which acquired the necessary technology and machine tools.

In 1965, a new contract concerning the production of the Célestin I and II reactors for the CEA in Marcoule continued to provide work for Sud Aviation. The Marignane site was in charge of the equipment for the fuel channels and lithium for the two reactors.

That same year, Sud Aviation produced the 216 channels for the EL4 reactor that was going to be installed at the Brennilis site in Brittany. Each of these channels included several elements of an average diameter of 100 mm and measuring four metres long, and two mobile units comprising



An element from the Pegase battery.

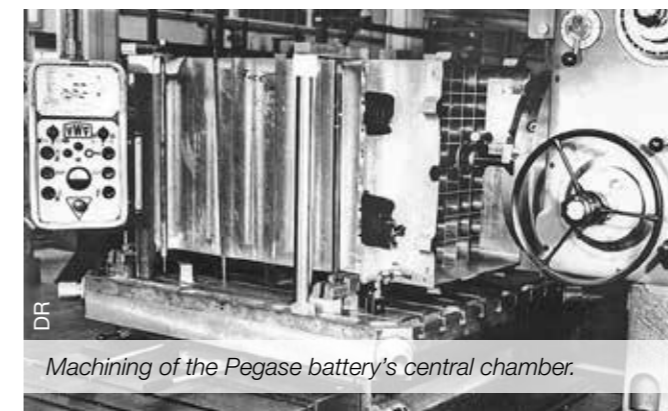
DR

plugs that would hold the combustible. Despite the difficulties encountered during production, delivery was made according to schedule on 4 November 1966.

Finally, in 1967, the CEA in Cadarache commissioned test loops and two models of its Phenix reactor from Sud Aviation. The latter were made in «polymer optical fibre» Plexiglass in Marignane. They were to be used to train technicians in charge of the reactors' hydraulics.



Trial assembly of the Pegase battery in M hangar.



Machining of the Pegase battery's central chamber.

DR

DR

1961



The shaft sections were loaded into the Super Guppy, specially chartered for this occasion, to be transported to Toulouse where the assembly line was based.



Shaft section 12 weighed 2.5 tonnes once equipped.

Concorde

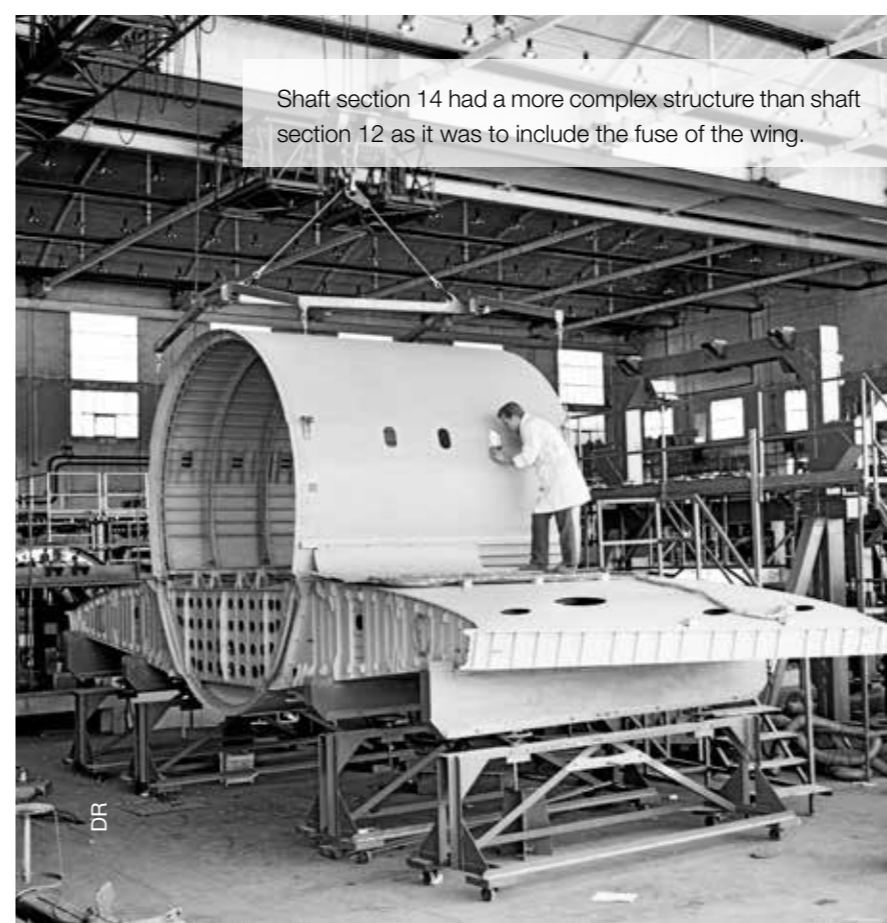
shaft sections 12 and 14

1964

80
Years
Airbus
Helicopters
Marignane

The Marignane site was involved in the great adventure of the Concorde. From July 1963 at the request of general management, a team from Marignane made contact with the British company Bristol for the production of certain parts of the Concorde, which were being manufactured in cooperation. This collaboration was put into practice in the form of fuselage shaft sections 12 and 14 for the manufacturing of the prototype in 1964. Shaft section 14 had a more complex structure as it was to include the fuse of the wing. In light of the quality and the degree of finish required, special tools were developed and produced. In addition, the machining required the

installation of new equipment. The shaft sections were loaded into the Super Guppy, specially chartered for this occasion, to be transported to Toulouse where the Concorde assembly line was based. A total of 16 sets of shaft sections were manufactured at Marignane. Shaft section 12, which measured eight metres in length and three metres in diameter, weighed 2.5 tonnes once equipped. Shaft section 14, at two metres long and with a wingspan of 10 metres, weighed 1,400 kg once equipped.



Shaft section 14 had a more complex structure than shaft section 12 as it was to include the fuse of the wing.

Did you know?

In 1967, 74 Concorde orders and special requests were placed by 16 airlines. But, at the start of 1973, sales collapsed as a result of the oil crisis. Ultimately, only 16 mass-produced aircraft were built and allocated to two airlines, Air France and British Airways. Commercial operation of the Concorde started in January 1976 and ended in 2003.



DR

80
Years
Airbus
Helicopters
Marignane

1962 - 1969

**The start of helicopters
made in-house**



René Mouille

A helicopter legend

1962

Born on 30 October 1924, this French engineer was a graduate of ICAM (Catholic Institute of Arts and Trades of Lille) and ESTAé (Aeronautical College of Paris). René Mouille joined SNCASE as early as 1945, thus sparking his passion for helicopters at a time when this technology was just beginning to emerge.

He was the man behind the design of the SE3120 (Alouette I), which, flown by Jean Boulet, broke the world record in 1953 for distance in a closed circuit.

In 1954, he was put in charge of the Frelon's test and study programmes, which would go on to become the basis for the Super Frelon, particularly for its 5-blade tail rotor (Sikorsky type), and which was later adapted for the Puma. René Mouille notched up a long list of designs and successes: the Alouette II (the first French helicopter equipped with one turbine) in 1955, the Alouette III in 1958, the Super Frelon in 1962, the Puma in 1964, the Gazelle in 1967, the Dauphin and then the Ecureuil in the 1970s. In 1963, he was put in charge of the Puma programme, his tasks ranging from development through to the certification stage.

A master of innovation...

He filed numerous patents throughout his career, including that of the NAT (non-drag hinged) hub with viscoelastic dampers, the famous Fenestron®, but also for several rotors still in use today, including Starflex (streamlined simplification and maintenance).

He also invented the SARIB suspension system (antivibration system with resonators integrated in the bars). He initiated the use of composite materials, including for rotors (Starflex), resulting in significant weight savings for helicopters. He was also a pioneer in the field of laminated glass/resin blades (higher resistance, reduced weight). René Mouille's inventions and those of his contemporaries still equip helicopters today and are hailed by foreign manufacturers that use them on their aircraft.

Over the course of his exceptional career, René Mouille received numerous awards in France



René Mouille passed away at the age of 95 on 10 January 2019.

The main patents out of the 40 he filed:

- «Fenestron®» ducted tail rotor (Mouille, Tresch, Mao) 1966
- Super Frelon MGB (main gear box) (Mouille, Tresch) 1966
- Fenestron® propeller for combinations (Mouille, Bouquardez) 1966
- MIR hub (integrated rigid hub) (Mouille) 1968
- NAT hub (non-drag hinged hub) (Mouille) 1969
- STARFLEX composite hub (Mouille, Coffy, Hancart, Mao) 1973
- Tail rotor with hinged blade (Mouille) 1975
- BMR hingeless hub (Mouille) 1977
- SPHERIFLEX hub (main & tail rotor) (Mouille) 1978
- SARIB 1 suspension (Mouille, Genoux, Hagé) 1980
- SARIB 2 suspension with diaphragm (Mouille) 1981
- SPHERIFLEX tail rotor hub (Mouille) 1985

(Médaille de l'Aéronautique, Chevalier de l'Ordre National du Mérite, Chevalier de la Légion d'Honneur), as well as the Alexander Klemin Award and Honorary Fellowship in the United States for the invention of the Fenestron®. René Mouille and the test pilot Jean Boulet were integral in developing the French helicopter industry.

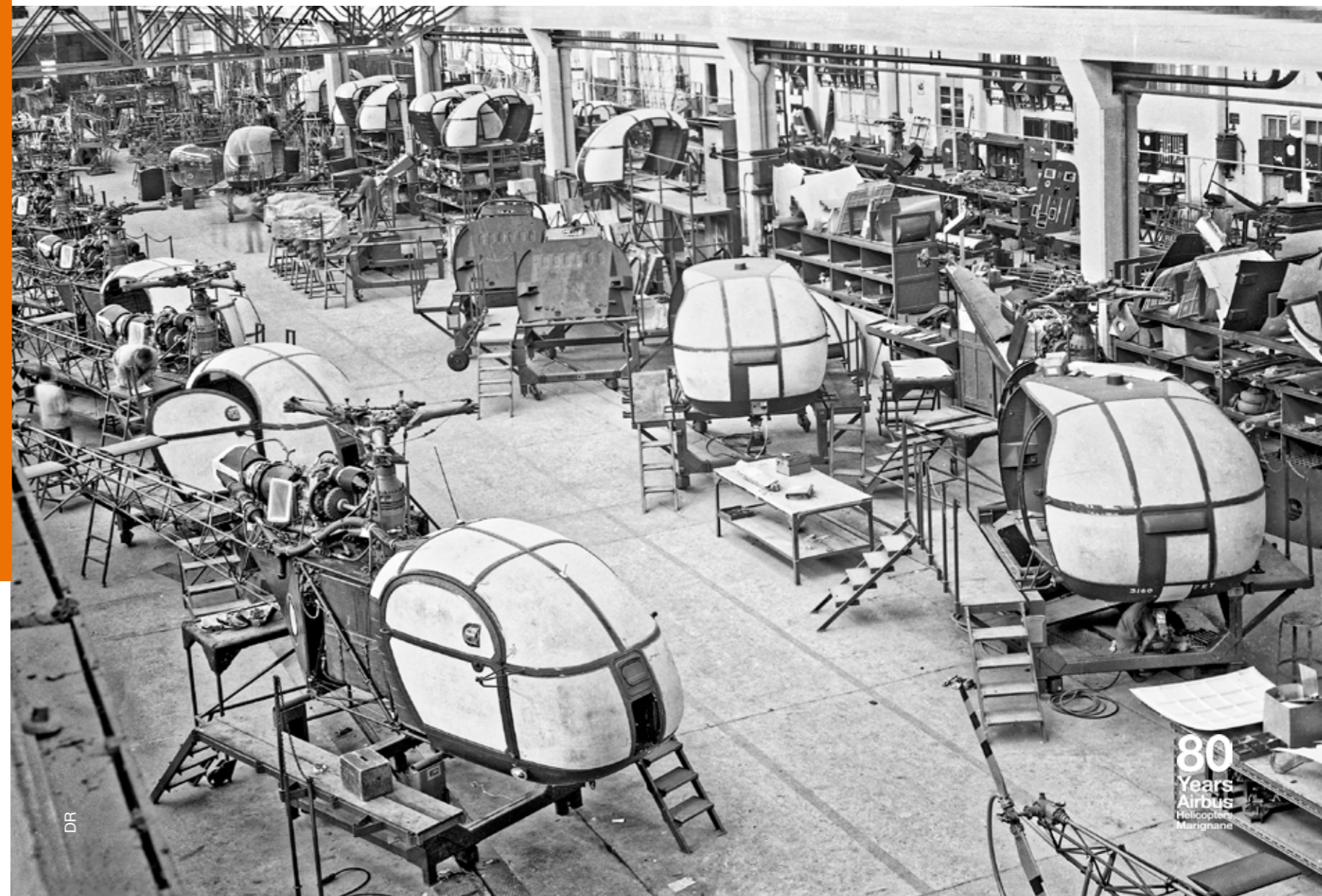
The transfer from La Courneuve to Marignane

The increased design, testing and production workload rendered installation of equipment and resources on the La Courneuve site problematic due to its limited area. In 1960, the decision was made to install the future Alouette III assembly line at Marignane and also to assemble the SA3210 Super Frelon at the same site. On 29 March 1961, another decision was made – to transfer the Alouette II assembly line to Marignane while maintaining the Helicopters design office and blade manufacturing activity at La Courneuve. The first Alouette II to be transferred was the 540th one produced. To ensure continuity of deliveries

to customers, the new Alouette II assembly line at Marignane and that in La Courneuve operated in parallel until the end of 1961. Also at the end of 1961, flight test activity was moved from its hangar at Le Bourget to Marignane. A total of 601 helicopters were built at La Courneuve over a five-year period.

In February 1963, the Helicopters design office moved to Marignane in order to bring together all helicopter engineering resources. A new chapter in the history of the site's activity – which up until then had focused on planes – started with helicopters.

1962





The Super Frelon flew for the first time on 7 December 1962. From left to right: Jean Boulet, Roland Coffignot, Jean-Marie Besse, Joseph Turchini and Henri Petit.

DR

The Super Frelon

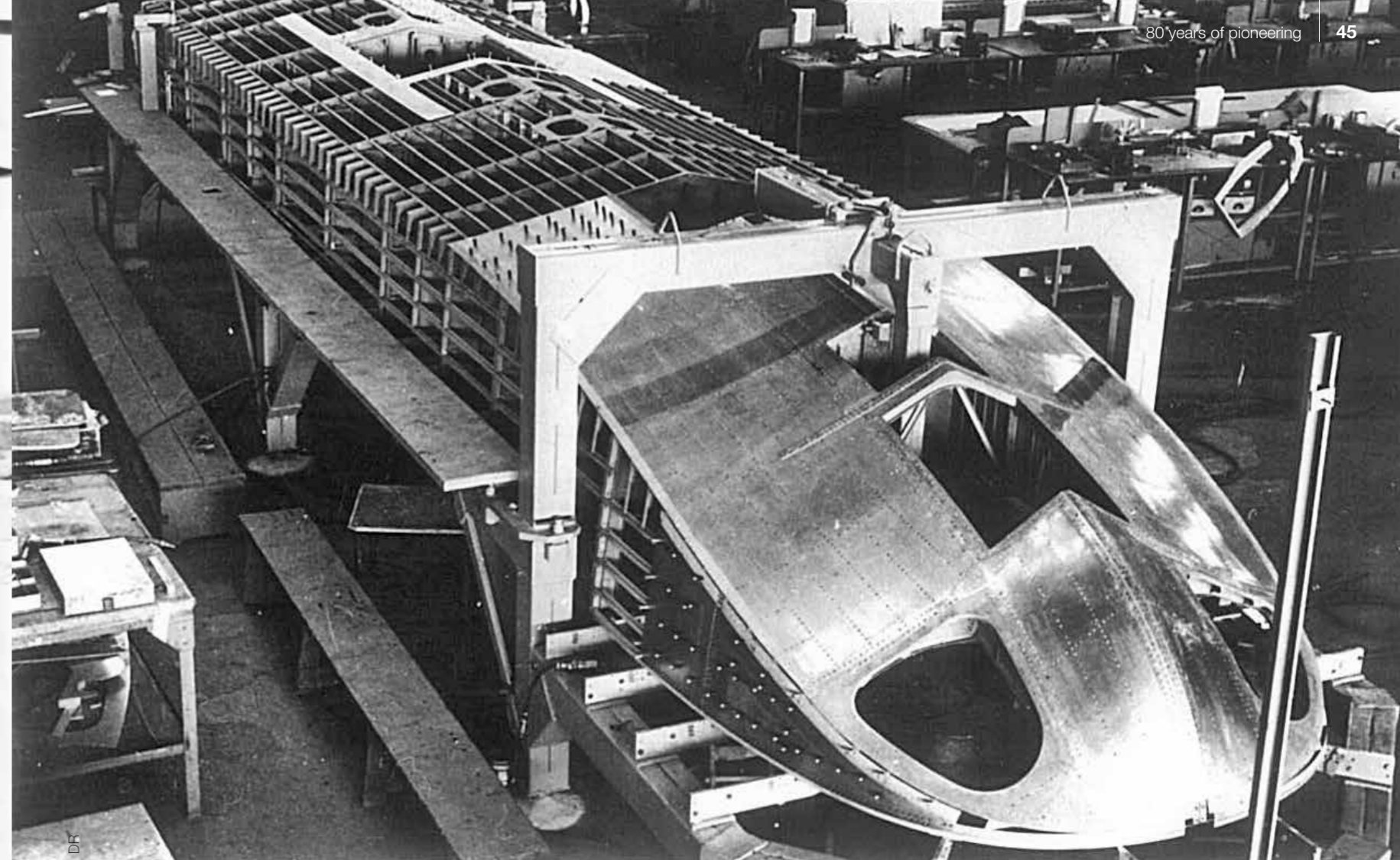
the first at Marignane

1962

80 Years Airbus Helicopters Marignane

The Super Frelon was the first helicopter in the Sud Aviation range to make its maiden flight at Marignane. It was on 7 December 1962. Two prototypes were built (the second flew on 28 May 1963). They were followed by four pre-series aircraft which flew for the first time between January 1964 and January 1965. The fuselage, general assembly and adjustments were carried out at Marignane. In total, about a hundred units were produced and delivered, in particular to the French Navy, Israel, South Africa, Libya, and Iraq. The last one was withdrawn from service on 30 April 2010 after spending 44 years in the hands of the French Navy. It was indeed an aircraft that marked the maritime world for its intervention capacities at sea and the number of rescues

carried out in the Atlantic (more than 2,000 individuals airlifted). With its imposing size and weight (13 tonnes when fully loaded), it made its mark in people's minds for its range (more than 300 km), and its fuel consumption (about a tonne an hour). The Super Frelon's production was also the opportunity for Marignane to develop its industrial potential. The decision was taken to manufacture its autopilot on site as well as the running-in benches for its intermediate and tail gearboxes.



Did you know?

On 25 July 1963 in Istres, the Super Frelon beat the world record for speed with 350.247 km/h. It was prototype No.1 that was fitted out to beat this record: special fairings, replacement of the landing gear with streamlined skid pads, and masking of rivets.

