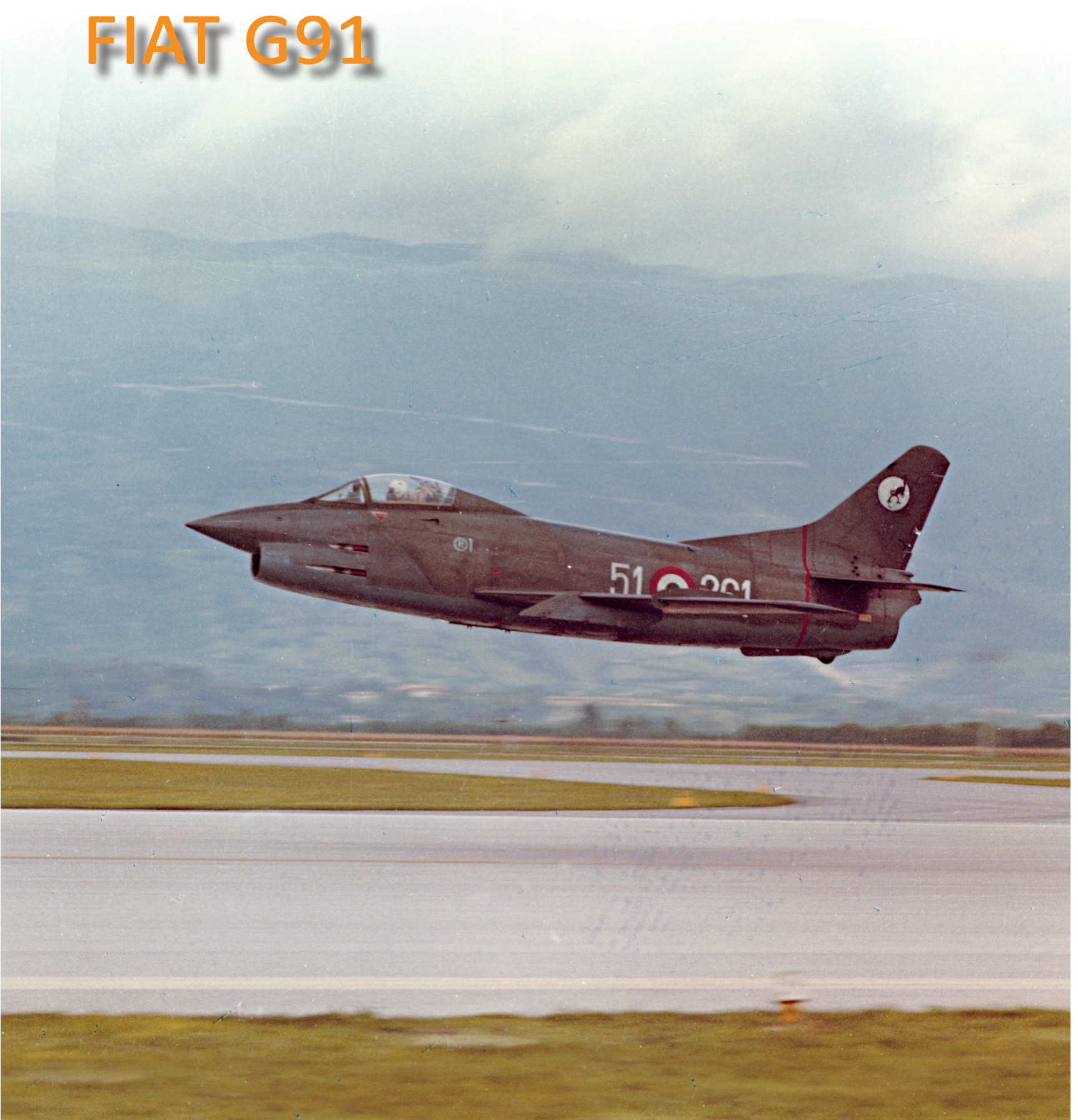
