

The procurement and production of the Starfighter in Germany

Aircraft selection and orders

After the Bundeswehr (German Armed Forces) had received its initial aircraft equipment in autumn 1956, it was only one year later the BMVg (German Ministry of Defense) considered replacing these outdated types of different design and origin with a more modern one.

The Republic F-84F was used as Fighterbomber, the RF-84F as Reconnaissance aircraft, the North American F-86K as All Weather Fighter, and the Canadair CL-13B-Mk.6 as Day Fighter.

For the Navy, the Hawker Seahawk Mk.100 flew as Fighterbomber and the MK.101 as Reconnaissance aircraft. Not to forget the Fairey Gannet AS.4 for submarine hunting.

All these different types from different companies and from different countries should be replaced by a versatile new single aircraft type.

The fact is that on 24.10.1958 the Federal Republic of Germany had agreed to procure the Lockheed F-104. This decision was groundbreaking for the other European countries and they followed somewhat later.

This documentation is intended to describe in more detail the procurement and licensing of the F-104 weapon system in Europe between 1960 and 1972.

F-104F

Initially 30 F-104D type Trainer were ordered on 18.03.1959. This type was improved for the Luftwaffe and received the new designation F-104F in the fall of 1959. Externally, they differed mainly in the different canopy construction. These aircraft were all assembled and flown at Palmdale (except for the first one).

Already on 16.03.1960 it was decided at a meeting of the Air Force Command Staff that the F-104F should be reassembled and flown in Nörvenich. Under whose responsibility this reassembly should proceed was at this time still unclear. In any case, the whole process should be handled by Messerschmitt, Lockheed and the Luftwaffe. At first Lockheed refused to agree to this proposal. In Nörvenich, the Americans wanted to reassemble these aircraft without German help and then hand them over to the Luftwaffe.

Due to these disagreements over responsibilities, the negotiations dragged on for months. On 24.05.1960 an urgent meeting finally took place at the headquarters in Bonn, shortly after the first two aircrafts had arrived at Nörvenich (BB+361 and BB+367).

Now everything went very fast. At Nörvenich, a branch office was set up by the Messerschmitt factory based in Munich. The staff consisted of US trained specialists, namely: 40 LVR 4 specialists, 10 Messerschmitt employees and 10 workers from Lockheed. For the test flights the Lockheed pilot Bob Faulkner was available. Furthermore, it was decided that this "upgrade command" should begin with the reassembly on 30.05.1960. According to a provisional agreement, the final acceptance was the responsibility of the Lockheed staff.

But there was no flight clearance for Nörvenich from the Luftwaffe. However, after the first F-104F had been handed over to the Messerschmitt branch on 14.07.1960, the flight clearance was granted the same day.

Now that the flight operations had started, it quickly became clear that the American pilot was constantly overburdened. After very tough negotiations with Lockheed, Messerschmitt pilot James "Leake" Jester was released for flight operations in Nörvenich on 11.09.1960. Another milestone was the 29.10.1960 because from that day on the Messerschmitt company took full responsibility for the final acceptance.

A total of 27 aircraft (numbers 1 to 27) were remounted in Nörvenich, test flown and delivered to the 4th squadron of WaSLw 10 at Nörvenich. The aircraft were transported, disassembled in wooden boxes, with a total of 12 shiploads.

F-104G

When the first F-104G was ordered from Lockheed on 06.02.1959, this aircraft actually existed only on paper. The German industrial delegation, which was at the Lockheed company from 10.12.-15.12.1958, was presented a "model 683-5" as an "all-weather multi-purpose aircraft", usable as a Fighterbomber and Interceptor. The project was specifically developed from the F-104C model or European requirements.

In order to move forward with the F-104G program, Lockheed borrowed 2 F-104A-20-LO from the USAF with the factory numbers 1078 (US s/n 56-0790) and 1096 (US s/n 56-0808) and converted them to the F-104G version. The first one made the maiden flight on 07.06.1960 before it started the flight test. In December 1966 the aircraft was sold to NASA.

After the production had started in the US, the "largest industrial joint project of the world" started in Europe, as a German newspaper wrote in her Business section in September 1962. For that time the numbers were worth mentioning. In order to build the 1045 aircraft ordered for the 4 NATO countries Italy, the Netherlands, Belgium and Germany, 100.000 workers were employed in 25 aircraft manufacturing plants, 6 engine companies and 36 electronic companies.