2-

Production of the Super Frelon's first hull.

The Super Frelon assembly line in December 1969.



DR

Assembly of the Super Frelon mechanical systems.



DR

The Puma

And Sud Aviation creates the «barbecue»

1965

In 1962, the French Army declared its need for a new tactical and logistics transport helicopter. Since there was no aircraft that met its requirements, a new project was launched in June 1963. It was entrusted to Sud Aviation and took the name of SA330 Puma. Immediately, a contract was signed for the production of two prototypes and five pre-series aircraft. The design of the main gearbox was entrusted to Fiat, but its tests were conducted at Marignane. The first prototype, which was again called Alouette IV, completed its first flight there on 15 April 1965. A few days later, a Franco-British agreement containing a helicopters section was signed. Although its development phase was largely underway, the Puma was affected by the subsequent cooperation agreement signed between the two governments in February 1967 (see page 50).

The vibration level of the two prototypes (the second one flew on 3 November 1965) was high especially at low speeds, which required a modification of the suspension between the MGB (main gearbox) and the rotor head. This new system that was used on many other aircraft is known around the world as the «barbecue». It was not the only innovation of this aircraft, which was also the first-ever helicopter with blades and air ducts that could be equipped with electro-thermal de-icing. Note also that it was equipped with retractable landing gear, which was new on helicopters.

Did you know?

The launch and mass production of the Puma SA330 started on 21 December 1966. In total, more than 700 were manufactured. At the end of 2017, 196 units were still in service and the fleet had accumulated more than 4 million flight hours.

80
Years
Airbus
Helicopters
Marignane



The Puma flew for the first time on 15 April 1965.



The Puma assembly line in 1975.

DERH

A «memory» of several thousand helicopters and planes



Photo taken in 1997 during the transfer of activity to the main site.

The construction of the Boussiron hangar began in the early 1950s to the west of the airport runways. The Heliservice company, based in Issy les Moulineaux, relocated in 1961 to the Fourès and Boussiron hangars, bringing together 400 people to develop its business repairing and overhauling VERTOL and S55 helicopters and maintaining the French Civil Protection's Catalina seaplanes.

It was absorbed on 30 June 1966 by Sud Aviation,

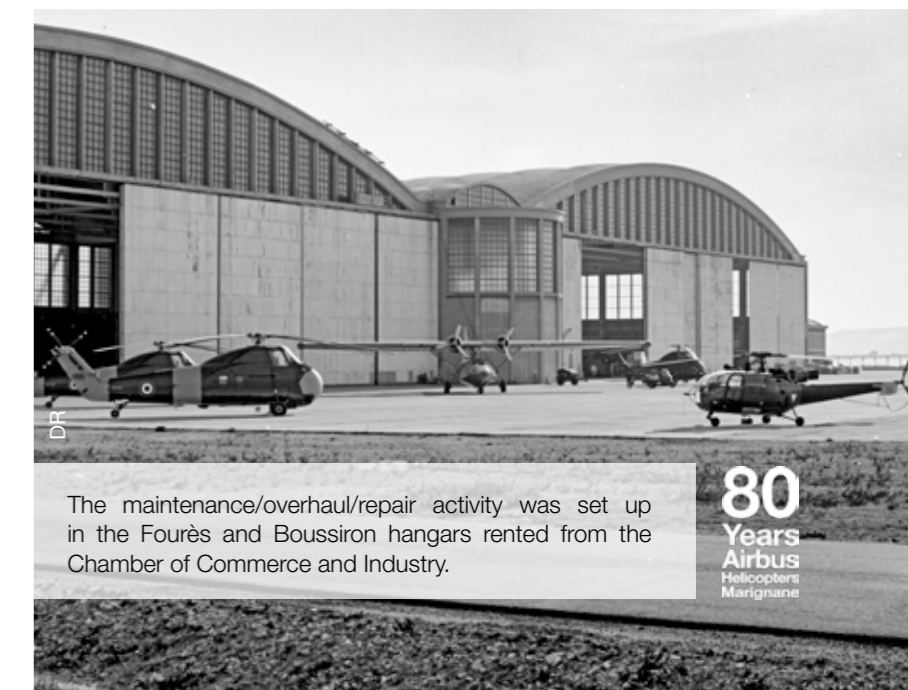


Heliservice was absorbed by Sud Aviation in 1966.

and the Fourès and Boussiron hangars, which were rented from the Chamber of Commerce and Industry, formed the DERH (Department of Helicopters Maintenance and Repair). Very quickly, the DERH entity concentrated its overhaul/repair activity both for the maintenance of the helicopters in the range and for the technical and logistical support of the Canadair fleet. As another string to its bow, since the 1970s the DERH has been customising helicopters in the range with the design, manufacture and approval of installations requested by customers, in addition to the assembly of optional equipment. Finally, it also developed an offer to purchase and sell second-hand equipment.

In 1973, the mechanical assemblies' overhaul/repair was transferred from the Marignane factory to the Fourès hangar. The equipment laboratory was set up in Boussiron at the same time.

In 1997, Eurocopter's management decided to provide the DERH with better suited premises and new and efficient means to face a very competitive repair market, particularly in the field of intervention cycles. The transfer of 700 people and 50,000 m² from the DERH to the main site started on 15 October and took just two and a half months.



The maintenance/overhaul/repair activity was set up in the Fourès and Boussiron hangars rented from the Chamber of Commerce and Industry.

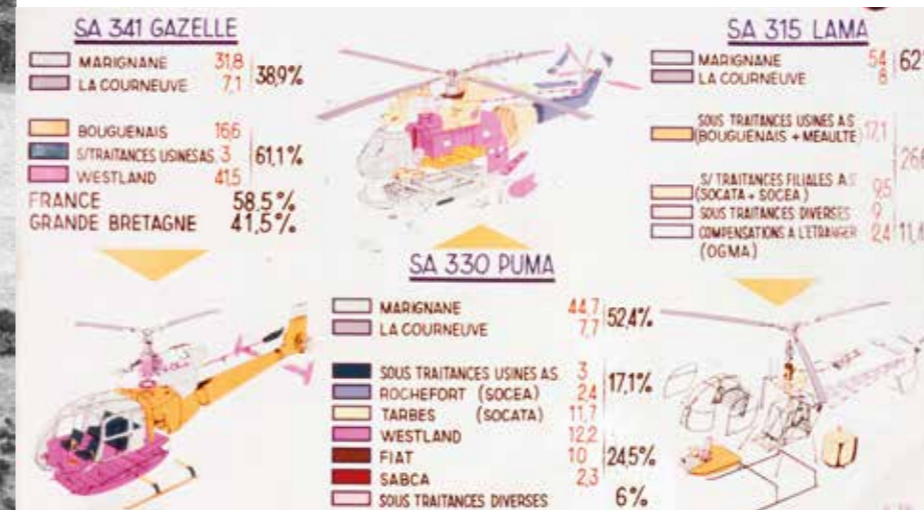
1966

80
Years
Airbus
Helicopters
Marignane



The WG13 Lynx, the all-titanium rotor hub of which was manufactured at Marignane.

Distribution of production



Did you know?

At the start of the cooperation, the percentage of participation for the United Kingdom was 60% for the Gazelle and 12% for the Puma. In 1986, it was reduced to 30% for the Gazelle and 5% for the Puma.



Franco-British cooperation

1967

The agreement between the French and British governments was signed on 22 February 1967 and defined the terms of collaboration on three helicopter requirements: tactical for air transport (Puma), light for observation (Gazelle) and versatile (WG13 Lynx). Aerospatiale was the project manager for the Puma and Gazelle while Westland was the project manager for the WG13 Lynx, the all-titanium rotor hub of which was manufactured at Marignane, a pioneer in the machining of this material. The facility also produced the nose sections and sponsons for the Lynx while La Courneuve provided the tail rotor blades.

The first Puma in the series flew in 1968, and the first delivery to the French Army took place in 1969. Serial production ultimately amounted to 198 aircraft on the French side and 48 on the British side, built under licence by Westland. The

first flight took place in 1970, and the first delivery to the RAF was in 1971.

The Gazelle SA341 was designed to meet common Franco-British requirements, and the agreement provided for joint development, which was shared on a 75/25 basis for work and funding. The first French series aircraft flew in August 1971, and the first delivery on the British side was made to the Army in May 1973.

The production of the Gazelle SA341 amounted to 170 units for France and 250 for Great Britain. It was followed by the SA342 for a roughly equivalent volume.

As for the Lynx, which was found on board helicopter-carrying vessels, its characteristics had to take into account the Navy requirements of both countries. The development was shared 75/25, but France gave up having its own assembly line and all the aircraft were assembled

at Westland. The first series helicopter was delivered to the French Navy in August 1978. A total of 40 aircraft were allocated to France and 234 to British defence.

Franco-British cooperation on helicopters was a success, leading to a heavy workload over a

long period of time, but the manufacturers then continued their activities on their own and often in competition with each other.

Aerospatiale was the project manager for the Puma and the Gazelle.



The Gazelle

The helicopter of firsts

1967

More than 50 years after its maiden flight on 7 April 1967 at Marignane, the Gazelle is still appreciated by nearly 100 customers in 34 countries for its ease of maintenance and great reliability. Developed and manufactured in cooperation with the United Kingdom at the end of the 1960s (see page 48), more than 1,250 Gazelle helicopters have been delivered. Today, more than 450, i.e. nearly a third of all Gazelle manufactured, are still in service.

The Gazelle was a helicopter of firsts:

- The first Airbus helicopter to be equipped with the Fenestron® (see page 54) which, change after change, is still present on light and medium helicopters in our range, including the first of the H generation, the H160. This major innovation improves ground safety around the tail rotor and reduces the sound level of the rotorcraft.

- The first Airbus helicopter to be equipped with glass-resin blades developed in cooperation

with the German company Bölkow.

- The first helicopter in the world to be awarded the IFR category I qualification by the FAA (Federal Aviation Authority), allowing operators to fly under instrument flight rules with a single pilot on board.

On 15 May 1971, the Gazelle broke three speed records in its category:

- On a 3-km basis: 310 km/h
- On a 15/25-km leg: 312 km/h
- Over 100 km in a closed circuit: 296 km/h

The Gazelle was the first helicopter equipped with a Fenestron®.



DR

Did you know?

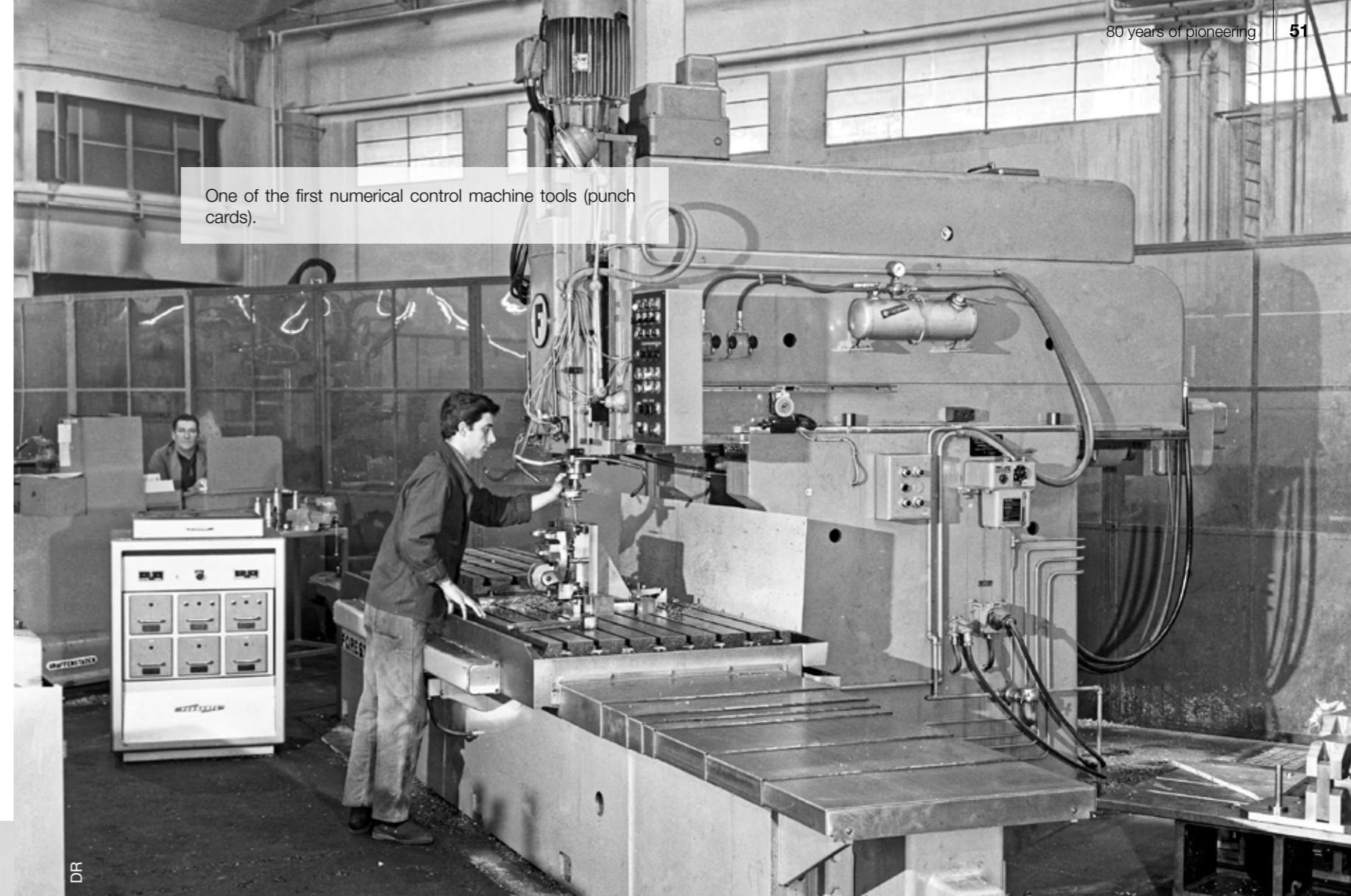
The Gazelle has been a major success in the military sector and today nearly 80% of these rotorcraft in service still fly for the benefit of armies around the world. It has been marketed in two versions, the SA341 and the SA342. The latter is essentially differentiated by a more powerful engine.

2.

The Gazelle flew for the first time on 7 April 1967.



DR



DR



DR

Simultaneous delivery of the 1,000th Alouette II and the 500th Alouette III on 7 May 1968 in Marignane.





The Fenestron®

The Airbus Helicopters mark

Did you know?

The aerodynamicist Paul Fabre had suggested calling this ducted tail rotor a Fenestrou, in reference to the Provençal term for a «small window». Fenestrou became Fenestron®.

1968

The wish to duct a helicopter's tail rotor appeared in the mid-1960s in response – already – to safety issues. At this time, studies on ducted propellers were being carried out in the field of airplanes. They inspired the creation of the Fenestron®.

The Fenestron® made its first flight on the second prototype of the Gazelle (SA340-002) on 12 April 1968 at Marignane. René Mouille and Paul Fabre were the fathers of this decisive invention for our company and for the aeronautical industry in general. It aimed to improve the safety of personnel working on the ground and also in the operational environment. Ensuring a safe landing in the case of a tail rotor failure was another one of the objectives.

The Gazelle equipped with a Fenestron® was certified in 1972 at the maximum mass of 1 tonne 8.

This first generation of the Fenestron® featured metal blades simply distributed around the hub. It was immediately installed on the Dauphin, the

first prototype of which flew in June 1972.

The second generation Fenestron® was unveiled at the end of the 1970s thanks to technological developments in materials.

Throughout its history, the performance and flight qualities of the Fenestron® never ceased to be improved through the development of blade profiles, hull contours, the addition of the stator, etc.

Adjustments to the blade distribution with a view to avoiding the concentration of sound emitted on a dominant frequency, as well as the adoption of a stator with thin and tilted blades, and decreased rotor speeds proved to be a very satisfactory compromise: the silent Fenestron®.

In 1994, the EC135 adopted these principles, followed by the EC120 in 1995. A testament to the effectiveness of this new configuration, in 1996 they both received the «décibel d'or» awarded by the French Environment Ministry to recognise innovative products in the fight against noise pollution.

The Fenestron® has continued to be adapted for more than 50 years and now equips the latest arrival in the range, the H160.

Airbus Helicopters Thierry Fostang



First test of the Fenestron® in the wind tunnel in April 1967.



Airbus Helicopters Anthony Pecchi

In 1999, the EC130 undertook its first flight with a Fenestron® that was closely based on that of the EC135. This allowed it to obtain the highly coveted Grand Canyon National Park noise certificate.

In 2010, the EC145 in turn adopted it, becoming the first helicopter to feature a new generation of the Fenestron® with fully built-in carbon fibre blades. An innovation that has increased reliability and reduced operating and maintenance costs. The Fenestron® concept is valid up to 5 - 6 tonnes, precisely in the H160 category. New architectural constraints were therefore taken into account so that it could receive the most powerful Fenestron® on the market. The latest technologies were applied to it to guarantee a minimal sound level and ensure manoeuvrability. Finally, it was also tilted to improve performance and ensure exceptional flying comfort at low speeds. It flew in June 2015.

Far from having said its last word, the Fenestron® can now be found on the VSR700, which is

derived from the Cabri by Guimbal Hélicoptères, and, in some ways, in the City Airbus concept, which is based on the use of ducted rotors. The adventure continues...

The Ecureuil AS350Z at the entrance to the Marignane site. This aircraft got no further than the prototype phase but led to the creation of the H130 a few years later.



Airbus Helicopters Christian Da Silva

Contractual policy

The driving force for social progress

1968 After the strikes of 1968, a social policy based on the «well-being» of employees was gradually implemented thanks to permanent social discussion. This period of social peace helped to rally staff in pursuit of the objectives and priorities resulting from the company's strategy.

The revival years

Even though there was a heavy workload in the 1970s (Alouette, Super Frelon, Puma, and the Caravelle and Concorde sub-contracting), it was necessary to review all aspects of the organisation of work (creation of autonomous production units). The digitalisation of production data, the adaptability of employees, the self-serve tool stock, the diversification of tasks, and the installation of break rooms for workshop staff all helped to support this new model.

On a social level, improvements in working conditions produced results that gradually transformed the site's structure: better laid-out workshops, cleanliness of the premises, fitting out of workstations defined in collaboration with operators. At the same time, an emphasis was placed on training for all staff with the introduction of the Training and Development service (see page 62). Finally, the setting up of flexible working hours lent credibility to the social policy built at the level of the young company, Aerospatiale.

When consolidation rhymes with consultation

The merging of Nord Aviation, Sud Aviation and



The creation of break rooms for workshop staff helped support the new model of work organisation.

SEREB led to the creation of Société Nationale Industrielle Aérospatiale on 1 January 1970. This merger meant that it was necessary to standardize salaries and social systems, working hours, and training. The first collective labour agreement in 1970 was only possible thanks to a particularly active contractual policy based on consultation. The company's growth was built on a consistently close and trustful relationship between management and staff in order to ensure maximum efficiency and the most extensive cooperation possible in a positive social climate. The search for a social consensus continued, in particular at Marignane, with a very open dialogue with the social partners. Today, negotiation is favoured over systematic power struggles and the social peace resulting from these signed agreements has given the company an image as a social role model.