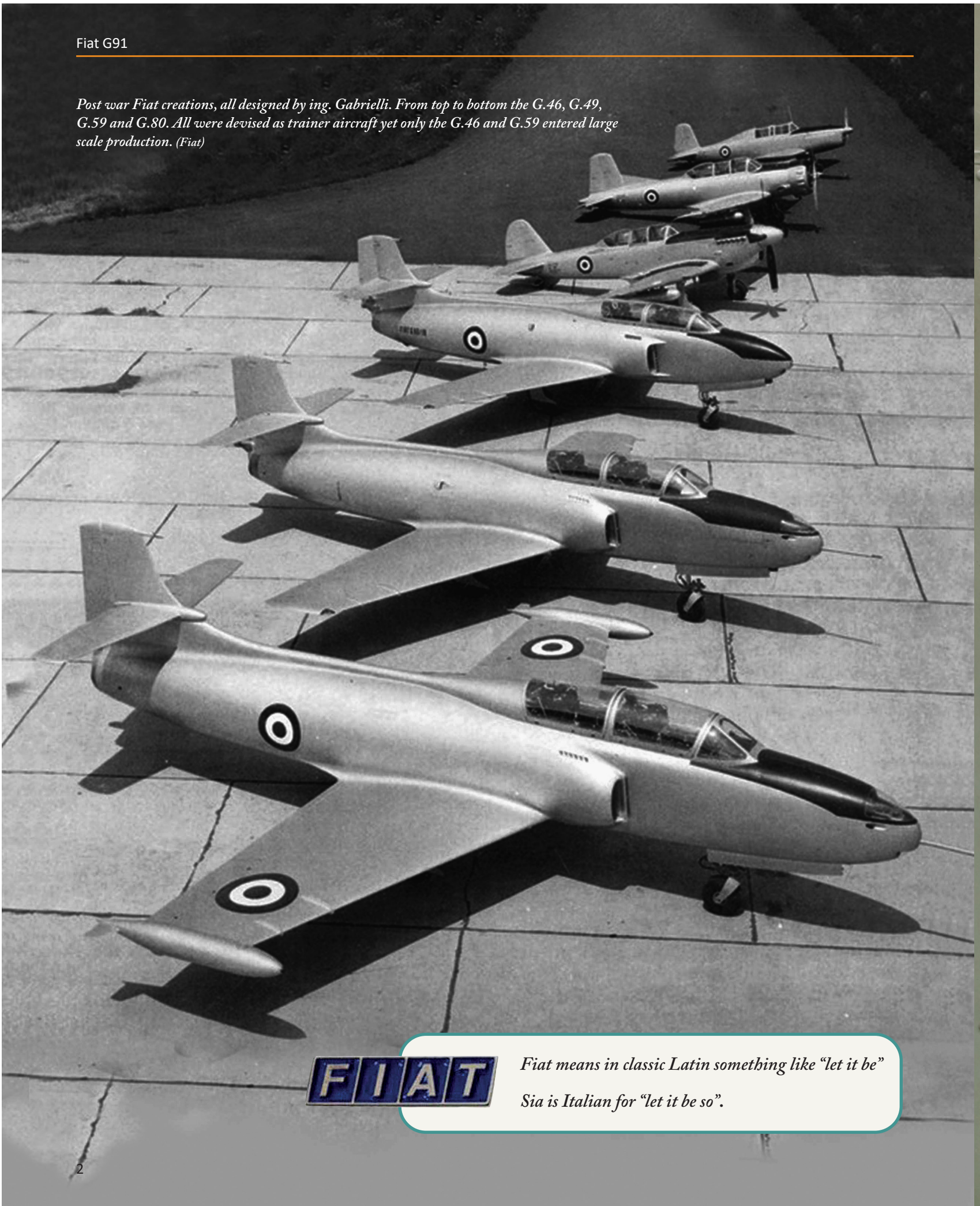