TF-104G

Of course, the 30 delivered F-104F were not enough for a speedy pilot training and thus the Bundesministerium der Verteidigung (BMVg = German Ministry of Defense) ordered 54 TF-104G in the US in the summer of 1961. However, this two-seater had the advantage of being operationally limited compared to the F-104F. It had e.g. the NASARR fire control system and 5 stations. All aircrafts were assembled and flown by Lockheed at Palmdale. During negotiations at Manching on 22.08.1962 with the Messerschmitt company concerning the re-assembly, Manching rejected the suggestion for the re-assembly by Messerschmitt. With the reassembly of the Lockheed aircraft and the final assembly of their own aircraft, Messerschmitt was working to capacity, at times even overloaded. Messerschmitt suggested that these 54 TF-104G should be re-assembled at FIAT in Turin-Caselle. Now the Luftwaffe rejected and made concessions to the Messerschmitt company for the delivery delay of the F-104G from Manching. Therefore the reassembly of the two-seater in Manching started in early 1963.

But only 42 aircrafts were delivered to Germany, the rest was flown straight to Luke AFB. However, the number of available aircrafts for the 4510 CCTW was not enough and so in 1963 further 18 aircrafts were manufactured.

1.Reproduction TF-104G (follow-on program)

As early as October 1963, the Luftwaffe began planning to produce another 33 TF-104G. This number was reduced to 32 in the spring of 1964.

The level of construction should be that of the last F-104G, e.g. "2097" with segment 231 and front fuselage of factory number 5779.

After the licensing of the F-104G in Europe came to an end and the ARGE-USA also had a low workload after the delivery of the last TF-104G, a tough struggle began for production shares. Lockheed had worked out four plans and put them up for discussion. From the beginning Messerschmitt endeavored for a final assembly with entry at Manching. But this was fundamentally rejected by the Americans. In Palmdale half of the staff would have had to be fired. After tough discussions, a bad deal for the German industry was concluded on January 31, 1964 at a meeting in Bonn-Hardthöhe between Lockheed, BWB and ARGE-Süd. Germany had to make that compromise, forced by the lengthy negotiations.

The ARGE-Süd therefore produced only 40%, the rest was built by the Americans.

Segment-split-up for ARGE-Süd:	Dornier:	241	610				
	Siebel:	248	260	261	270	271	273
	Heinkel:	400, 410, 420, 430, 440, 510, 520					
		530	800				
	Messerschmitt	220 (only assembly!)					

The contract P-600 was signed on 31.03.1964.

The layout was similar to that of the F-104G, but with the following exceptions:

The segment 231 (front fuselage) was manufactured by Lockheed and delivered to Augsburg. There it was mounted together with the segment 241 (center section) to segment 220 (main fuselage). All segments were then collected in Manching and sent individually by airfreight to Lockheed-Palmdale. There the final assembly and the test flights took place. Then the aircraft was disassembled again and brought by airfreighter to the company AVIO DIEPEN, the Hague-Ypenburg, NL for reassembly. From there they were flown direct to the individual wings of the Air Force and Navy.

2. Reproduction TF-104G (follow-on program)

In the spring of 1965, the planning for another reproduction of two-seater for Germany, the Netherlands and Belgium began. A total of 46 aircrafts was supposed to be built for these 3 countries. Germany wanted 33 aircrafts (factory numbers 5933-5965), the first 10 were intended for Luke AFB. This time, there were 2 suggestions from ARGE-Süd for the German share, with the intention of greater involvement of the German industry. But Lockheed had low utilization problems again and therefore was again fighting for every percentage of manufacturing. After a big meeting in Munich from 19.07.-10.08.1965 between Lockheed, BWB and ARGE-Süd a production split was agreed on 11.08.1965. Since the share of German industry was again very low, the following compromise was reached:

The companies Dornier, Heinkel and Siebel manufactured their segments for all 46 aircraft; e.g. they also delivered all segments to AVIO DIEPEN in the Netherlands for factory numbers 5814-5817 and to SABCA in Belgium for factory numbers 5101-5109.

Messerschmitt company received the final assembly line and the flight tests of the last 23 aircraft intended for use in Germany.

Despite this "ring exchange" (they called it project "Twist"), ARGE-Süd was involved with only 43%.in the construction of these 33 aircraft for the German Air Force.

This co-production contract P-619 for the construction of 46 TF-104G was signed on 17.12.1965. Since the first 10 German TF-104G (factory numbers 5933-5942) were destined for the USA, Lockheed's segment 231 also remained there for the final assembly. Messerschmitt company had therefore no production shares for these 10 aircraft.