Strikes outside the site in May 1968.



The Lama made its maiden flight on 17 March 1969 at Marignane.

The Lama

high altitude record-breaker

Towards the end of the 1960s, India was looking for an aircraft that could exceed a ceiling of 6,000 metres with a payload of 200 kg. Sud Aviation provided the answer with the Lama SA315, a hybrid aircraft designed using the airframe of the Alouette II and the dynamic components of the Alouette III. The SA315 accomplished its first flight on 17 March 1969. India bought 41 of them, and manufactured another 150 after signing a licensing agreement in 1971.

The Lama became particularly noteworthy when Jean Boulet piloted it to beat the world altitude record of 12,442 metres on 21 June 1972. One month previously, the Lama had already won renown in India with a record landing at an

altitude of 6,858 metres by a pilot in the Indian Air Force, accompanied by an in-house pilot, Claude Aubé. Five years later, the Lama achieved a new record: on 24 December 1977 a colonel from the Salvadorean Air Force descended approximately 600 metres into the crater of the El Boquerón volcano during a rescue mission.

The Lama, specially adapted for aerial work in high mountain areas, received the French certificate of airworthiness in September 1970. Less than two years later, in April 1972, it was certified by the FAA (Federal Aviation Administration).

India inspired others because the Lama was sold to many other countries: Angola, Argentina, Bolivia, Chile, Ecuador, Pakistan, Peru, Togo, Morocco, Italy, Finland and Switzerland. In total, more than 700 aircraft were built (licence included).



Airbus Helicopters Patrick Penna

Did you know?
The Lama was known as the Cheetah in India. Cheetah were primarily used in India for mountain rescue missions, liaisons, and high altitude flight training.

1968

1969



1970 - 1991

a new range of products



On 1 January 1970, SNIAS (Société Nationale Industrielle Aérospatiale – National Industrial Aerospace Organisation) was created from the merger of three companies, Sud Aviation, Nord Aviation and SEREB (Société pour l'Etude et la Réalisation d'Engins Balistiques – Organisation for the Study and Realisation of Ballistic Devices). It changed name on 27 June 1984 and became Aérospatiale, société nationale industrielle (national industrial company). In 1970, it made 39% of its turnover from exports and employed 37,420 people. 93% of it was owned by the French State and its Chief Executive Officer was Henri Ziegler, the former Chairman of Sud Aviation.



Open days

1971

For employees, open days are always a moment of great pride that they can share with their families. But they are also demanding in terms of organisation and can be costly, which explains why these very special days are relatively rare. Always based on the same principle, namely the mobilisation of volunteers who organise visits to workshops and offices and present the various professions, over the years they have set the pace of life at the site. On the agenda: static exhibition, flight demonstrations, and sometimes first flights, parachute jumps and a miniature train taking people around the site.

The first open day at Marignane was held on 16 May 1971 just after the creation of Aerospatiale. For this first, 35,000 people were welcomed at the factory.

For the open days that followed in 1973, 1975, 1977, 1981, 1990, 2002 and 2012, invitations were extended to include local figures and employees' families. As such, the number of visitors increased to 60,000 and even 82,000 in 2012.



First open day on 16 May 1971.



Open day organised in May 1975.



Open day organised in June 1990.



Open day organised in September 2012.



Open day organised in 1973.



Training

Always one step ahead

1972

In the 1970s, the social affairs of the Helicopters Division were limited to staff management. However, a second component, the advent of training, was being organised in two areas: firstly, a production workshop with experienced trainers who taught production operators preparing for their professional tests; and secondly, a social development area where theory lessons (French, maths, English, etc.) were taught outside of working hours by staff members to help those wishing to progress in the company or prepare for national exams.

Fernand Carayon, head of the site, put Jean Loubat, the then HR Director, in charge of developing social structures, insisting on the need for «internal promotion» associated with training. Thus, training became a real investment in the company's aeronautical performance.

From 1972, a structured organisation of several people was set up around three new activities: training for all staff, proper management of middle managers, and the creation of a career advancement entity with targeted internal and external recruitment actions. Training already represented 0.8% of the wage bill in 1970 even though the law on training for 1% of the workforce only entered into force in 1971.

From 1984, the need for change was apparent and the challenge was mainly to ensure the support of each employee in order to increase motivation and consequently improve performance.

The Vice-President for Human Resources, Charles Hemour, set up a training strategy based on four concepts:

- management focused on real internal cohesion
 - the encouragement of individual and collective expression for solutions as close as possible to the field
 - the importance of a value system for the emergence of a company project
 - the vision of a job not perceived as a constraint
- At the same time, professional training accompanied the technological evolution of centres of excellence, in particular electronics/ systems, dynamic components, and composite structures.

Key figures

In 1984, more than 218,000 hours of training were provided, 30,000 of which were in social development (650 participants, 85% of which were employees in 20 different disciplines [for a total of 60 to 150 hours for each course]). About 4,000 people/course for a budget of €4.2 million, namely more than 3% of the workforce. A percentage way above the legally required 1%, which demonstrates the commitment to promoting skills and creating conditions for performance to face an increasingly competitive market. From 1989, it exceeded 6%, namely 300,000 hours of training for 5,000 trainees.

July 1988: inauguration of a new building housing 25 classrooms in the presence of the team in charge of training.



Measuring 10 m long and 4.5 m wide, the H890 weighed 4.5 tonnes and had a catamaran-style hull.

The hydrofoil the flying boat

Did you know?

With the H890, France was third in the world in the field of hydrofoils behind the United States and Russia.

From 1970, the Marignane site participated in the construction and development of a 4.5-tonne experimental hydrofoil named H890. Aerospatiale had been entrusted with the project by the DTCN (Direction Technique des Constructions Navales – Technical Directorate for Naval Constructions). With the hydrofoil's techniques being based on technologies used in the aeronautical industry, in particular the complex autopilot systems, the Helicopters Division's skills in this field and the

proximity of the Etang de Berre meant that the Marignane site was an obvious candidate for the development of this prototype.

The H890 flew for the first time on 27 June 1972 with Jean Boulet at the controls. Measuring 10 m long and 4.5 m wide, the H890 weighed 4.5 tonnes and had a catamaran-style hull. The tests that started in June 1972 were suspended for six months following an accident in February 1973 during the adjustment of the autopilot. They were completed on 14 November 1974 with a presentation to the press. The H890 had reached 53 knots and sailed through one-metre waves. The H891 succeeded it with a view to studying high-speed propulsion with a propeller. Tests on it ended in November 1979 because of a lack of funding and the programme was suspended and the test equipment dismantled.



1972

The Dauphin

The helicopter of speed records

1972

In June 1970, the Helicopters division decided, for the first time using its own funds, to launch the study of an aircraft designed to replace the Alouette III. The Dauphin SA360 was created: it was equipped with a four-bladed main rotor with a NAT hub (non-drag hinged hub) from the Gazelle and composite blades in fibreglass, carbon-coated for greater rigidity. It made its maiden flight on 1 June 1972 at Marignane. Less than a year later, in May 1973, its stability and excellent vibration level helped it to beat three world speed records: 312 km/h over 3 km, 303 km/h over 15/25 km and 299 km/h in a 100 km closed circuit. It was certified on 21 December 1976 for a maximum weight of 3.4 tonnes. And, in November 1978, it was awarded category I



The single engine Dauphin made its maiden flight on 1 June 1972.

two-pilot IFR certification in the United States. It was a first for a helicopter without an autopilot. On 8 February 1980, the N version of the twin-engine Dauphin beat the world speed record on the Paris-London route with passengers at a speed of 321.91 km/h. Seven years later, it was the Panther, the military version of the Dauphin, that made its mark with a 3,000 m climbing speed record in 2 min 54 sec and a 6,000 m record in 6 min 14 sec. Finally, on 19 November 1991, the Dauphin AS365 X, referred to as the Dauphin Grande Vitesse (High Speed Dauphin), beat the world speed record for all categories over 3 km with 372 km/h.

Delivery of the 1,000th Dauphin in 2011 to the Indian operator Pawan Hans.



Airbus Helicopters Patrick Penna

Did you know?

By the end of 2018, more than 1,100 helicopters from the Dauphin/Panther family had been built, more than 800 were in service, and the global fleet had completed more than 6.7 million flight hours.

Visit in May 1972 by Queen Elizabeth II in the context of Franco-British cooperation. She was accompanied by Henri Ziegler, Chief Executive Officer of Aerospatiale.





The Ecureuil flew for the first time on 27 June 1974.

DR

The Ecureuil

the phoenix of the range

1974

On 27 June 1974, the single-engine Ecureuil made its maiden flight at Marignane. It was the start of a wonderful long story that is still being written.

The figures for the Ecureuil family speak for themselves. Ecureuil helicopters account for 43% of the Airbus Helicopters fleet in service and 50% of flight hours completed in 2017. More than 5,000 Ecureuil helicopters fly worldwide for the benefit of nearly 1,900 operators in over 110 countries. They have accumulated more than 33 million flight hours in missions as diverse as passenger transport, search and rescue, emergency medical services, law enforcement, aerial work, hoisting, high-voltage line inspections, firefighting, tourism flights, military operations, etc. Since 14 May 2005, the Ecureuil has held the world record for the highest altitude takeoff, from the summit of Mount Everest, a feat that has never been equalled. It's enough to make you dizzy!

Did you know?

Originally called Alouette Affaires, it was given the name Ecureuil in March 1976.



DR

other. Initially, the idea was to design a simple, rustic and competitive rotorcraft with a doubled payload, 25% lower fuel consumption, and an operating cost almost 40% lower than for the Alouette II. The use of new materials and a completely revolutionary rotor hub – the Starflex – were an essential part of this performance. But beyond the technical aspects, its exceptional development potential is what has made it an extraordinary helicopter: it has undergone around 20 major upgrades in 40 years, single-engine and twin-engine versions combined (the twin-engine made its maiden flight on 3 October 1979). In particular, the maximum takeoff weight has been increased by nearly 400 kg and the Fenestron® joined the family in 2000 with the EC130 B4. More than 40 years after its certification, the Ecureuil continues to adapt to meet customers' needs and expectations, in particular in terms of safety, quality and the reduction of maintenance costs.

Did you know?

The oldest Airbus helicopter in service is an Ecureuil AS350 BA delivered in 1991 and operated by Air Maui Helicopters.



Airbus Helicopters Christophe Guibbaud

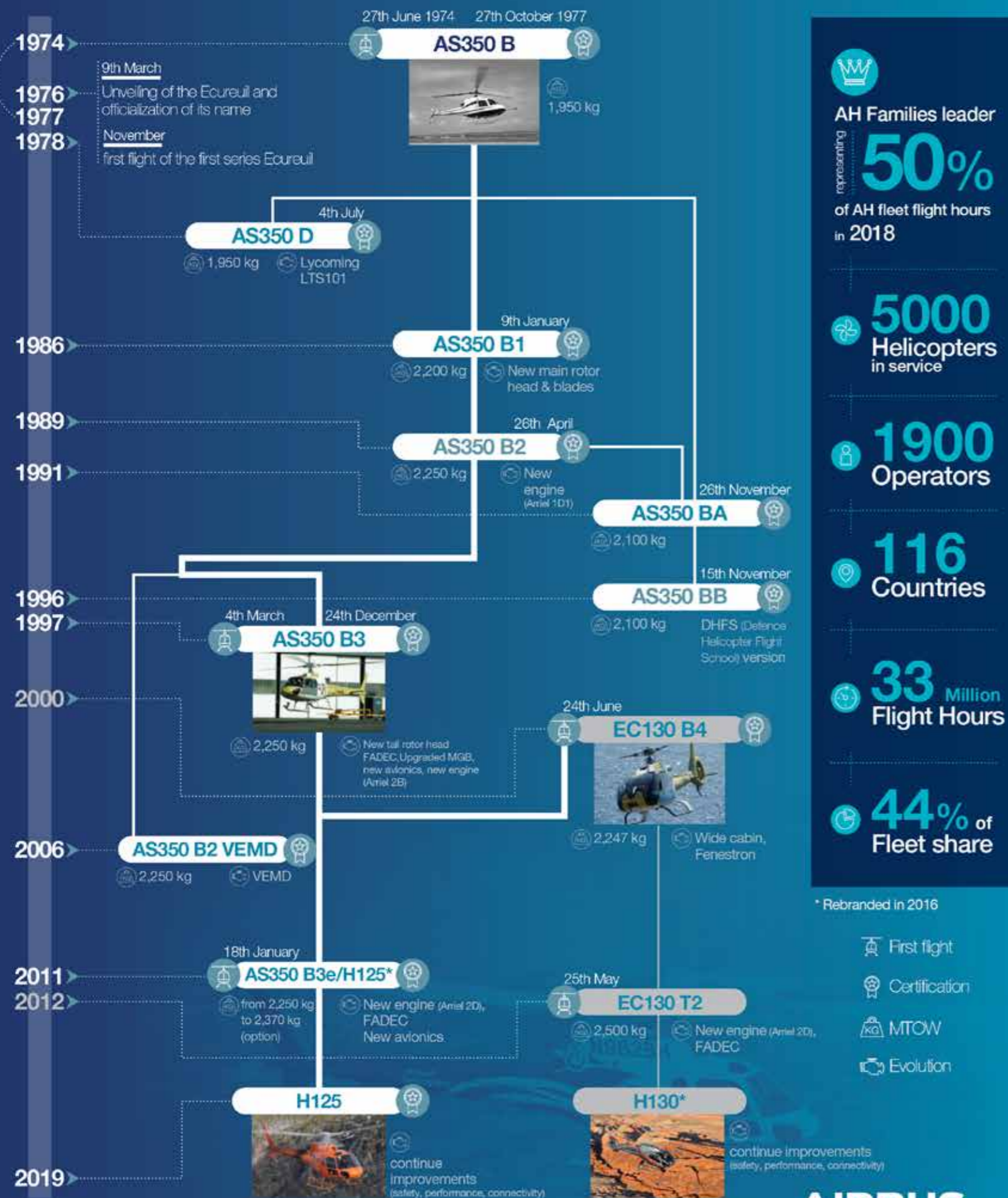
80
Years
Airbus
Helicopters
Marignane

But what's behind this success and longevity?
To understand this, we have to go back to the origins of this rotorcraft, one that is unlike any



DR

Ecureuil family evolution



AIRBUS



DR

The twin-engine Dauphin made its maiden flight on 24 January 1975.

The twin-engine Dauphin

The market and changes in regulations meant that a twin-engine architecture was needed to improve safety during missions. Thus, on 24 January 1975, the Dauphin AS365 C made its maiden flight at Marignane. The first versions of this new twin-engine were greatly appreciated for their performance and, in particular, they allowed the Dauphin to break into the oil and gas market in the North Sea, Africa, and India. Eighty units were built. But customers were demanding a larger range and the abandonment of the tailwheel landing gear. A major change in the programme was therefore undertaken with the AS365 N launched at the end of 1977. The fuselage was redesigned with an extended front tip for fitting a radar, the blade aerodynamics were completely reviewed, and the tank capacities were doubled. The first flight took place on 31 March 1979. A few months later, on 14 June 1979, Aerospatiale's Helicopters division was awarded a contract based on the AS365 N for 90 aircraft for the American Coast Guard services. This contract gave the programme a new lease of life. Three segments were developed simultaneously: the civil version, the AS366 G1 version for the United States which flew on 23 July 1980, and the military versions. What's more, the Dauphin AS365 N was the subject of a

licensing agreement with China, which built more than 260 of them. The N model was available in N1, N2 and N3 versions which were designed to increase power. Shortly after, the naval version, called the AS365 F, took off on 22 February 1982. The land version followed two years later on 29 February 1984. These two versions gave rise to the Panther. In pursuit of performance at altitude and in hot weather conditions, the M version was created. In the middle of the 1990s, the need to adapt the helicopter to future environmental standards led to the Dauphin being upgraded to produce the EC155 B. It made its maiden flight on 17 June 1997 at Marignane (see page 94).

1975

Did you know?

At the start of 2017, the American Coast Guard services celebrated 1.5 million flight hours for their Dauphin fleet.

80
 Years
 Airbus
 Helicopters
 Marignane

Best craftspeople of France

an eloquent prize list

1976

In 1975, the Marignane site took part in the «Un des Meilleurs Ouvriers de France» contest for the first time, and three winners were selected in June 1976 in the Metalworking category. In 1979, three other gold medals were awarded at a national level. Then in 1982, there was spectacular progress with 12 national gold medals. This set the ball rolling and today there have been almost 80 national winners for the Marignane site.

The excellence of the best craftspeople of France

One thousand hours or more of work to make each masterpiece. Since its launch at Marignane, the contest has rewarded winners in four sectors: mechanical components, metal structures, composite materials, and electricity (see table page 74).

In metalworking for example, tracing, forming and welding are not enough; you also need to really understand the metal in order to comply with

Did you know?

The only female candidate amongst the 80 winners, Chantal Fillia – the youngest from the 1994 class – was the first and the only woman (to date) to win the title with a stunning composite scallop-shaped bowl.

tolerance levels down to tenths of a millimetre. However, beyond the technical competence, this competition reflects a wish to surpass oneself in the search for excellence, in which sacrifice and deprivation are par for the course. Courage, patience, precision and determination are the qualities required to produce manual work that is both powerful and enriching. But it is also an artist's talent that guides the beauty of the work, as in the plastics category (free subject) with the use of precious materials: ebony, boxwood, mahogany, and more, with which the best craftspeople of France have learned to work according to certain traditions.

Best craftspeople of France who pass on their knowledge

Passing on knowledge to young people, but also a spirit of defiance when it comes to difficulties and overcoming obstacles in the quest to produce the perfect piece: this is the role of Alain Sanchez and Jean-José Liron, now in charge of training apprentices at the Airbus Helicopters Mechanics training centre.

It is a commitment taken at the very highest level of the company because Bruno Even, the Chief Executive Officer of Airbus Helicopters, attaches great importance to passing on the knowledge that constitutes the company's strength, and expresses his wish to see commitment to excellence become a permanent fixture. «This commitment helps Airbus Helicopters maintain its position as a leader on the helicopters market,» he explains.