FIAT G91



Fiat G91

Post war Fiat creations, all designed by ing. Gabrielli. From top to bottom the G.46, G.49, G.59 and G.80. All were devised as trainer aircraft yet only the G.46 and G.59 entered large scale production. (Fiat)



FIAT

*Fiat means in classic Latin something like "let it be"
Sia is Italian for "let it be so".*



The Fiat CR.32 was a successful fighter during the Spanish civil war. Just over 1000 examples were built.
(Fortepan)

in Aachen, Germany and worked some time at Piaggio. His vision and knowledge ensured that Fiat could follow the technological developments in the 1930s, and later in the 1950s. With the Fiat G.18 commercial transport monoplane the age of metal production was entered, and the 1938 G.50 could compete with any contemporary fighter. During 1943 the G.55 fighter appeared, an aircraft considered the top of the cream. Due to the collapse of the Fascist Mussolini regime production was limited to about 200 examples. After the Second World War Gabrielli designed the first Fiat jet aircraft: the G.80 trainer, which made its first flight in December 1951.

Fiat – a short history:

The involvement of Fiat with the aviation industry started in the years before the First World War. In these days, one of the main issues for airplane designers was the development of reliable light-weight engines.

Fiat was established in 1899 as Fabbrica Italiana Automobili Torino (the acronym FIAT was changed to Fiat in 1906). The next ten years Fiat built out its market position quickly by design and production of cars and vans. In 1908 it was decided to expand to aviation with the SA 8/75 engine, which was developed from a race car and had a high power to weight ratio. The introduction of Fiat as aircraft engine designer was not an immediate success; the European market was dominated by French Gnome, Antoinette and Renault, and German Mercedes, showing that there were more automobile manufacturers active in aviation. Only during the First World War the Fiat aircraft engines saw a wider use, especially the A10 and A12 were used in Italian aircraft designs as the SAML S.1 and S2 (total production about 660) and the Pomilio PE (over 1600 produced).

In 1916 Fiat started aircraft manufacturing with the establishing of the Società Italiana Aviazione (SIA), first concentrating on license production of the Farman MF and Pomilio types. With the SIA 5 a first own design was made, and the improved SIA 7, a light twin-seat bomber introduced in 1917 was produced in some numbers. With aircraft designer Celestino Rosatelli entering the company, and the purchase of Ansaldo after the war, Fiat started aircraft design and production under its own name. The R.2 was the first aircraft branded under the name Fiat, and in the 1920s and 1930s a range of aircraft appeared. Landmarks were the Fiat BR, and the CR.20, CR.30 and CR.42 fighters.

In 1931 the young aircraft designer Giuseppe Gabrielli entered Fiat. Gabrielli was educated by the eminent Theodore von Kármán

In 1947 Fiat entered the gas turbine market with the manufacturing of spare parts for the De Havilland Goblin turbine for the De Havilland Vampire, which Fiat built in license in collaboration with Macchi. Production of gas turbines started in 1952 with license production of the De Havilland Ghost. In 1953 Fiat could take advantage of the US Government offshore procurement programme: Fiat was granted license production of the North American F-86K Sabre.



The Fiat G.80, here in model form at the Paris Air Salon 1951 (at the exhibition in the Grand Palais) was the first jet aircraft designed by Giuseppe Gabrielli. It was only produced in small numbers. Prototype maiden flight was in December 1951.
(Avia/KNVvL)



Giuseppe Gabrielli

INTRODUCTION

The Fiat G.91 was based on NATO requirements and was developed in the second half of the fifties. It entered service with German and Italian air forces in the light strike role, and proved to be a sturdy and highly serviceable aircraft. With over 750 examples built it was a common sight at many exercises all over Europe.

For nearly 20 years the Italian Freccie Tricolori display team inspired countless spectators with their colorful aerial ballet. In 1995, after nearly forty years of service, the G.91 made its last flight.

G.91 ORIGINS

During the winter of 1953 NATO SHAPE (Supreme Headquarters, Allied Powers, Europe) issued the first NATO basic requirement (NBRM), which concerned specifications for a light weight tactical strike fighter. The specifications were based on experiences in the Korean war (which ended in the summer of that year), where it became increasingly obvious that jet aircraft should be less complex, and, for close air support, be able to operate from unpaved runways. In general, costs, weight and complexity of military aircraft were rising at an ever-increasing rate, which was reflected in practical issues like the amount of ground equipment and maintenance needed. Also, the NBRM



was a product of the thought that standardization would lead to a more effective military power buildup, while logistics would simplify and that producing large batches of complex weapon systems could suppress costs. In fact a lot was learned from a Russian MiG.15 captured in Korea.