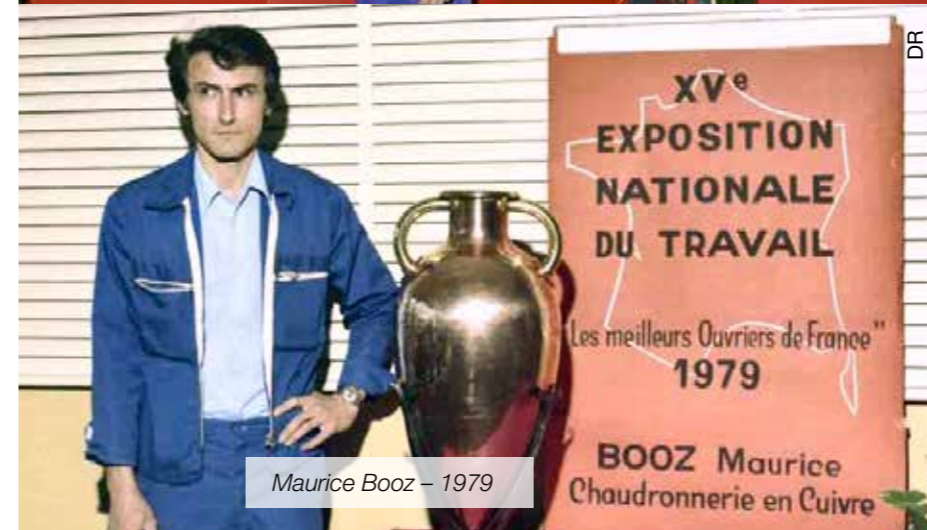
Robert Antonio – 1976



Fernand Giovannini – 1976



Marius Voliani – 1976



Maurice Booz – 1979



Raymond Cadière – 1986



Guy Gignac – 2004



Jacques Verraux – 2004



Paul Marsaguet – 2015



Nicolas Ciron - 2015



As part of the celebrations marking the Marignane site's 80th anniversary, on 1 July 2019 at 1:15 pm with temperatures of 41.3°C, about 600 employees formed the number 80 on the runway to accompany a flight demonstration and a static exhibition open to all the site's employees.



The Best Craftspeople of France contest

Marignane's winners

ANTONIO	Robert	Stainless steel boilermaking	1976
GIOVANNINI	Fernand	Sheet metal forming	1976
VOLIANI	Marius	Sheet metal forming	1976
ROCHER	Christian	Milling	1979
BOOZ	Maurice	Copper boilermaking	1979
SALIGNE	Pierre	Copper boilermaking	1979
ALLEGRI	Jean-Baptiste	Deburring	1982
AUDIBERT	Maurice	Welding	1982
BAUDOIN	Guy	Turning	1982
BERGER	Alain	Welding	1982
DELUNSCH	Christian	Milling	1982
CHAZALMARTIN	Jean-Baptiste	Turning	1982
DELILE	Guy	Welding	1982
DER-SAHAKIAN	Jacques	Turning	1982
FERRETTI	Michel	Copper boilermaking	1982
JOSSERAND	Georges	Copper boilermaking	1982
KOUKOUDJIAN	Robert	Milling	1982
JANJIKIAN	Jean-Claude	Turning	1982
BARISONE	Marcel	Milling	1986
BONNET	Jean-Pierre	Milling	1986
CADIERE	Raymond	Deburring	1986
FABRE	Bernard	Turning	1986
KERMEL	André	Turning	1986
LASSARA	André	Welding	1986
MEJIA	Maurice	Milling	1986
PASQUALETTI	Christian	Copper boilermaking	1986
RAPETTI	Henri	Sheet metal forming	1986
TRUBERT	Alain	Stainless steel boilermaking	1986
AIELLO	Pierre	Sheet metal forming	1990
BLANCHET	Alain	Sheet metal forming	1990
CAVAILLOU	Daniel	Steel boilermaking	1990
LAGADEUC	Claude	Milling	1990
POURCIN	Gérard	Milling	1990
TORRESE	Bernard	Turning	1990
ALLEGRI	Antoine	Turning	1994
BADDLY	Marc	Milling	1994
BARBEY	Michel	Turning	1994
BELLONE	Serge	Turning	1994
BERIDOT	Jean-Louis	Turning	1994
BONNET	Jean-Pierre	Deburring	1994
MEJIA	Maurice	Deburring	1994
CRISI	Bernard	Composites materials and plastics	1994

DOUBLEAU	Michel	Composites materials and plastics	1994
FILLIA	Chantal	Composites materials and plastics	1994
PASCALE	Georges	Milling	1994
RENZI	Primiéro	Milling	1994
ANDRE	Joel	Composites materials and plastics	1997
ASDIGUIAN	Marc	Milling	1997
BEDIAF	Slemen	Turning	1997
GUILLERMO	André	Turning	1997
PASCAL	Claude	Turning	1997
ROSSO	Robert	Milling	1997
SABAINI	Alain	Sheet metal forming	1997
VELLA	Denis	Milling	1997
BERTHUIT	Christian	Deburring	2000
BRUNO	Christian	Sheet metal forming	2000
CASANOVA	Roger	Deburring	2000
GUIGUES	Jean-Charles	Saddlery	2000
KOCH	Joseph	Deburring	2000
MARTELOTTO	Noel	Deburring	2000
MOTOT	Christian	Composites materials and plastics	2000
RAVEL	Michel	Deburring	2000
ROUX	Jean-Luc	Sheet metal forming	2000
SANCHEZ	Alain	Deburring	2000
SIGLER	Stéphane	Composites materials and plastics	2000
GIGLIO	Antoine	Turning	2004
DEHAN	Marc	Composites materials and plastics	2004
GIANNETTI	Frédéric	Composites materials and plastics	2004
BOESSER	Thierry	Turning	2004
GIGNAC	Guy	Milling	2004
LIRON	Jean-José	Turning	2004
ORELLANA	Antoine	Milling	2004
ROUX	Cyril	Milling	2004
VERRAUX	Jacques	Sheet metal forming	2004
PAYET	Denis	Composites materials and plastics	2007
AGNEDANI	Matthieu	Composites materials and plastics	2007
LIBRINI-GRATO	Fabrice	Electricity	2007
MARSAGUET	Paul	Composites materials and plastics	2015
CIRON	Nicolas	stainless steel and copper boilermaking	2015

Autonomous Production Units

The Autonomous Production Unit is a production centre that has all the resources and people assembled in one place or building in order to make a product.

Set up and tested at the Ecureuil unit from 1975 under the aegis of the site's director, Fernand Carayon, and his experience in the automotive industry, this production model was based on optimising the direct and indirect production costs of products and reducing their manufacturing cycle.

This objective was all the more important for the Ecureuil product, which had been designed to be manufactured at a controlled cost and at a pace of about 40 aircraft per month.

The Ecureuil line was in the shape of a fish bone with units, organised by product, that assembled the doors, the mechanisms, etc., and equipped the engines, instrument panel, and so on. Once equipped, the sub-assemblies joined the structure on the main assembly line. These units worked on a contract concept negotiated with the Management Board based on a quantity of elements to be produced per month.

The progress of the assembly line and the aircraft on the flight line was monitored visually on a huge board in the Production Unit Leader's office, that was filled in by the Team Leaders who provided a «snapshot» of the situation, allowing decisions to be taken in real time. The meaning of the term «Compagnon» (or comrade) was clear in this organisation since it implied the empowerment of operators. Once the contract was completed, the team was granted leave corresponding to the number of days they had managed to save in their work. The «compagnons» worked flexitime,



The meaning of the term «compagnon» was clear in this organisation.

in particular with extended hours at the start and end of their shifts.

At their self-service workstation, they had all the components they needed, along with a provisional stock for one month which was continually refilled.

All the departments seconded the workforce that was needed to manufacture the product, not only the workshop staff and its production support, including for support functions (HR, Finance, Purchasing, Programmes, Sales, Design Office), and were able to react immediately. This team was managed by one sole operational head from the design office at the beginning, then from production once the product had reached maturity.

1975



Did you know?

«The director, Fernand Carayon, very much involved in the activity and wishing to set an example, led a progress meeting for the programmes every week, taking the place of the Production Unit Leader. The priority was to highlight any difficulties encountered and to contribute to solving them.» Jean-Marie Trabucco, Ecureuil Island Leader in 1980-1983

The beginnings of the Super Puma family

1977

The French Army wanted to replace its Pumas with a more effective and more modern helicopter that would be able to take over from the 1980s onwards. The corresponding State contract was announced in June 1975 for the study and production of a medium-tonnage tactical transport twin-engine aircraft. This led to the creation of the AS331 which flew for the first time on 5 September 1977. Based on the Puma, which had been greatly modified, in particular with a longer nose, the AS331 proved to be transient. Although its development did not reveal any specific problems, the project was abandoned. A solution was favoured that involved preserving the majority of the Puma structure and adding localised reinforcements to it, a more streamlined nose, a ventral fin underneath the tail boom, etc. All the equipment developed and adapted on the AS331 was mounted on this new structure: the gearboxes, the engines, the main and tail rotors, and the energy-absorbing equipment. This new aircraft was called the AS332 B. It made its maiden flight on 13 September 1978. It was followed by a longer version, the AS332 M with a higher fuel capacity offering a larger range, and a naval version, the AS332 F for operational requirements at sea. Initially designed for military use, the AS332 had features that could be easily adapted to the civil market for aerial work



First flight of the AS331 on 5 September 1977.

missions, passenger transport, sea rescues, VIP transport, etc. Certain specific equipment was added to the military version, such as emergency floatation gear. The first civil serial aircraft flew for the first time on 1 February 1980.

Did you know?

In May 1984, the FAA issued the airworthiness certificate for unrestricted flight in icing conditions to the Super Puma AS332. A world first.



First flight of the AS332 on 13 September 1978.

The Marignane site creates its own newsletter

The first issue of the Marignane site's monthly newsletter was published on 15 July 1983. In its editorial, Etienne Lefort, the site's director, presented the concept to readers, who were also asked on page 4 to select one of the suggested titles for this new communication channel designed for them. In the end, it was the title Helicoptreize that won the most votes.

Over the years, the newsletter's editorial line, format, and number of pages changed.

A black and white version was even published in October 1992 owing to budgetary constraints. A few months earlier, during the creation of Eurocopter, a similar newsletter – Eurocopter News – was created to cover news from the newly formed Franco-German group. The two company newsletters were published in parallel up until January 1999, when they merged (them too!) to produce the Eurocopter group's in-house newsletter, Rotor In. The latter was published for 18 years: 91 issues were edited in first two languages (French, German), then three (with English), and then four (with Spanish). Mid-2017, its publication was stopped as part of the integration of the Airbus group's communication resources. Today, just one in-house newsletter – Airbuzz – covers news from all Airbus sites and divisions.



1983



Static exhibition of the range – February 1985

The Super Puma Mark II

1987

The Super Puma Mark II was a major upgrade in the Super Puma family. This new version flew for the first time on 6 February 1987 at Marignane and was certified on 12 June 1991.

The decision was taken to upgrade the Super Puma to meet the needs of civil and military customers. Objective: to increase the aircraft's performance in terms of speed, range, weight carried, etc. For this, the Super Puma was equipped with a more powerful engine, a Spheriflex main rotor with four blades, and a new Spheriflex tail rotor, also with four blades. In this way, the maximum takeoff weight was increased to 9,300 kg.

In terms of avionics, the Super Puma was equipped with EFIS cathode screens offering a summary of the flight parameters on one sole screen. The rear part of the cabin was modified

with a new tail cone larger than the older one and equipped with a loading ramp. In addition, the windows at the rear of the cabin were enlarged to improve external visibility for on-board personnel. The Super Puma benefited from a further upgrade in 2000 with the creation of the H225M (see page 97).

Did you know?

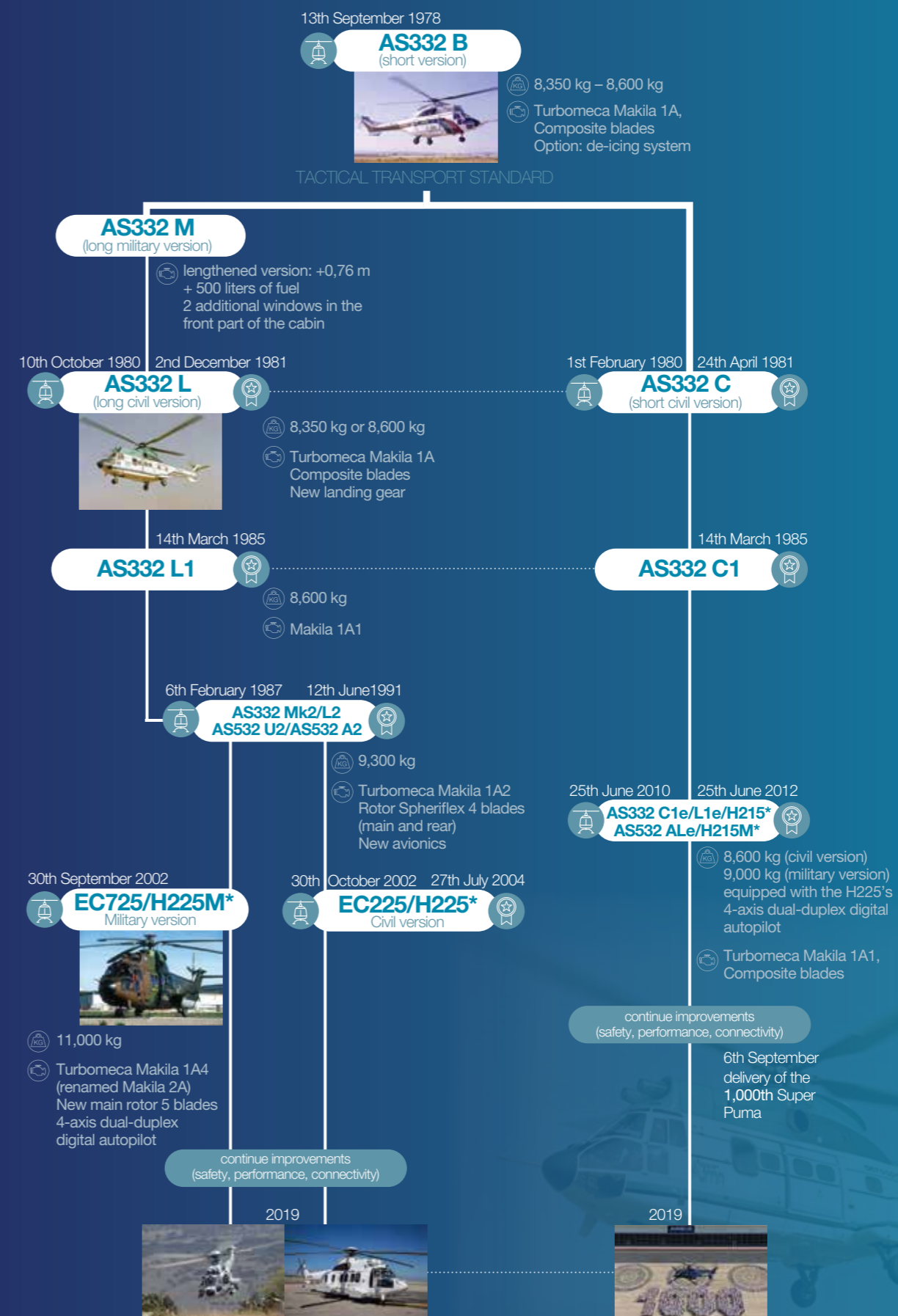
In October 2000, a test campaign of an in-flight fuel transfer to a combat SAR version of a Cougar Mark II (military version of the Super Puma) enabled the system to be qualified and up to 5,500 litres of fuel to be transferred in less than 15 minutes.



First flight of the Super Puma Mark II on 6 February 1987.

HELICOPTERS

Super Puma family evolution



- 95+** Total Operators
- Nearly 60** Operating Countries
- +5,6 Million** Flight Hours

1983
 14th February
 Delivery of the 1st AS332 L

1984
 May
 The FAA issues the Certificate of Airworthiness for flight in icing conditions without restriction. World premiere

1999
 12th June
 Delivery of the 500th Super Puma

9th September
 Delivery of the 1st Cougar Mk2 Rescue to French Army

2008
 28th June
 Delivery of the 700th Super Puma

- * Rebranded in 2016
- First flight
- Certification
- MTOW
- Evolution

Tiger

The basis for Franco-German industrial integration⁽¹⁾

1991

The topic of a combat helicopter for France and Germany was raised at the start of the 1970s and was deemed to be possible with comparable timescales. On a political level, the need for European cooperation on defence as a result of the Elysée Treaty (1963) offered an opportunity. However, the new requirements demanded technological breakthroughs in several fields: optronics, gearboxes, countermeasures, stealth, etc.

A painful genesis (1975-1987)

The first discussions started in 1975 and led to an agreement in November 1976 to launch common studies. The signing of a memorandum of understanding (MOU) on 16 October 1979 triggered a definition phase lasting 18 months (1979-1981) but which ended in failure as a result of differences.

National options (1981-1982)

This failure left the countries facing national options: the Apache or the production of a PAH2 with an MBB airframe for the Germans, a lighter helicopter than in the cooperation, in two HAP-HAC versions, with simplified mission equipment for the French.

The cooperation is resumed (1983)

The political wish to resume cooperation on defence was materialised in January 1983 by an attempt to lower expectations and differences with regard to the helicopter's configuration, its avionics and its performance. This resulted in the drafting of common specifications in November 1983 which formed the basis for an MOU signed on 29 May 1984 concerning the development phase.

The first development efforts (1984-1986)

In industrial terms, MBB became the project manager with a balanced workload between the two countries. Nevertheless, incompatibility regarding objectives quickly started to appear: for Germany, compliance with technical requirements was to be favoured, whereas

for France the priority was controlling costs. Development was interrupted up until 1986.

The founding act of the Tiger programme

Finally, it was politicians who found a solution to these difficulties. The French and German Ministers of Defence, André Giraud and Manfred Wörner, agreed on a common anti-tank version with an upper limit for development costs. Eurocopter Tiger GmbH, the main contractor, responsible for the equal distribution of work between Aérospatiale and MBB, was created in September 1985.

From foundation to mass production

On 30 November 1989, the global development contract was signed.

In December 1990, a basic agreement on the cooperation between Aérospatiale's and MBB's helicopters divisions was signed by Chief Executive Officer Martre and Dr Schäffler.

The Tiger's maiden flight was made on 27 April 1991 with Etienne Herrenschildt and Andrew Warner at the controls. Five prototypes were built in order to develop different versions. In parallel to the development of the Franco-German programme, work on the export versions contributed to the development of a specific version to meet Australia's needs. An order for 22 ARH units was received in December 2001.

Signing of the industrial-scale production contract on 20 June 1997.



Airbus Helicopters Anthony Pecchi

The last serial HAP should be delivered in France at the start of 2020.

Refocusing of the programme

For Germany, the PAH2 programme was called into question following the collapse of the USSR. For France, it was the reduction of defence budgets that endangered the programme. As a result, Germany revealed its new multi-role UHT helicopter concept (based on the former PAH2) in line with the operational context, whereas France changed its allocation to 115 HAP + 100 HAC instead of 75 and 140, respectively. In 1994, the decision was taken to delay the HAP to 2001 and the HAC to 2007. For Germany, the first delivery of the Tiger UHT was delayed until 2001.

From 1995 to 1997

The industrial scale manufacturing MOU has been signed on June 30, 1995. However, because the questions asked by countries, the

corresponding contract was only signed two years later. Six months after the signing of the MOU on industrial-scale manufacturing, France requested a postponement of production for budgetary reasons and, in May 1996, defined a new production schedule: from 2003 for the HAP and from 2011 for the HAC, thus reducing the rate of production to less than 10 a year. In 1997, Germany in turn reduced its rate of production. The industrial-scale production contract was finally signed on 20 June 1997.

The volume of aircraft

It became necessary to prepare a production tool that was no longer based on 450 aircraft but half that number and to define the subsequent serial prices. Two principles were adopted: an order for a first batch of 160 aircraft (80 for each country) with relatively similar timetables helped to launch the series. In total, 40 HAP (being retrofitted to HAD) and 40 HAD for France and 80 UHT for Germany. The MOU on serial production was signed on 20 May 1998 and the contract was ratified on 18 June 1999.

In France, the army replaced the anti-tank version with the HAD multi-role version in 2003. The first HAP version of the aircraft was delivered to ALAT on 16 March 2005. Spain joined the programme in 2004 and ordered 24 Tiger models (18 HAD and 6 HAP for retrofitting to HAD).

Delivery to ALAT of the first Tiger in March 2005.

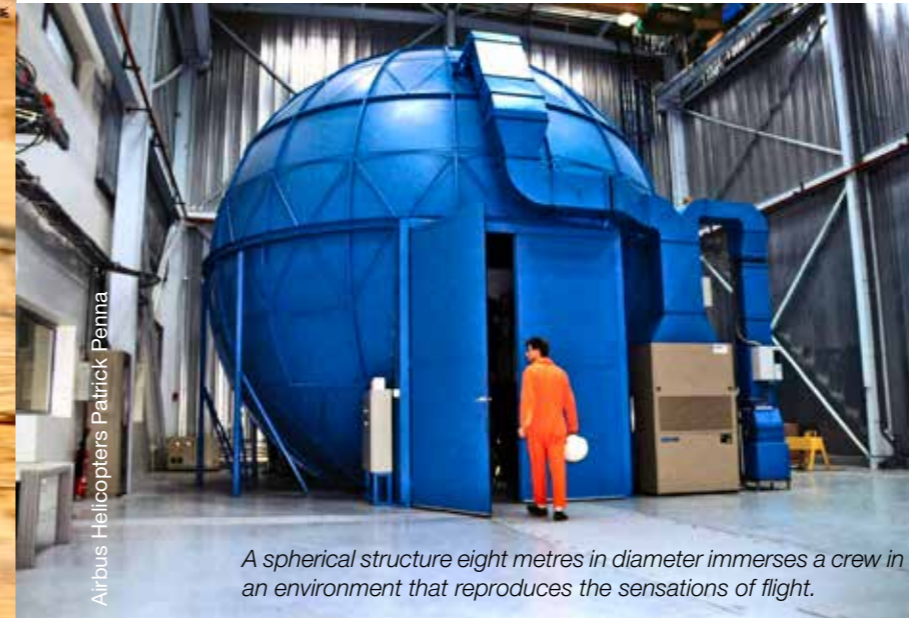


Airbus Helicopters Jérôme Deullin



Airbus Helicopters Anthony Pecchi

SPHERE simulator⁽¹⁾



Airbus Helicopters Patrick Penna

A spherical structure eight metres in diameter immerses a crew in an environment that reproduces the sensations of flight.

replica of the audio environment, faithfully replicating its physical characteristics in 3D: on-board alarms, sound of the engine and the blades, impacts on the gears when landing, skidding tyres, etc. In interaction and in real time with this environment, a simulation with a very high level of representation replicates the behaviour of the aircraft being studied: for the H160, more than 400 models have been used on it to accurately reproduce the aerodynamic characteristics, the mechanical systems (rotor, components of the flight command chain, gears, etc.), hydraulics, electrics, as well as each piece of avionics equipment (sensors, calculators, etc.).

⁽¹⁾ Helicopter flight simulator for study and research

1991



Spain joined the programme in 2004 with an order for 24 Tiger aircraft.

French ships near the Libyan coast

January 2013: France deploys the Tiger HAP within the framework of the SERVAL operation in Mali, then in southern Sahel with the Barkhane mission

March 2017: the UHT version is deployed by Germany in Mali within the framework of the Minusma mission

July 2018: delivery of the last UHT serial version Tiger in Germany

End of 2019 – beginning of 2020: delivery of the last serial HAD Tiger to Spain and France

⁽¹⁾ Summary prepared from the book «L'histoire de l'hélicoptère en France depuis 1945» J. Dubreuil and B. Fouques

The first Tiger ARH aircraft were delivered to the Australian army in December 2004.



Airbus Helicopters Éric Raz

And the Tiger programme continues ...

December 2004: delivery of the first two Tiger ARH to the Australian army

April 2005: delivery of the first Tiger UHT to the German army

March 2005: delivery of the first Tiger HAP to the French Army

December 2005: signing of the development contract for the HAD version and delivery of the first HAP to the Spanish army

December 2007: first flight of the HAD version (prototype)

July 2009: three Tiger HAP are deployed in Afghanistan

December 2010: first flight of the Tiger HAD France

May 2011: two Tiger HAP are deployed from

To master the design of future helicopters and their sub-systems, the SPHERE⁽¹⁾ simulator was installed at the end of 1990 and put into service at the end of 1991.

This tool is now essential for testing and adjusting increasingly complex systems that interact with each other. It helps to anticipate problems well before having a prototype capable of flight and significantly reduces costs and times.

A spherical structure eight metres in diameter immerses a crew in an environment that reproduces the sensations of flight. Inside, entire cockpits are installed with instrument panels and equipped consoles representative of the helicopters being studied.

A summary representation of an area particularly rich in detail and reproducing the weather conditions in a very realistic manner (fog, rain, wind effects, etc.) can be projected 180° around the cockpit inside this sphere, thereby completely immersing the pilots in an animated scene that reflects the simulated machine's movements and manoeuvres.

A very elaborate system allows a detailed reproduction of the stress felt on the flight commands that replicates physical parameters such as friction, spring effect, viscosity, stops, etc.

An interactive sound system creates a precise

Adjusting complex systems and anticipating problems before the development of a prototype.



Airbus Helicopters Patrick Penna

Many aircraft from the range (NH90, H175, H160, and more) have been evaluated during sessions, bringing together engineers from the design office and crew members.

1992 - 2007

**An international
dimension**





Airbus Helicopters Patrick Penna

The construction of the R7 building displaying one of Eurocopter's logos lasted from 1989 to 1991. This building houses the Support and Services activity.

The birth of Eurocopter

1992

On 1 January 1992, the merger of Aerospatiale's and MBB's Helicopters divisions led to the creation of Eurocopter, the headquarters of which have been based at Marignane since the beginning. The creation of Eurocopter became essential at the start of the 1990s in particular in response to the growing power of the American competition (see insert). Also, the two divisions were committed to cooperation on two major military programmes – the Tiger and the NH90 – crucial for the survival of their entities, but also for security and the economic, political and military independence of France and Germany. Its creation led to a directorate comprising Jean-François Bigay and Heinz Plückthun (replaced after a few months by Siegfried Sobotta) being placed at the head of Eurocopter SA. The first strategic objectives for the brand-new company concerned the strengthening of its position as a leader of the global civil market (54% in 1991), its availability to German and French armies, and also the generation of profits. To achieve this, several lines of work were identified:

ensure customer satisfaction and loyalty, win new markets, optimise technical and industrial resources, boost human potential, favour the transparency of information, and encourage synergy amongst teams. «In 1992, the market will remain depressed» was the title of an interview with Jean-François Bigay published in the in-house newsletter Eurocopter News in February 1992. In this article, J.-F. Bigay stressed the gloominess of the civil and military markets. For the civil sector, the two major centres – America and Japan – were experiencing difficulties. In the rest of the world, the situation was different but each sale was only for small quantities. For the military segment, there was a complete freeze on orders. In terms of organisation, site specialisation by product type was favoured. Each national company (Eurocopter France and Eurocopter Deutschland) had to be able to ensure the management of a programme and the release of a helicopter. Neither should become the sub-contractor of the other. The distribution of



At the 1991 Paris Air Show, Aerospatiale's Helicopters division was already flying the Eurocopter flag. ECI (Eurocopter International), in charge of sales, was created a few weeks earlier.



Jean-François Bigay and Heinz Plückthun at the press conference organised as part of the creation of Eurocopter.

work had to be based on each site's areas of excellence. When this merger was announced, competitors were very concerned especially owing to Eurocopter's increased ability to launch and support new programmes. Despite being risky, the wager was won: 27 years later, Airbus still leads the civil and parapublic helicopters market.



Ceremony organised at the Vasarely Foundation in Aix en Provence to celebrate the creation of Eurocopter.

Airbus Helicopters Charles Debos

Fusion with MBB

The reasons for the merger

1992 **T**he size of the company

Before the merger with MBB, the size of Aerospatiale's Helicopters division gave it the leading position in Europe but did not allow it to compete on a level playing field with the American industry, at the time comprising four manufacturers: Sikorsky, Bell, MDHC and Boeing. In 1987, American helicopter manufacturers received 25 times the French research and development budget. Furthermore, their costs were written off against much larger series: for example, 2,200 Black Hawk models were ordered by the American army, whereas the French forces only ordered 22 Super Puma aircraft.

The European military market

At the start of the 1990s, European armies had to equip themselves with new aircraft but no national market could cover the development costs of a new programme. Manufacturers were

therefore required to join forces to reach the critical number of aircraft that would make the launch of such a programme possible.

A cooperation strategy

Franco-British cooperation initiated at the end of the 1960s (Lynx, Gazelle, Puma) had been behind a new boom in the division, allowing it to develop a new range of aircraft. However, Britain did not have any other equipment projects with France and the competition with Westland was insurmountable in the short term. Also, in view of the different parameters, Aerospatiale's management believed that a similar opportunity was available with Germany and was going to allow new aircraft to be exported in response to the need to replace fleets.

European Works Council

Eurocopter was the first EADS entity to acquire a European Works Council.

The creation of Eurocopter was going to profoundly change the scope of the company and its representative bodies. Now a transnational company, in 2001, Eurocopter had to integrate a new structure: the European Works Council. The agreement concretised the wish that was declared in October 2000 during the constitution, this time, of the EWC of EADS NV to define this institution by profession, and therefore by that of helicopters.

Why was it the first one created?

Simply because the company already had more than 10 years of experience in the field. Indeed, in 1992, Eurocopter had created a similar body between the German and French entities. The EWC substituted but did not replace the legal institutions and regulations in force on a national or local level. The 12 members of the EWC – four Germans and eight French – and their deputies were appointed or elected for a four years period according to the law in the country where they worked.

The EWC, an information and consultation body, tackles themes from a transnational angle, such as the economic and financial situation of the entities, investments, essential changes in organisation, the situation and evolution of work, etc.

The EC120 B

Called Colibri

The EC120 made its maiden flight on 9 June 1995 at Marignane and was awarded its certification on 19 June 1997. The smallest helicopter in the range had a maximum weight at takeoff of 1,550 kg and could transport four passengers and a pilot for 700 km at a maximum speed in level flight of 127 knots.

The development of the EC120 started in October 1992 with the signing of a contract between the project's three partners: Singapore Aerospace, which had a 15% participation, was responsible for the doors, the Fenestron®, and the tail boom; Catic with 24% was in charge of



The EC120 made its maiden flight on 9 June 1995.

the centre structure, the landing gear, the canopy and the fuel system; Eurocopter with 61% was responsible for the assembly line, dynamic assemblies, avionics, integration, certification and flight tests.

This single-engine aircraft featured many innovations: simplified dynamic assemblies, a silent Fenestron®, a fuel circuit, and energy-absorbing seats, not to mention new avionics. The latter allowed the engine control parameters to be displayed on two screens connected to two separate processors. The Vehicle and Engine Multifunction Display (VEMD) offered additional information on flight progress (quantity of fuel, exterior temperature, etc.).

1995



Did you know?

Production of the EC120 was halted at the end of 2017. This decision came from Airbus' intention to focus its offer on the H125 and H130 for its single-engine helicopter range in order to continue to develop these two aircraft in terms of safety, performance and ease of maintenance.

At the end of 2017, 699 EC120 had been built, 610 were in service and the global fleet had racked up a total of 1,970,000 flight hours.



Airbus Helicopters Anthony Pecchi

The NH90 was the first serial helicopter equipped with electric flight controls.

NH90 always a step ahead

1996 The NH90 (NATO Helicopter 90) programme, which refers to the 1990s when the project was launched, was for a common European tactical transport and naval helicopter. It was a military twin-turbine manoeuvre and assault helicopter in the 11-tonne class. Prototype 1 of the NH90 made its first technical flight in a TTH⁽¹⁾ version on 18 December 1995 and its first official flight on 15 February 1996 at Marignane. The flight was completed by Philippe Boutry (pilot), Alain Trivier (flight engineer), Guy Dabadie (head of flight crew) and Jean-Claude Rabany (flight mechanic). In total, this prototype racked up 365 flight hours in order to test the vibration level, the engine system, flight qualities and the main gearboxes (MGB). It was then transferred to Agusta Westland for General Electric T700 engine system tests. In total, five prototypes flew between 1995 and 2000, three of which at Marignane.

(1) TTH: Tactical Transport Helicopter
(2) NFH: NATO Frigate Helicopter

Key figures

The 400th unit was delivered to the Bundeswehr on 24 October 2019. It was also the first Sea Lion version.



The NH90 PT1 made its first technical flight on 18 December 1995. It is exhibited at the Aviation Museum in Saint-Victoret.



Airbus Helicopters Patrick Penna

The high cabin version of the NH90 made its maiden flight on 18 March 2005.

Technical features

- Maximum weight** : 10,600 kg
- Capacity** : 1 pilot + 5 passengers in standard version or 1,134 kg of sling load
- Engine system** : 2 RTM 322-01/9 or GE T700 turbines
- Cruise speed** (at maximum weight) : 291 km/h (157 kts)
- Maximum range of action** (takeoff at maximum weight) : 890 km (475 NM)
- Armament** :
 - Gun pod, side-mounted machine guns (TTH)
 - Torpedo, anti-ship missile (NFH)

Technological innovations

- Low radar and infrared signature
- 15% weight saving
- Structure made entirely of composite materials
- Electric flight controls
- Carbon blade de-icers (increased longevity)
- Fire detection system (excluding any potential false alarms)
- Electric folding of blades
- Kinetic energy absorbers for protection against hard or forced landings
- Protection against severe electromagnetic environments
- Armoured FADEC (automatic regulation of engines)
- FMS (flight management system) computer that manages all the machine's controllability parameters (negotiation of trajectory, preparation of flight plans, approach procedure)

Key dates

1992

Creation of NAHEMA (NATO Helicopter Management Agency) in Aix en Provence bringing together four nations: France, Germany, Italy and the Netherlands.

13 August 1992

Creation of the NHIndustries joint venture by four partner companies to ensure the management of the programme: Eurocopter France, Eurocopter Deutschland, Agusta and Fokker Aviation.

19 March 1997

First flight of the PT2.

2 July 1997

First flight of the NFH⁽²⁾ version of the PT2 in electric mode with mechanical backup.

27 November 1998

First flight of the PT3.

31 May 1999

First flight of the PT4.

22 December 1999

First flight of the PT5.

30 June 2000

Signing of the industrial-scale production and manufacturing contract for a first batch of 298 aircraft.

23 September 2001

Finland, Sweden and Norway opt for the NH90.

September 2002

Assembly of the first serial NH90.

12 December 2003

First flight in all-electric mode.

4 May 2004

First TTH version serial aircraft delivered to the Bundeswehr.

18 March 2005

First flight of the «high cabin» version for Sweden.

15 December 2005

First NFH version serial aircraft delivered to the Italian navy.

21 December 2011

First operational entry into service of the NH90 Caïman for French naval aviation (Lanvéoc-Poulmic).

11 December 2012

Delivery of the TTH version of the NH90 to ALAT for entry into service at Le Luc.

The H155

1997

The adaptation of the Dauphin to future environmental standards and the wish expressed by customers to have a more spacious cabin dictated the creation of the H155. It made its maiden flight on 17 June 1997 when the Paris Air Show was in full swing. Certified on 9 December 1998, it was delivered to its launch customer, the German border police, on 16 March 1999 with three units dispatched to the German Interior Ministry.

This new upgrade of the Dauphin included a five-bladed Spheriflex rotor combined with a silent Fenestron® with blades that had been moulded according to the RTM (resin transfer moulding) process. The size of the cabin was increased by 40% in height and length. With a maximum weight of 4,800 kg, it can reach a speed of 270 km/h in conditions comparable in comfort to those for business aviation with an external sound level largely below the ICAO's recommendations. Available only as a civil version, the H155 has been ordered by leading customers such as the Hong Kong GFS, Shell Nigeria, and Dancopter,



Airbus Helicopters Eric Raz

At the end of 2018, 187 units of the H155 had been produced.

which took delivery of the 100th H155 on 5 June 2009. Whether used for border surveillance, search and rescue, or oil and gas industry or VIP transport, the H155 has catered to the needs of a wide range of missions. The H155 has also led the way for several innovations, in particular with two major tests in June 2008: sound measurements with a rotor equipped with Blue Edge blades and the first unmanned flight.

Did you know?

The H155 served as a basis for future Korean helicopters: the LCH (Light Civil Helicopter) and the LAH (Light Armed Helicopter), the contract for which was signed with KAI (Korean Aerospace Industries) in 2015.

The H155 made its maiden flight on 17 June 1997.



80 Years Airbus Helicopters Marignane

Airbus Helicopters Patrick Penna



Airbus Helicopters Eric Raz



Airbus Helicopters Anthony Pecchi

More than 100 units of the Ecureuil AS350 B3 were delivered over two years.

The Ecureuil AS350 B3

The Ecureuil AS350 B3 flew for the first time on 4 March 1997 and was certified on 24 December that same year. On 11 June 1997, this replacement of the Lama reached 26,500 feet in a normal production configuration. Indeed, this upgrade of the Ecureuil had a more powerful engine system which predisposed it for missions at high altitudes. The engineers and pilots were already dreaming of conquering Everest, but it was not until 2005 that the Ecureuil beat the world record for takeoff at the highest altitude in another improved configuration (see page 136). Greeted with open arms by customers, more than 100 units of the Ecureuil AS350 B3 were delivered over two years. Very quickly, it won over customers with the increased power delivered by a Turbomeca Arriel 2B engine system with an electronic control unit. For the first time, the Ecureuil's performance exceeded that of the Lama. As a result, cost-effectiveness was increased by about 20% per flight hour during aerial work missions. With its new avionics and an updated instrument panel with a double screen in colour displaying the main vehicle and engine parameters, its FADEC system and its automatic startup, the Ecureuil AS350 B3 also offered its users greater modernity.

1997

Did you know?

The 100th Ecureuil AS350 B3 was delivered to the Japanese distributor Kawasho on 14 December 1999.

The Ecureuil AS350 B3 flew for the first time on 4 March 1997.



Airbus Helicopters Jérôme Daulin

80 Years Airbus Helicopters Marignane



Airbus Helicopters Éric Raz

The 700th H130 was delivered on 16 May 2017.