A few aircraft manufacturers were issued the NBRM spec in the form of a restricted tender, where the designs submitted were assessed by the AGARD (NATO Advisory Group for Aeronautical Research and Development). Designs were received from Folland (Gnat), Hawker (lightweight

NBRM specification
The most important requirements in the NBRM for the "light weight tactical strike fighter" (LWTSF) were:
<ul style="list-style-type: none"> • durable construction and relative simple to maintain with minimum of facilities;
<ul style="list-style-type: none"> • maximum empty mass of 2270 kg (5000 lbs); maximum take-off mass of 3630 kg (8000 lbs);
<ul style="list-style-type: none"> • minimum Mach number of 0.95 (1165 km/h) from sea level to 150 meter for at least 30 % of the mission and cruising at 645 km/h for the remainder;
<ul style="list-style-type: none"> • clearing a 15 meter obstacle within 915 meters after take-off from a grass strip (at maximum take-off mass);
<ul style="list-style-type: none"> • pressurized cockpit (for interceptor duty);
<ul style="list-style-type: none"> • minimum roll rate 100 deg/s at Mach 0.9;
<ul style="list-style-type: none"> • combat radius 278 km (150 nm);
<ul style="list-style-type: none"> • to be equipped with UHF radio, IFF (radar identification), DME (Distance Measuring Equipment), radar homing beacon and gyro gun-and-rocket sight.



A Fiat G.91 prototype competes against a backseat lady in a model 1800 of the same company. After entering operational service, the G.91 received the popular nickname "Gina", after the then popular well-curved Italian movie star Gina Lollobrigida.

version of Hunter), Bréguet (1002 Taon), Dassault (Mystère 26, later renamed Etendard VI), SNCASE (Durandal), Aerfer (Sagittario II) and Fiat (G.91). However, a number of designs were withdrawn again (for instance all British), for various reasons.

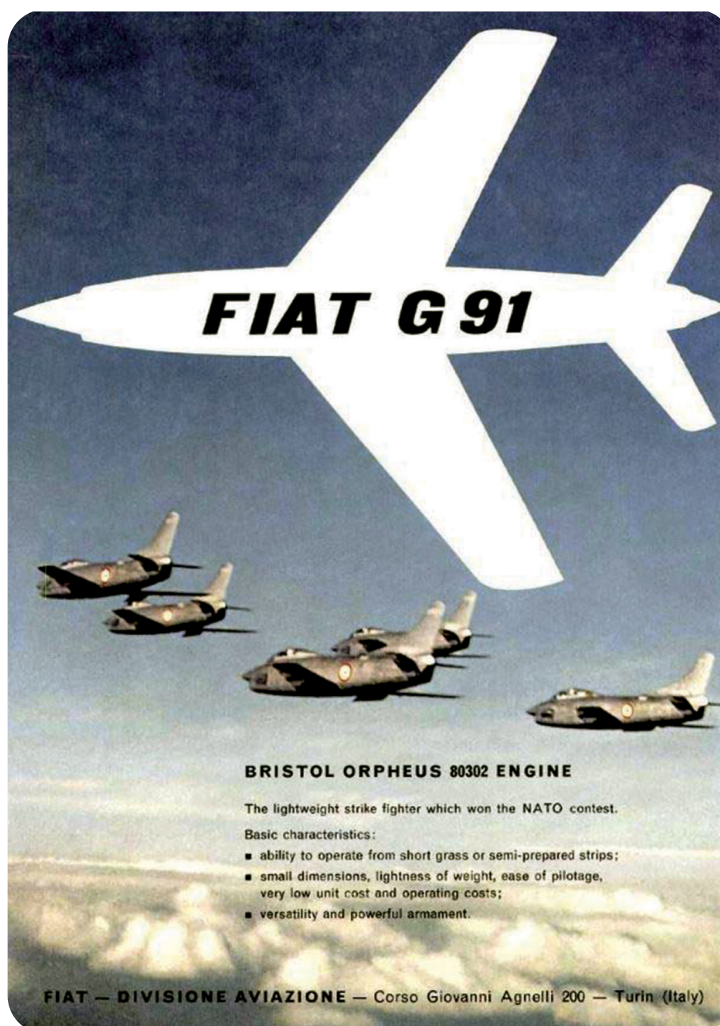
The Fiat design, the G.91, was a robust conventional aircraft, by contemporary press often described (and later almost standard cited) as having resemblance with the F-86 Sabre, something that could be said about every jet with a low swept wing, conventional shaped tail plane and nose-inlet. On the other hand, the license production of the F-86K gave Fiat a unique insight into design features of second generation jet planes, which without a doubt played a role in the G.91 design. The G.91 appeared to have some smart design features connected to the NBRM (such as an easy removable tail unit and armament bay and many inspection panels) and, maybe because of its conventional design, Fiat made good progress in its engineering, something which paid off very well in the competition.[]