The H130

1999 The H130 made its maiden flight on 24 June 1999 at Marignane. Derived directly from the Ecureuil AS350 Z, a prototype of the Ecureuil equipped with a Fenestron®, the H130 was developed to meet a double need: to position itself against the competition with the inclusion of an additional seat, and to meet standards for limiting the sound emitted by helicopters. Compared to other versions of the Ecureuil, the volume of the cabin and the luggage hold

were increased, with 23% more space for the cabin. The doors and windscreen came from the EC120. A design study helped to refine the aircraft's silhouette. This resulted in a very attractive profile adapted to customers' needs. From the outset, the H130 integrated the latest technologies available, in particular a Fenestron® comparable to that of the EC135, and an automatic rotor speed management system based on flight conditions. Another highlight: its extremely large windows offering great visibility, much appreciated by tourism flight operators. The main gearbox, main rotor, and engine system are identical to those of the Ecureuil AS350 B3, which offers the H130 a very high level of performance. The first H130 unit, which was actually the 3,000th Ecureuil produced, was delivered to Blue Hawaiian in February 2001.

The H130 made its maiden flight on 24 June 1999.



Airbus Helicopters Jérôme Devlin

Did you know?

The 700th H130 was delivered to the Swiss distributor Europavia on 16 May 2017. This Stylence version of the aircraft had been acquired by a Swiss private customer.



Airbus Helicopters Jérôme Deullin

The H225M made its maiden flight on 27 November 2000.

The H225

The H225M, initially called the EC725 or, in more familiar terms, the Cougar Mark 2+, was presented to the French Air Force, its launch customer, on 15 January 2001 at Marignane. It had completed its maiden flight a few weeks earlier on 27 November 2000. Designed for delicate combat SAR missions, 14 H225M units were ordered by the French army in 2002 within the framework of an economic recovery plan. A second batch of five aircraft

Did you know?

The H225/H225M fleet had accumulated more than 600,000 flight hours by the end of October 2018.

completed this first order in 2009. Renamed Caracal by French soldiers, the H225M intervened in numerous conflicts (Afghanistan, Mali, etc.), proving the worth of this aircraft, which is heavily armed, well protected, extremely discreet, and able to transport commandos or recover troops in hostile areas. Equipped with brand-new avionics with an instrument panel comprising four 6 by 8-inch screens, the H225M also had a latest-generation 4-axis autopilot said to be «fail operative». These assets meant that it was chosen by many foreign armies: Brazil, Kuwait, Mexico, Thailand, Singapore, etc. The civil version, called the H225, was certified on 27 July 2004. It was used in particular for passenger transport in the oil sector. After the crisis experienced by the sector, the H225 was adapted especially for SAR or parapublic missions, for which it was the perfect size.



The 1,000th Super Puma was delivered to the German federal police on 6 September 2019.

Airbus Helicopters Thierry Rostang

2000



Helisim started its commercial activities in 2002.

Creation of HELISIM

2000 One of the pioneers of level D⁽¹⁾ simulators, Helisim represents the top of the range for medium and heavy helicopter simulations for which all emergency situations can be reproduced in complete safety. This major feature allows pilots from around the world to learn all flight envelope of their helicopters, manage all types of emergency situations, and acquire solid experience and advanced skills in all piloting related systems.

Helisim is a consortium formed by Airbus Helicopters (46.3%), Thales AVS (46.3%) and Défense Conseil International (7.4%), a company specialising in the operational training of armed forces. It offers very high-level training services on eight different cockpits⁽²⁾ from the range. The overall quality of the centre, its classes and all the operating resources, combined with a multitude of accreditations from French (DGAC), European (EASA), American (FAA) and international (Russia, Brazil, Oman, etc.) authorities, makes Helisim a global leader in simulation-based training.

Helisim was created in 2000, but it only started its commercial activities in 2002 when one and then two level D flight simulators were put into service. These FFS⁽³⁾ already represent four different types

Inauguration of Helisim in 2000 in the presence of Yves Michot, Chairman of Aerospatiale, Guy Delevacque, Chief Executive Officer of Thales Training & Simulation, Jean-François Bigay, Chairman of Eurocopter, and Guy Dabadie, Chairman of Helisim.



Airbus Helicopters Patrick Penna



Airbus Helicopters Thierry Rostang

Helisim is set to total 200,000 flight hours in 2020.

of aircraft. The RO/RO (Roll On, Roll Off) system allows the cockpit in these two simulators to be changed in less than two hours.

An additional training resource, a non-motion system called FTD (flight training device), is also used for three cockpits with pilot training systems: AS365 N2, AS332 L1 and H225.

Training hours are divided up mainly between type ratings and recurrent training, provided each year by the centre.

In order to ensure a real-life situation as close as possible to the helicopter represented, each flight simulator is equipped with flight software-in-the-loop containing original data from Airbus Helicopters aircraft. Associated with a very detailed visual database, this offers customised realism reflecting various missions, different weather conditions and special effects such as brown-out, 3D sea conditions, etc., and allows teams that have already been formed to work together. Technical training is provided by a dozen experienced pilot instructors.

In figures

Today, this centre at Marignane, comprising 52 people, delivers 11,000 hours of training a year to about 3,000 civil and military pilots from 55 countries. Its simulators work 20 hours a day, 350 days a year with more than 99.5% availability. Helisim is being deployed on an international scale: Helisim LLC (its 100% Helisim subsidiary in the US created in 2018) opened its doors in January 2019 in Grand Prairie, Texas, near the Airbus Helicopters, Inc site.

Primarily dedicated to the Americas region, Helisim LLC already offers its simulation solutions for H125, H135 and H145 pilots. A new building that will house a new level D H145 FFS will be finalised at the start of 2020 and will be operational in July 2020.

Key dates:

2002 : Official opening of HELISIM and start of operation with the first AS332 L1 FFS level D (DGAC).

2003 : Delivery of the Super Puma AS332 L2 and Dauphin AS365 N2 cabins. FFS level D certified (DGAC).

2004 : Delivery of EC155 FFS and level D certification (DGAC).

2006 : FTO is approved, recognizing HELISIM as a training centre for European standards (EASA).

2008 : Delivery and EASA level D certification of the H225 simulator.

2009 : Delivery of the FMFS NH90 simulator.

2012 : Extension of the building to accommodate the H175 FFS.

2013 : Celebration of 100,000 flight hours in ten years (22,500 pilots trained in total).

2014 : Installation of H175 simulator, FFS level D (EASA) and purchase of the H175 simulator by HELISIM in 2015.

2018 : Creation of a HELISIM LLC subsidiary in Dallas, USA. Purchase of H125, EC135, EC145 simulators.

2019 : Extension of the existing building for installation of the H160 FFS level D in Marignane.

2020 : HELISIM will have carried out 200,000 accumulated flight hours.

⁽¹⁾ Level D qualification is the highest level of realism currently available in the world of simulation. It imposes many operational constraints, but allows pilots to benefit from the equivalent of one hour of actual flight with one hour in a level D simulator.

⁽²⁾ AS365 N2, H155 - AS332 MK1, AS332 MK2, H225 - NH90 in a TTH version - H175, currently unique in the world - H160, for which Helisim has exclusive use for a few years and which will be operational in May 2020.

⁽³⁾ FFS: Full flight simulator

Helisim provides 11,000 hours of simulation per year to about 3,000 civil and military pilots.



De Sousa



In 2003, the objective of preserving the operational entity of the Tiger and NH90 lines led to production for the two aircraft being brought together in one sole building: H4. This helped to ensure optimum efficiency for these extremely sophisticated helicopters (sharing of experience and grouping of skills) as much on an industrial level as on a human level.

Airbus Helicopters Patrick Pema

2008 - 2019

The new generation





Airbus Helicopters Éric Raz

The EC155's basic equipment comprised a 4-axis autopilot, navigation calculators, avionics and guidance systems.

First official flight of the EC155 drone demonstrator

2008 On 24 June 2008, the EC155 helicopter drone demonstrator (UAV) took off for its first official unmanned flight⁽¹⁾. This hailed a new era in the field of vertical flight, highlighting the company's wish to establish itself as a leader on the European market of unmanned aerial vehicles, bearing in mind that the development phase was financed entirely with its own funds.

The EC155's basic equipment comprised a 4-axis autopilot, navigation calculators, avionics and guidance systems. For this first unmanned flight, it was equipped with an experimental navigation calculator, a GPS, screens displaying the trajectories and ground speeds, as well as tailored piloting rules to ensure automatic control of the takeoff and landing phases.

This flight helped to gain experience, which was used in particular for the VSR700 (see page 111).

⁽¹⁾ Safety pilots were present aboard the aircraft, but they did not intervene during the flight



Airbus Helicopters

Did you know?

The missions of these unmanned aircraft can be varied: reconnaissance missions and transport in combat, sea and land-based areas; and surveillance of coastlines, borders or pipelines.

The H175

The 5 December has a special meaning for the H175 programme: in 2005, it marked the signing of the development contract between Eurocopter and its Chinese partners; in 2006, the end of the Preliminary Design Review phase; in 2007, the end of the Critical Design Review phase.

The cooperation agreement signed between Eurocopter and HAIG, a subsidiary of the Chinese group Avic II, was based on the equal sharing of costs (50/50). It provided for the development, industrialisation and serial production of a 6/7-tonne class helicopter. This was not a first with China: in 1980, a contract had been signed for the production of the Dauphin under licence. In 1992, the adventure continued with the EC120. All the equipped structures of the fuel system, canopy, right flap door, and engine cowlings were produced at the HAIG factory in Beijing.

It was not easy to develop a helicopter with a partner on the other side of the world, but the digitalisation of exchanges and studies offered solutions. A DMU (digital mock-up) was one of them, namely a virtual helicopter depicted entirely in 3D. The suppliers' design offices had equal access to this DMU in order to validate the integration of their equipment.

Throughout the H175's design phase, workshops were organised with a wide range of customers in order to hear their opinions and

better understand their needs. Safety, reduction of operating costs, availability, and versatility were at the centre of the discussions. The H175 flew for the first time on 17 December 2009.

Did you know?

At the end of 2018, 34 H175 aircraft were in use around the world, mainly by oil companies, with a total of more than 33,000 flight hours.



Airbus Helicopters Patric k Penna

The H175 made its maiden flight on 17 December 2009.

The first three H175s in public services version were delivered to GFS Hong Kong on 18 June 2018.



Airbus Helicopters Thierry Rostang

Technical data

Maximum takeoff weight : 7,5 tonnes -
7,8 tonnes (end of 2016)
Standard fuel capacity : > 2 tonnes
Ferrying distance : > 600 NM
Autonomy: 6 hours
Maximum cruise speed :
160 kts (300 km/h)

The X³ revolution

2010

It started out as a concept...

Surpassing existing aircraft technologies for vertical and horizontal flight, Eurocopter developed the H³ concept (High-speed, long-range, Hybrid Helicopter), a new vertical takeoff and landing aircraft formula that would make it possible to fly at a speed of 220 knots with the efficiency of a turboprop whilst also maintaining excellent performance in stationary flight.

But, the objective was not only high speed, it was also the total cost (acquisition, maintenance and use) of the aircraft that had to remain reasonable: no more than 25%, bearing in mind that the increase in cruise speed would be about 50% (from 145 knots to 220 knots). Therefore, the approximately 50% increase in productivity was much higher than that of the aircraft's hourly cost. An indirect saving was to be added to this: operators would need fewer machines to cover their long-distance transport missions.



Airbus Helicopters Anthony Pecchi

The X³ made its maiden flight on 6 September 2010.

The X³ in formation with the Patrouille de France.



Airbus Helicopters Anthony Pecchi



Airbus Helicopters Jérôme Deulin

The X³ above a TGV high-speed train preparing for its speed record (472 km/h) attempt in 2013.

...and it became the X³ technological demonstrator

The X³ (proof of concept demonstrator) was the demonstrator that served to validate the H³ concept. It made its maiden flight at Istres on 6 September 2010. It had three purposes. Firstly, to validate the technical concept: tail rotor function and yaw control, optimisation of propulsion managed either with the propellers or a slight inclination of the rotor, and regulation of the rotor and propellers (power management system). Secondly, to evaluate performance, flight qualities, loads, and vibrations in an extended flight range. Finally, to explore the aircraft's different configurations and identify the optimal settings. For example, when stationary, it is possible to perform the tail rotor function in an infinite number of ways by adjusting the speed of the two propellers.

This aircraft is mainly targeted at civil passenger transport, transfers between large urban areas, long-distance SAR (search and rescue) missions on land or at sea, etc. It can also be used in military missions for special forces, troop transport, search and rescue, or medical evacuations in the theatre of operations.

2011-2013 :the X³ notches up records

2011: maturity

After three months of work, the X³ was flown again in the step 2 configuration in March 2011 with a view to reaching a speed of 220 knots. The aircraft reached the speed target without any difficulty on 12 May 2011 and even exceeded it with 230 knots (430 km/h) during level flights using 80% of its available power, thus confirming its excellent behaviour in flight, its manoeuvrability, and its exceptional acceleration and deceleration capacities.

June 2012: the X³'s tour of the United States

In June 2012, the X³ started a seven-week tour of the United States during which it presented the range of its operational capacities during stopovers at military bases and civil operators.

7 June 2013

The X³ pushed the boundaries when it reached a speed of 472 km/h (255 kts) during a stabilised level flight lasting 40 minutes at an altitude of about 10,000 feet (3,048 m).

The knowledge acquired thanks to the X³ served as a basis for the project for a high-speed hybrid aircraft as part of the Clean Sky 2 European research programme, and helped to prepare a commercial application with the RACER (see page 118).

«The X³ is clearly in its element at high speed,» explained the test pilot, Hervé Jammayrac. «At 472 km/h, the behaviour of the X³ is exactly the same as that tested in its flight envelope, showing exceptional stability and a low vibration level without any need for an anti-vibration system.»

The X³ has been exhibited at the Museum of Aviation in Saint-Victoret since 2017.

Daniel Sémioli, flight engineer, and Hervé Jammayrac, test pilot.



Airbus Helicopters Patric KPenia



The first serial H160 completed its first flight on 17 December 2018.

Airbus Helicopters Eric Raz

The H160

first of the H generation

Did you know?

In March 2017, the French government announced its choice of the H160M (the military version of the H160) as the basic platform for its HIL (Hélicoptère Interarmée Léger – Joint Light Helicopter) programme designed to replace its Puma, Alouette, Gazelle, Fennec, etc. The aim was to streamline costs by means of a grouped purchase, and pooled maintenance and training.

2015 On 13 June 2015, the first prototype of the H160 took off for the first time. A few months later, in January 2016, Airbus renamed its helicopter range by prefixing it with the letter H. The H160 became the first of this new generation. The H160 positioned itself in the range between the H145 and the H175 with one aim: to create added value for its customers in terms of performance, competitiveness, safety, comfort, and environmental protection. In this area, its double-swept Blue Edge blades helped to halve its perceived sound level compared to that of an H155. The H160 offers a large number of technological innovations for which 68 patents have been filed. Furthermore, with a simplified maintenance plan, designed with customers and based on digital tools, the H160's support will be a real asset in comparison to that of the competition. The H160's three prototypes are designed to carry out all the tests needed to offer an optimum level of maturity as soon as the aircraft enters into service, scheduled for 2020.

The first H160 prototype flew for the first time on 13 June 2015.

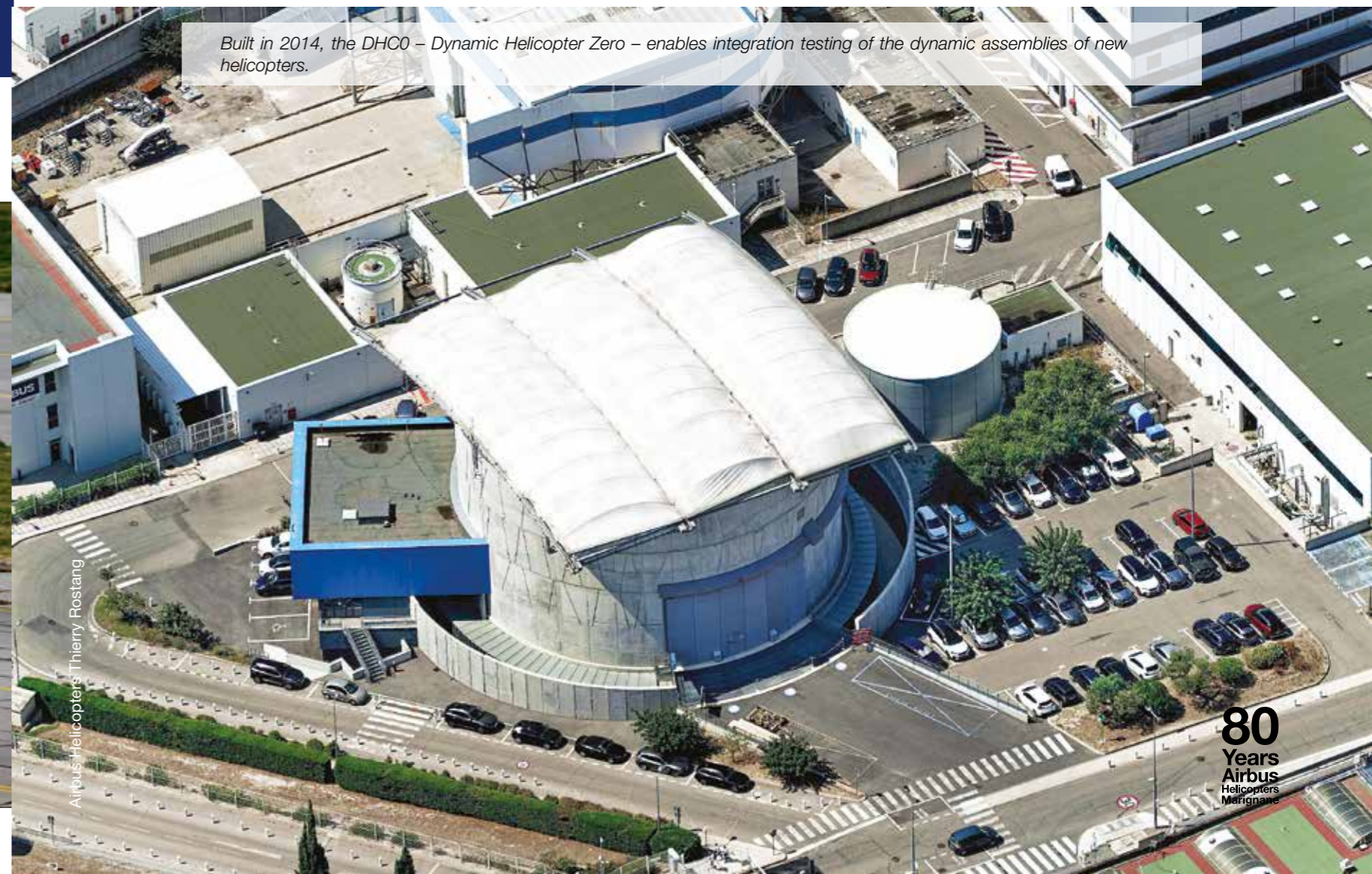


Airbus Helicopters Anthony Pecchi



Airbus Helicopters Thierry Rostang

After 19 months of work and fitting-out, the F3 building (20,000 m²) that houses the Marignane Development Centre dedicated to the research and development of new helicopters was inaugurated on 8 March 2016.



Built in 2014, the DHC0 – Dynamic Helicopter Zero – enables integration testing of the dynamic assemblies of new helicopters.

Airbus Helicopters Thierry Rostang



The H160's final assembly line entered into service in January 2018.

H160 Final Assembly Line

A technological breakthrough

2018

The H160's final assembly line marked a breakthrough for this field in terms of what had been done up until then at the Marignane site. From its design phase, this assembly line aimed to be effective, innovative and positioned for excellence. Airbus Helicopters capitalised on the concept of the MCA (main component assembly) defined in the context of the industrial strategy to invent the assembly line of the future. The H160 was divided up into sub-assemblies, each manufactured, equipped and tested separately before arriving on the assembly line. This helped to counter risks well in advance, thus guaranteeing an industrial cycle two times shorter than for previous generations. Another advantage of the MCA was that it limited the number of components to be assembled on the line. Thus, we have evolved from a manufacturing line to a real assembly line. The first station entered into service on 29 January 2018 with the arrival of the first central fuselage manufactured in Donauwörth. The stations are organised around elevators which lift the aircraft to the optimal position, thus providing favourable working conditions for the operators. Also, AGVs (automatic guided vehicles) move the aircraft from

one station to another in five minutes without any human intervention. Finally, a robotic arm is used to position the avionics bay in the aircraft in just a few minutes in one sole movement

Did you know?

The assembly line for the H160 comprises five stations:

- Station 1: delivery of the MCA central fuselage and start of assembly with the installation of the harnesses
- Station 2: installation of the air-conditioning system and the avionics bay
- Station 3: installation of the MDA (main dynamic assembly) and rear fuselage
- Station 4: installation of the engine and the landing gear
- Station 5: ground tests and final quality control

The VSR700

The VSR700 OPV (optionally piloted vehicle) demonstrator made its first unmanned flight on 20 December 2018. This OPV is a «droned» Cabri G2 from the 700 kg range. This first flight was an important milestone for the development of the VSR700 programme, and it came less than 18 months after the first autonomous-mode tests of the OPV with a safety pilot on board. The OPV experience helped to unite the different stakeholders around a common objective and to create the necessary synergies between the Airbus Helicopters teams in Marignane and Les Milles, the Hélicoptères Guimbal teams that produce the Cabri G2, as well as the DGA (French Armament General Directorate) for flight authorisations.

The OPV was a decisive technical step in the development of the VSR700, the first prototype of which completed its first «attached» flight on 8 November 2019.

2018 marked the launch of the VSR700 programme with the implementation of a risk assessment study for the DGA in cooperation with Naval Group. This contract, signed with the DGA at the end of 2017, aimed to refine the specifications and prepare the development of a future programme for a rotary-wing drone called «SDAM» (Système de Drone Aérien Marine - Naval Airborne Drone System) which will be integrated aboard French navy frigates.

2018

Did you know?

The VSR700 is not just an autonomous flying platform, it is a complete system containing an aircraft, data links, and a ground station which allows control of both the flight and the onboard payloads.

The VSR700 OPV during its first unmanned flight on 20 December 2018.



Airbus Helicopters Stéphane Keyralla

And tomorrow?





The mock-up of the HIL was revealed on 27 May 2019 at Marignane.

The Joint Light Helicopter (HIL)

The French State has to face the challenge of replacing its ageing fleets. In the three armies, the HIL programme must replace five types of specialist aircraft (Panther, Dauphin, Alouette, Gazelle, Fennec) with a single platform. This involves militarising the H160 to create a common H160M military base that is able to receive a range of «on-demand» equipment to carry out missions as diverse as interception in flight, search and rescue, offensive reconnaissance, anti-surface warfare, and the integration of commando troops for example, alongside the Tiger, NH90 and Caracal. But support is also another challenge: thanks to the state fleets' streamlining and the financial hedging of the H160 civil platform designed to reduce maintenance costs, the HIL aims to enable the French State to generate significant savings on fleet support while improving operational readiness. On 27 May 2019, Florence Parly, the French Minister of the Armed Forces, announced the early launch of the HIL, thus underlining the importance of this programme for the French forces. This early implementation is twofold: one year for the launch of the programme (mid-2021), and two years for the first deliveries (2026). The risk assessment study we were informed of at the end of 2017 was successfully completed. Its main objectives were to mature the system



Florence Parly, the French Minister of the Armed Forces, announced the early launch of the programme.

architecture and fine-tune the configurations in close collaboration with the DGA, the armed forces, and manufacturers. Next, we must prepare the launch of the HIL: a first offer must be submitted to the DGA from mid-2020 for signature in June 2021. This contract will of course include the development of the HIL but also a fixed order of a certain number of units (out of the 169 planned) and their support for a period of up to 10 years. According to the development schedule, two prototypes will fly respectively in late 2023 and mid-2024. The first aircraft delivered in 2026 will carry the colours of the Army, with the first Navy and Air Force deliveries expected from 2028.

Tiger MkIII

a new chapter in the history of the Tiger

In order to meet their operational needs in 2020 and beyond, the European countries that operate the Tiger (France, Germany, Spain) are considering upgrading their fleet based on the feedback acquired during their deployment in various theatres of operation. In this context, contracts for risk assessment studies were drawn up in September 2018. The objective of these was to ensure that all of the equipment and functions have reached the necessary technical maturity during the start of development, and to prepare a development, upgrade and support offer for the Tiger Mk III. This upgrade aims to introduce new battlefield capabilities (mission, weapon and communication systems), as well as a new avionics suite allowing all of these new systems to be managed, and to deal with cases of obsolescence. New screens will also be integrated, with a better resolution and touchscreen functionality. Moreover, the crew will also be supplied with new helmets featuring an electro-optical visor offering significantly improved performance. In terms of weapons, new surface-to-air and air-to-air missiles and rockets are planned for integration. The interoperability and communications systems are also to be upgraded to meet the increasing

need for operational communications: radio, satellite communication, interfaces with national battlefield management systems and drones. Finally, all of the electrical systems (including the harnesses) are to be changed. After submission of the initial offer planned for December 2019, the negotiation phase will commence with the OCCAR⁽¹⁾ and the three European nations; the objective being to sign the development, modernisation and service support contract in 2020. This will concern more than 130 aircraft. The first deliveries planned after 2025 will open a new chapter in the history of the Tiger.

⁽¹⁾ OCCAR: Organisation for Joint Armament Cooperation

More than 130 aircraft are affected by this upgrade.



The members of the Tiger Mark III project at Marignane.



The PT1 of the VSR700 made its first unmanned flight on 8 November 2019.



The H225 equipped with the EAGLE system during the test campaign carried out in 2017.

Did you know?

The new thermal engines should help to reduce CO₂ emissions by 50% thanks to a significant drop in their fuel consumption.

The future of helicopter flight

In 80 years, the Marignane site has largely contributed to the development of helicopter flight through innovations resulting from technological breakthroughs placed at the service of customers. From the Fenestron® concept to electric flight controls, there is no shortage of examples. But what does the future hold?

«The reduction of CO₂ emissions will be fundamental in the future and is one of the four pillars of our innovation strategy,» explains Tomasz Krysinski, Research and Technology Director at Airbus Helicopters. The three other pillars concern flight safety, simplification and economic accessibility. «Our aim is to develop technological building blocks that can be deployed on multiple platforms, in the short term for the existing fleet, in the medium term with demonstrators, and in the longer term via disruptive concepts that can influence the transport of the future.» In 2020, three themes will be on the agenda: hybridisation, autonomy and obstacle avoidance.

Regarding hybridisation, work carried out on an Ecureuil in 2011 demonstrated the benefit of having an additional energy source in the event of an engine failure. Initial trials on a new single-engine flying test bench equipped with an emergency electric engine are planned for next year. In the future, considerable gains are expected in the fields of safety, environmental footprint, and performance. In particular, this electric engine will facilitate autorotation manoeuvres by giving the pilot more time to react and supplying additional power in the final seconds of descent.

In terms of autonomy, the first prototype of the VSR700, based on a droned Cabri G2, made its first unmanned flight on 8 November 2019 (see page 111).

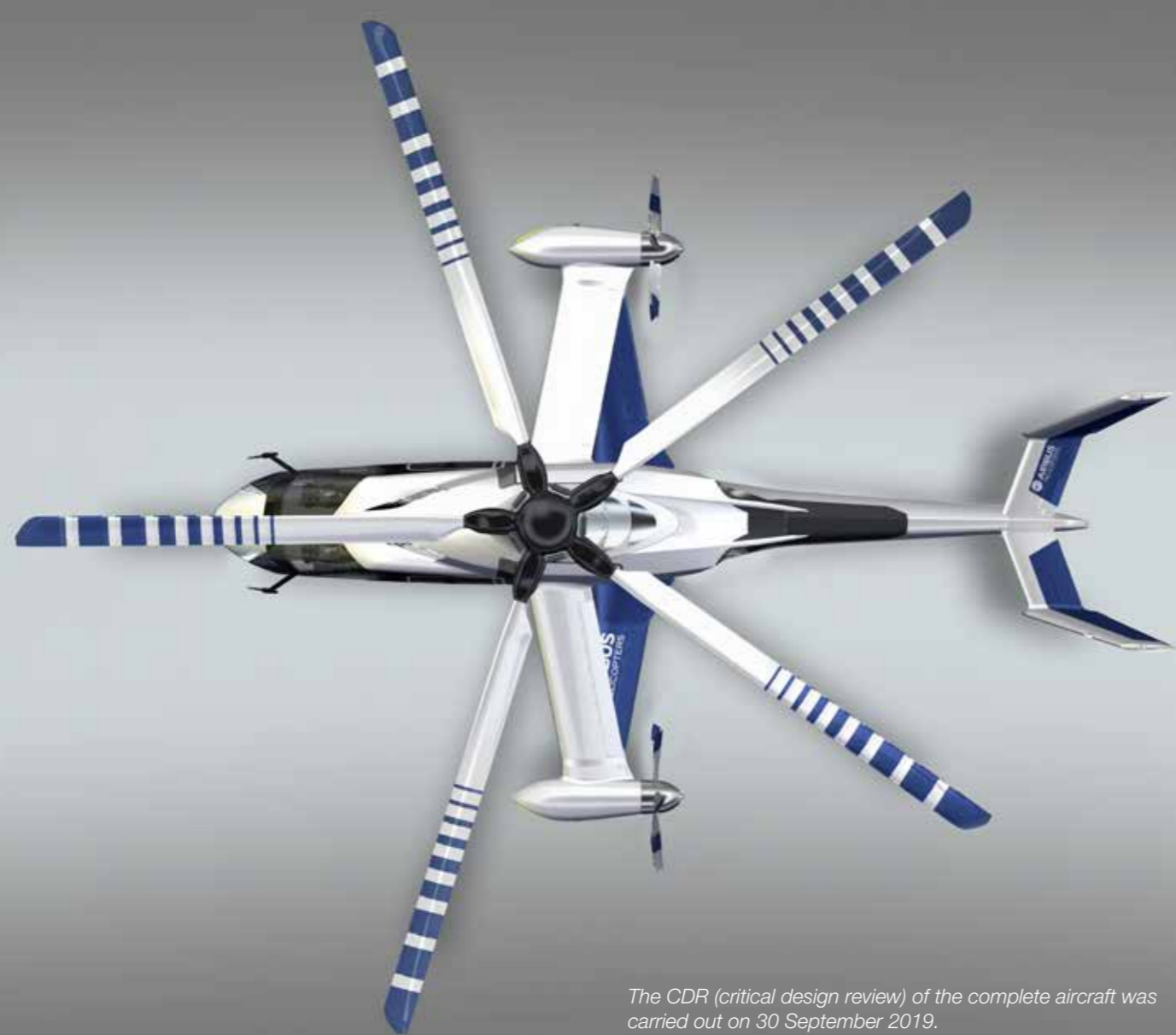
Regarding obstacle avoidance, several projects have already made great headway. The RSAS (Rotor Strike Anti-collision System), enabling the display of obstacles detected near the aircraft, will be certified on the Ecureuil by the end of the year. As for power line detection, its certification on the Ecureuil is planned for next year. Finally, the EAGLE (Eye for Autonomous Guidance and

Landing Extension) system produced good results during a test campaign on the H225 carried out at the end of 2017. This project aims to collect and analyse images and then insert the data in the avionics so as to improve

the information sent to pilots and reduce their workload. The goal is to automate and secure the aircraft's approach, takeoff and landing in complex environments.

The work carried out on an Ecureuil in 2011 demonstrated the benefit of having an additional energy source in the event of an engine failure.





The CDR (critical design review) of the complete aircraft was carried out on 30 September 2019.

Airbus Helicopters

© Airbus Helicopters Design Studio

Racer

Speed at the heart of the mission

Did you know?

The RACER's missions: inter-city transport, medical emergencies, search and rescue operations.

RACER (Rapid and Cost-Effective Rotorcraft) – an economical, high-speed hybrid aircraft – is being developed as part of the European Clean Sky 2 research project with the participation of about thirty partners, in particular from Spain, Germany, Poland, and France. It is derived from the X³ high-speed demonstrator which has helped to confirm the technological choices and demonstrate its potential. The objective is to fly the demonstrator by the end of 2020 or start of 2021 and test its mission capabilities with a total potential of 200 flight hours by the end of 2023. It is hoped that this will generate interest amongst the civil market.

The CDR (critical design review) of the complete aircraft was carried out on 30 September

2019. Parts are already being manufactured: the fuselage, main gearbox, landing gear and tail boom; and the demonstrator's assembly is scheduled for 2020. Its design was fixed in spring 2016 after numerous wind tunnel tests. Some differences should be noted in relation to the X³: in particular, an asymmetrical tail boom, lateral rotors positioned towards the rear to free up a safety zone for boarding passengers, and a more slender fuselage with a double wing ensuring greater stability. Equipped with two RTM322 engines (identical to those of the NH90), it will reach a cruise speed of 220 knots (with two engines) and 180 knots in energy-saving mode (with one sole engine). Its structure will combine carbon and metal.



Airbus Helicopters Eric Raz

Did you know?

Thanks to Blue Edge™ blades, in the approach phase the H160 generates the same sound level as a helicopter that is two tonnes lighter!

Helicopters that are even more environmentally friendly

Over the decades, CO₂ emissions and the noise level of Airbus helicopters have been greatly reduced. However, today, respect for the environment is becoming ever more important in society on an international level. How is this new awareness being addressed by Airbus Helicopters?

Reducing emissions

There are two types of emissions: CO₂ which contributes to global warming, and other particles (NO_x, carbon oxide, etc.) which contribute to a

deterioration of air quality. Although there are no regulations regarding emissions for helicopters, Airbus Helicopters is currently working on several solutions. To reduce these two types of emissions, it is necessary to focus on the propulsion system, whether thermal, hybrid, or all-electric.

Five areas of work have been identified for the thermal engine: improvement of the thermodynamic cycle (together with engine manufacturers), use of alternative fuels, optimisation of the recovery of heat generated



Replacing the tail rotor with a Fenestron® (the fairing limits the propagation of sound towards the ground) for aircraft with a tonnage less than or equal to six tonnes helps to reduce the sound level.

Airbus Helicopters Wolfgang Obrušnik



© PAD

«Design to noise» was created in order to give this aspect greater importance in studies carried out for the future urban air mobility (UAM) segment.

are all obstacles to the development of helicopter missions in urban areas. Requirements on this subject are already being defined by potential customers in calls for tenders (for example, EMS missions in Germany).

Today, the Airbus range of helicopters is positioned the best in terms of sound level. This positioning is the result of the use of three technologies for mass-produced aircraft: an automatic rotor speed control rule (which varies according to altitude, for example), the replacement of the tail rotor with a Fenestron® (the fairing limits the propagation of sound towards the ground) for aircraft with a tonnage less than or equal to six tonnes, and finally, blades with very fine tips and an arrow shape (the Blue Edge™ blade on the

H160 is very effective in approach flights). Other solutions are also being studied, in particular low-sound flight procedures that involve flying higher, further away from sensitive areas, and faster in order to limit time of exposure to the sound, as well as the avoidance of conditions in which helicopters tend to be noisier.

Although Airbus helicopters are the most quiet on the market, it is not enough for the future urban air mobility (UAM) segment. That's why «design to noise» was created in order to give this aspect greater importance in studies.

Air transport represents 12% of global transport and just 2% of CO₂ emissions. The percentage of helicopters in this total is less than 0.02%.

by the engine, the integration of engines in the aircraft, and power management (for example, creation of an energy-saving mode in the RACER).

For hybridisation, we have a «micro» level with a power of between 10 and 50 kW (used for the gas turbine's Start & Stop), a «medium» level with a power of 100 kW which allows thermal and electric power to be used together in certain flight phases (a project is underway to test a handover to the electric engine in the event of the thermal engine breaking down), and finally, a «full» hybridisation level with power exceeding 200 kW. In this last case, electric energy is favoured over thermal energy depending on the flight phase, meaning that a less powerful and therefore more fuel-efficient turbine can be used. With all-electric propulsion, there are no more emissions of CO₂ and particles, but there are still many challenges. The first is energy storage: the batteries have to be light and compact. The second concerns certification regulations, as these do not exist yet. The third is the completely different aircraft integration. The aerodynamic optimisation of aircraft and the reduction of emissions for producing the energy and batteries

are also issues to be addressed before being able to switch to all-electric.

Reducing the sound level

Three sources of sound can be identified on a helicopter: the main rotor, the tail rotor, and the engine(s). The sound level depends on the type of helicopter, the flight conditions (approach, takeoff, forward flight, etc.), and the observer's position. ICAO regulations require helicopter manufacturers to work relentlessly on this subject. Other challenges need to be taken into account as well though. Complaints filed against our customers by communities that are under a flight path, the payment of taxes, and flight restrictions

«The reduction of CO₂ emissions of air transport is an exceptional opportunity for Airbus.»

Guillaume Faury, CEO of Airbus
September 2019



Master Films Pascal Pigeyre

MECA 4.0

A standard of excellence

Through an investment of €116 million, MECA 4.0 aims to raise rotors and gearboxes to a level of excellence in terms of quality, flight safety and competitiveness by substantially improving manufacturing methods.

This major investment affects all parts of the value chain, from design to maintenance, and from suppliers to final delivery to the customer.

Decontamination of parts

As there are several sources of pollution, this issue is all the more complex. The metal or hard particles generated during the process of manufacturing and assembling gearboxes is just one that can have a considerable impact on their reliability.

Washing systems will allow parts, housings, and gearboxes to be decontaminated, including the removal of all machining dust and residue, and then rinsed using specific rinsing benches.

Assembly of mechanical modules

A large share of the total investment, €50 million, is allocated to the industrial facilities at the Marignane site. It will finance the creation of a new assembly unit for all Airbus helicopter rotors



«Eccoclean™» machine for eliminating machining dust and residue before packaging.

and gearboxes, both for serial production and maintenance repair and overhaul (MRO). Initial work on this future building is scheduled for the beginning of 2020 and the inauguration is planned for the middle of 2021.