In June 1955 AGARD selected the Bréguet 1002 Taon and the Fiat G.91 for further evaluation, which in practice meant that for every type three prototypes were ordered. After it was announced that 50% of the costs were funded by the US, the Dassault Etendard VI was also selected. Furthermore, Fiat was rewarded with a pre-production order for 27 G.91s, which were to be trialed by NATO SHAPE, especially on battlefield conditions as specified in the NBRM. The pre-production order illustrates the trust AGARD had in the G.91 design, which was the most developed of the three selected aircraft, and the only design that was beyond the experimental phase

The US government closed agreements with Italy and France, under the Mutual Weapons Development Programme (MWDP) stating that the three selected aircraft types would have the Bristol Orpheus engine as powerplant. The Orpheus itself was developed under a MWDP agreement between the US and UK, and was at that time the only European engine suitable for the light



The Bréguet Taon, of which the AGARD had high expectations, but which lacked a lot of development at the time of the Brétigny evaluation and in the end did not pass the prototype level.



This Fiat advert shows a group of pre-production aircraft.

weight jet. In December 1955 agreement was reached between Fiat and Bristol for delivery of 30 Orpheus turbojets (for the prototypes and pre-production series) and, under provision that the G.91 would be accepted by the NATO, a production license

Already late 1956 Fiat started to set up the production line for the G.91, which was housed at Turin-Aeritalia, Turin's second airfield west of the city.



NATO VISIT TO FIAT:

After the AGARD conference in Rome in February 1956, a NATO delegation (with USAF, NACA, AGARD and French representation) visited the Fiat plant at Caselle airport in Turin to examine the G.91 mock-up. One of the US delegates, Thomas Carroll of USAF, described the G.91 as *"in general a good aircraft design with prominent features the easily accessible cameras in the nose cone and the gun-panels at the fuselage sides, which were detachable with minimum of disconnections"*.

However, there was some important criticism about the aerodynamic design; the wing was much too thick in comparison with "current practices", and the position of the horizontal tailplane was questioned, which was at the top line of the fuselage just above the jet.

Therefore it was expected that the high speed requirements were not to be met, and that the G.91 handling characteristics (pitch-up) would not be as good as expected. The delegation was told by Gabrielli that the G.91 first flight was to be expected next autumn, and that

the total engineering staff on the project numbered about 140. According to Carroll *"this is a very small number as compared with American engineering staffs and it should be interesting to see what kind of job so small a number can accomplish. Peculiarly, this number of engineering personnel, 140, is exactly the number that was engaged on each of the French projects (Bréguet and Dassault). A consistency that may indicate their belief that so many are sufficient rather either a paucity of men or money"*.

Especially the note about the camera in the nose cone is very interesting; it means that development of the reconnaissance G.91R

version started well before the first flight of the G.91. The wing thickness was decreased to 10% of the wing chord, at that time more or less used as minimum standard value for transonic jets. The criticism about the aerodynamics proves also that the G.91 was not simply a copy of the Sabre.

PROTOTYPES:

The prototype of the G.91 made its maiden flight on August 9, 1956, when Fiat test pilot Riccardo Bignamini made a successful 30 minutes flight from Caselle. Within 15 months after receiving the contract, the basic design was transformed to a real working aircraft, which, as appeared during the first test flights, behaved as expected. The only disappointment was that the specified empty mass of 2270 kg was exceeded by about 20%, mainly due to installation of additional equipment and the required structural strengthening.



One of 294 F-86K Sabres built by Fiat. The aircraft were delivered to the Italian, French and German air forces and (in smaller numbers) the Norwegian and Dutch air forces.