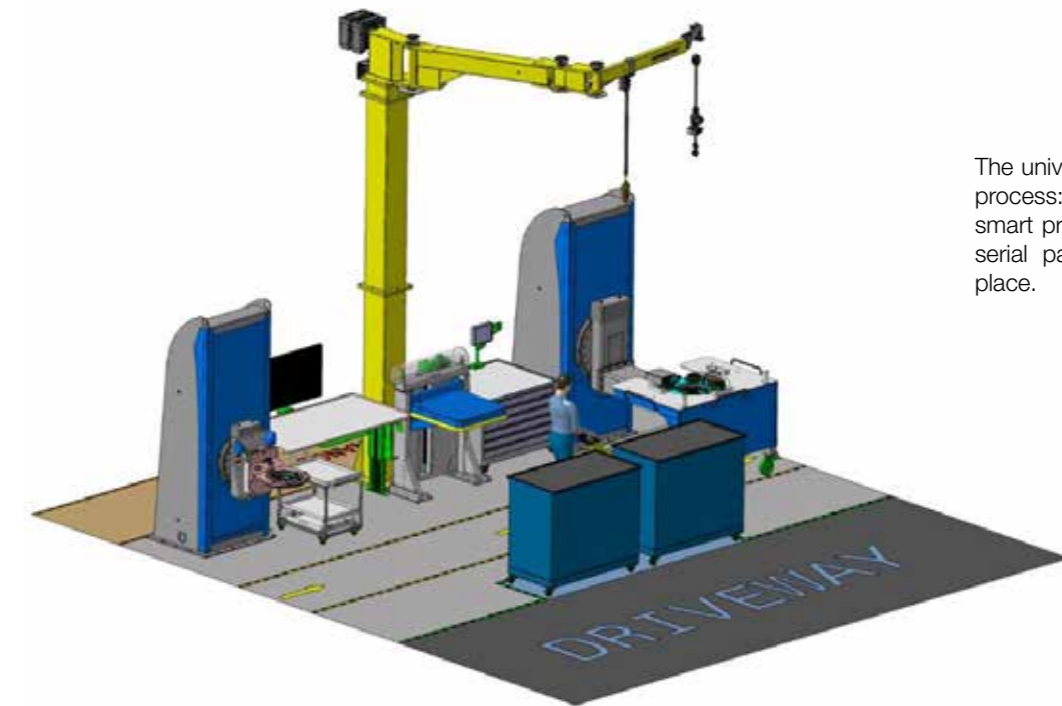
Inside, production will be organised around universal work stations. Their great versatility will allow the full diversity of our new and repaired products to be brought together on the same work station.

A chain of several stations will enable the creation of assembly lines. This will be a great asset for quickly adapting the pace of production and repairs to fluctuations in the order book. Digitalisation will be at the heart of this new-generation production strategy. Operators' work will be assisted by numerous smart tools offering access to precise production parameters and even greater traceability.

The MES (Manufacturing Execution System) will ensure coordination and will provide operators with assembly instructions.

Ergonomics has played a central role in the

Demathieu-Bard construction



The universal station for the assembly process: a digital station with all the smart production tools for processing serial parts and MRO in the same place.

project since the outset. As such, robotic arms will allow operators to work in better conditions.

Transport and protection of parts and mechanical modules

The new Safelog containers for transporting main gearboxes (MGB) and other assemblies (tail gearboxes, satellite carriers, etc.) were approved in 2019 for the entire Airbus Helicopters civil range. These durable shuttle boxes provide a standardised solution that is perfectly safe for customers and suppliers, while at the same time eliminating disposable packaging. Now a quality standard, they will be integrated into the technical documentation of helicopters.

The start of deployment is scheduled for 2020. At this stage, priority has been given to the flow of new MGBs or repair outflows. Eventually, the project will be extended to MGBs that customers send us.

Feedback and data capitalisation

It is crucial to be able to analyse and capitalise on data that will serve to increase the reliability of parts and flight safety. This area comprises two initiatives:

- Healthbook, a digital logbook that allows data concerning a serial part to be recorded and accessed throughout its life cycle (design, manufacturing, assembly, service, maintenance).

- A RETEX (return on experience) factory, a specific organisation set up to study a selection of scrapped parts and enrich our knowledge base.

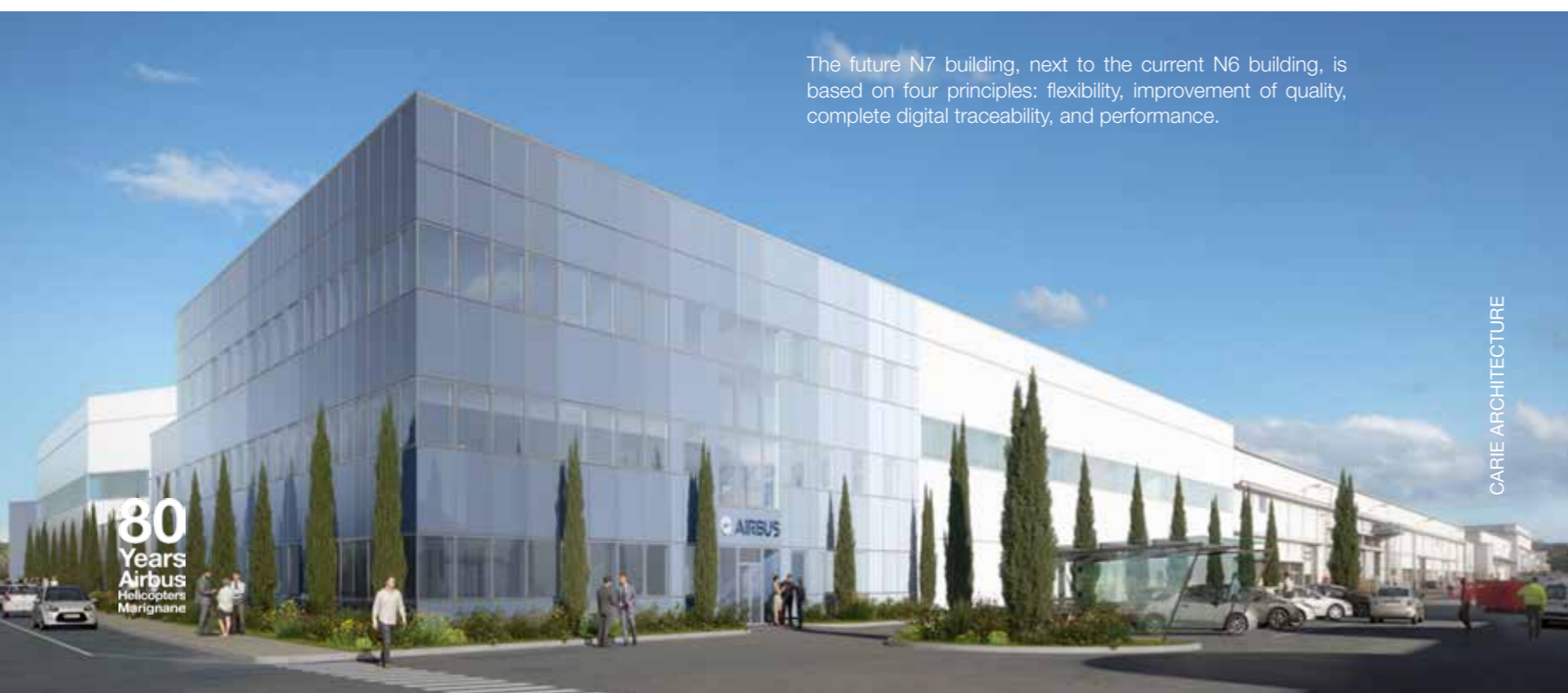
Skills and the human factor

Training on the manufacturing of basic parts and assembly is already in place. Objective: to improve skills and generate new expertise and new working methods in order to develop greater awareness of quality and aviation safety issues. A specific integration path for new arrivals in the mechanics sector in a broader sense (purchases, design office, production, support, quality, etc.) is in the process of being organised in order to raise awareness amongst all the sector's players.

Deployment throughout the world

Where appropriate, the standards implemented by MECA 4.0 at Marignane will be deployed in our network of approved repair centres, with the same high standards in order to establish global norms.

The future N7 building, next to the current N6 building, is based on four principles: flexibility, improvement of quality, complete digital traceability, and performance.



CARIE ARCHITECTURE

80
Years
Airbus
Helicopters
Marignane

Improving skills and generating new expertise in order to achieve a higher level of awareness of quality and aviation safety issues.



80
Years
Airbus
Helicopters
Marignane

The pilots of the first flights



The pilots of the first flights

A closer look at the test pilots who completed maiden flights from the Marignane site.



Daniel Bauchart
27 June 1974: Ecureuil



Roland Coffignot
1 June 1972: single-engine Dauphin
23 January 1975: twin-engine Dauphin



Raymond Berlioz
6 February 1987: Super Puma
AS332 Mk2



Jean Boulet
7 December 1962: Super Frelon
15 April 1965: Puma
7 April 1967: Gazelle (standard tail rotor)
12 April 1968: Gazelle (with Fenestron®)
17 April 1969: Lama
27 June 1972: H890 (hydropter)



Jacques D'Elbreil and Pierre Loranchet
13 September 1978:
Super Puma AS332 Mk1



Guy Dabadie
28 October 1996: Dauphin AS365 N3
17 June 1997: EC155



Philippe Boutry
19 December 1995: NH90
(first technical flight)



Didier Delsalle
24 June 1999: EC130

The pilots of the first flights



Airbus Helicopters Patrick Penna



Airbus Helicopters Patrick Penna

Alain Di Bianca
17 December 2009: H175



DR



Airbus Helicopters Jérôme Deulin

Didier Guérin
4 March 1997: Ecureuil AS350 B3



Airbus Helicopters Patrick Penna



Airbus Helicopters Anthony Pecchi

Hervé Jammayrac
27 November 2000: EC725
6 September 2010: X³



DR



DR

Pierre Loranchet
27 September 1979:
twin-engine Ecureuil



Airbus Helicopters Eric Raz



Airbus Helicopters Eric Raz

Olivier Gense
13 June 2015: H160



DR



DR

Etienne Herrenschmidt
27 April 1991: Tiger
9 June 1995: EC120



DR



DR

Bernard Pasquet
10 October 1980: Super
Puma AS332 L

The records set in Provence



Airbus Helicopters Patrick Penna

The tradition of setting records has been an integral part of our company for many years. Over time, these have helped to demonstrate our helicopters' ability to carry out the most demanding missions in the most challenging environments.

19 and 23 July 1963

The record over a 3 km stretch was raised to 341.23 km/h on 19 July with a Super Frelon. On 23 July, the record over a 15/25 km stretch was raised to 350.47 km/h, and on the same day the record over 100 km in a closed circuit was smashed: 334.28 km/h. The record-breaking aircraft was none other than the first prototype to which a certain number of modifications had been made: new fairing on the rear section to prevent a break owing to the rear ramp, fixed landing gear replaced by three skids, ducted blade shanks, and masking of slots and rivets.



Crew: Jean Boulet, Roland Coffignot and Joseph Turchini (flight mechanic for the 100 km record only)

13 May 1971



The Gazelle smashed three world speed records: over a 3 km stretch (310 km/h), over a 15/25 km stretch (312 km/h) and over 100 km in a closed circuit (296 km/h). The modifications made for the record concerned the main rotor, which was enclosed in a circular cowling, called the sea urchin, with specific shaft fairing studied in the wind tunnel.

Crew: Denis Prost (pilot) and Jean-Marie Besse (test flight engineer)

15, 16 and 17 May 1973

Roland Coffignot set three speed records with a Dauphin and a load equivalent to eight passengers: 299 km/h over 100 km in a closed circuit, 312 km/h over a 3 km stretch, and 303 km/h over a 15 km stretch. The aircraft used for the record was in an almost normal configuration. However, it should be noted that the blades and the airframe had been waxed!

Crew: Roland Coffignot (pilot), André Ricaud (test flight mechanic), René Stevens (test flight engineer), Joseph Rostaing (Dauphin programme leader) only for the record over the 100 km stretch

21 June 1972



Pilot: Jean Boulet

Jean Boulet broke the world altitude record in all categories with a Lama reaching 12,442 m. The Lama used was a serial aircraft with a greatly reduced weight: the stabiliser and all the seats (except the pilot's!) had been removed. One of the Plexiglass doors had been replaced with a lighter 8-kg metal sheet. The landing gear had been stripped down to the very basics, and non-essential equipment (battery, starter, directional gyroscope, horizon, etc.)

had been done away with. However, after breaking the record, the turbine switched off and Jean Boulet was unable to start it again because of the absence of a starter and a battery. So he began his descent in autorotation and without instruments in difficult conditions (iced windscreen in a thick layer of cloud). Despite this, he managed to land very near the departure area, a condition for validating the record. Mission accomplished.

8 February 1980

The Dauphin AS365 N beat the world speed record on a defined route – Paris-London with passengers – at a speed of 321.91 km/h. The record was beaten with the first one built even before the aircraft had been certified. The aim was to demonstrate the Dauphin's long-distance transport capacities at high speed. It also provided the opportunity to deliver a French baguette bought in Paris an hour earlier to the sports commissioner of the British Royal Aero Club!

Crew: Bernard Pasquet and Max Jot (pilots), Michel Sudre (test flight mechanic)



DR

15 September 1987

Max Jot set a climbing speed record with a Panther: 3,000 m in 2.54 min and 6,000 m in 6.14 min. The aim was to demonstrate the aircraft's capacities in order to promote them to the Indian air force. This flight was made under very unfavourable conditions for the aircraft with temperatures higher than the seasonal average.

Crew: Max Jot (pilot) and Pierre Rougier (test flight engineer)



DR

14 May 1985

Pierre Loranchet set a 3,000 m, 6,000 m, and 9,000 m climbing speed record with an Ecureuil AS350 B1 in respectively 2.59 min, 6.54 min, and 13.51 min. The aircraft had not undergone any structural modifications but the main rotor had been replaced by that of the twin-engine Ecureuil equipped with larger blades.

Crew: Pierre Loranchet (pilot) and Bernard Certain (test flight engineer)



DR

19 November 1991

Guy Dabadie broke the world speed record for all categories over a 3 km stretch at a speed of 320 km/h in the Dauphin AS365 X. The Starflex hub had been replaced by a one-piece Spheriflex shaft hub in wound carbon fibre, which was unparalleled in the world at the time. The cowling of the rotor hub head, called the sea urchin, was used as in the Gazelle. The number of blades was increased to five (instead of four). Finally, the Fenestron® used was smaller in diameter (0.90 m instead of 1.1 m) with a larger number of blades (13 instead of 11).

Crew: Guy Dabadie (pilot), Michel Sudre (test flight mechanic) and Bernard Fouques (test flight engineer and flight tests director)



Airbus Helicopters Patrick Panna



Pilot : Didier Delsalle

14 May 2005

Didier Delsalle broke the world record for takeoff at altitude, at 8,850 m from the summit of Everest in a serial Ecureuil AS350 B3. This record is forever etched in helicopter history since it can never be broken! Only the seats and comfort features were removed to lighten the aircraft, which had been equipped with low landing gear.

One month earlier, Didier Delsalle broke three time-to-climb records: 3,000 m in 2 min 12 s, 6,000 m in 5 min 6 s, and 9,000 m in 9 min 26 s with the same aircraft.

7 June 2013

Hervé Jammayrac reached a speed of 472 km/h in level flight with the X³ (unofficial record), making it the fastest helicopter in the world.

For this speed record, the X³ had been equipped with its «sea urchin» and closely adjusted extensions on its flaps streaming aerodynamically towards the rear. The lower part of the vertical fins had been shortened and the fairing of the

joint between the horizontal stabiliser and the tail of the aircraft had been optimised, not to mention the landing gear.

Crew: Hervé Jammayrac (pilot), Dominique Fournier (test flight engineer)



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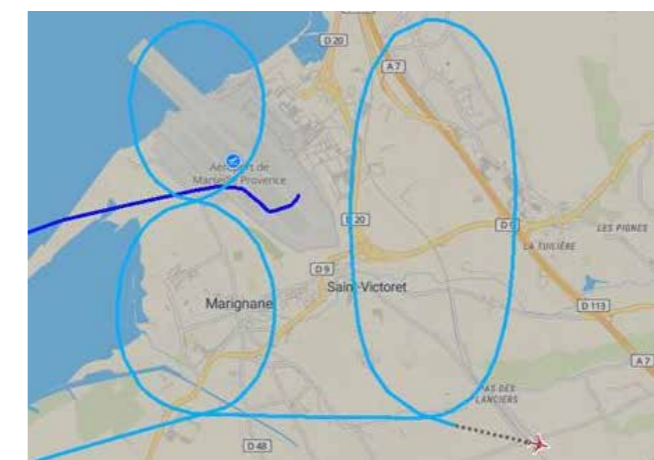
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On 27 February 2019, the H160 PT3 wrote the number 80 in the sky above the site to celebrate the 80th anniversary in its own way.

Around Marignane ...

Several satellite sites – subsidiaries, service centres or remote sites – can be found near the Airbus Helicopters head office at the Marignane plant.



Airbus Helicopters Thierry Postang

AHTS - Marignane

The AHTS – Airbus Helicopters Training Service – customer support division is adjacent to the Marignane site. Its 10 buildings offering a total surface area of 5,700 m² are home to a restaurant and all the facilities required for customer training. A hundred people from Airbus work there.

EUROSUD – Marignane

Located on the other side of the D20, this entity brings together three buildings covering a total surface area of 10,000 m².

- One 3,300 m² building houses all the shared services (wages, training, recruitment, time

management), namely 100 people from Airbus.

- Two buildings comprising a total surface area of 6,700 m² house 24 service centres for Airbus service providers (500 people).



Airbus Helicopters Eric Raz



Airbus Helicopters Camille Morenc

Les FLORIDES – Marignane

Located on the edge of Marignane on the road to Martigues, this hub features:

- One 48,000 m² building devoted to logistics activities operated by Daher Aerospace.
- One 6,400 m² building devoted to tertiary

activities, which brings together support activities and the «AOG war room⁽¹⁾», employing a total of 400 Airbus staff.

⁽¹⁾ Aircraft on Ground

VSR700 Plateau – Aix-Les-Milles

Located near the Aix-Les-Milles airfield, the VSR700 plateau comprises 500 m² devoted to tertiary activities and 400 m² of hangars where about 50 Airbus employees work.

As for all Airbus Helicopters programmes, operating in «plateau» mode has been favoured. It ensures greater agility and operational efficiency as well as better cost control. With the VSR700's

aerial platform being derived from Hélicoptères Guimbal's Cabri G2, which is based at Aix-Les-Milles airfield, the site was a natural choice. This geographical proximity helps us to be more responsive and makes collaboration between the teams much easier.



Airbus Helicopters Eric Raz



Aerial view of the Marignane site – August 2019

2019

Civil Range



Military Range



Technology demonstrators



AIRBUS

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The latest additions to the Airbus range, symbols of the innovation strategy that drives all divisions of the group.

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During the many interviews we conducted with the employees and former staff of our site, we were able to see for ourselves their great attachment to our history and the desire to perpetuate the pioneering spirit that has helped the company become a global leader on the civil and parapublic helicopter market.

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