Segment-split-up for 46 aircraft:	Dornier:	241, 249, 610
	Siebel:	236, 248, 260, 261, 270, 271, 273, 280
	VFW:	400, 410, 420, 430, 440, 510, 520, 530, 800
Segment-split-up for 23 aircraft:	Messerschmitt:	100, 105, 110, 220, 250, 500, 700

All individual segments of the factory numbers 5933-5942 went from Manching by airfreighter via Frankfurt (load of the VFW assemblies) to Lockheed-Burbank for the final assembly.

In the middle of 1967, it was decided that 3 aircrafts with the factory numbers 5939-5941 should be used in Germany. They were delivered to their wings after the test flight at Palmdale via AVIO DIEPEN.

The remaining 23 aircrafts were finally assembled and flown at Manching.

Project designations used during the upgrade phase and for deliveries to the wings

Project "42":

When introducing the F-104 weapon system, the plan was to equip first the JaboG 31 (FBW 31) at Nörvenich with this new type of aircraft. Starting in spring 1962, the aircrafts mainly built in the USA and remanufactured at Messerschmitt in Manching were delivered to Nörvenich, because the European license production had not yet started. As a result of an order dated 24.02.1962, 42 aircrafts (hence the name of the project!) were planned to be part of the original delivery: 37 (31+6) from the ARGE-Süd, 3 from the ARGE-Nord and 2 from the ARGE-West. The following factory numbers were planned:

2009, 2010, 2018-2030, 2032-2044, 2046, 2048+2053. 7001-7006, 8001-8003, 9001+9002.

Fighterbomber version with built-in Vulcan M61 20 mm machine gun, long-distance tanks as loose parts.

All 42 aircrafts were supposed to be delivered by 16.05.1962. Responsible for the implementation was the ARGE-Süd. The deadline of this project was met, but there were a lot of changes in the factory numbers.

Project "Lorely":

This project was announced on 20.03.1962. The plan was to equip 42 Fighterbomber for the second wing designated to be converted being JaboG 33 /FBW 33) in Büchel. Again, the ARGE Süd was responsible for the implementation. The required modification level was "2097 plus". The plus meant the incorporation of additional SBs (Service Bulletins) and ECPs (Engineering Change Proposal). On 01.02.1963 all modifications were summarized in the modification collection "TA 150" and this modification level was renamed to "2097D".

The following factory numbers were assigned according to the status as of 22.06.1962:

2011-2016, 2045, 2052, 2059, 2067, 2069-2097, 7051-7053.

Fighterbomber version with built-in Vulcan M61 20 mm machine gun, long-distance tanks as loose parts.

After the commissioning of JaboG 31 in June 1962, it was noted that there were a total of 6 different Starfighter modification versions. Since these aircrafts had been built in different lots, they naturally had a different state of construction modification. This caused confusion among the pilots and maintenance personnel, which was not beneficial to the flight operations. This statement was mentioned in a report by the Lockheed Advisory Office (LAAO), European Headquarters in Koblenz.

This circumstance was probably one of the reasons why a large retrofit program was launched. It was decided to upgrade entire aircraft groups by the industry, organized in several steps. The Air Force itself should also participate. It was proposed to set up a "MOD Center" in Erding; but this was not realized until 1963.

For reasons of secrecy, all these programs received project names that concealed clearly defined configurations and quantities. These projects were prepared and supervised by the Air Force along with the BWB (Bundesamt für Wehrtechnik und Beschaffung) and NASMO (NATO Starfighter Management Organization) This control applied to all European working groups (ARGEs). An aggravating factor was that all necessary retrofit kits should be delivered from America.

Project "44":

As early as 15.06.1962, the day project "42" was completed, it was decided that in 1963, all 44 aircraft stationed at Nörvenich should gradually be returned to the industry or to the Air Force (Luftwaffe) in order to be upgraded to the modification status "2097D". The company Heinkel, Speyer was to be commissioned by the industry. However, initially this failed due to lack of space in one of the hangars at Manching and the non-existent testing and ground equipment. Since no "kits" for this planned upgrade were available until the end of 1962, this project was not feasible. Therefore, this project is not mentioned in the individual aircraft data. Nevertheless, the aircrafts that were planned for this action should be listed:

factory numbers: 2018-2028, 2030-2042, 7001-7006, 8001-8009, 9001-9005.

Project "Replace":

From the ARGE-Süd production, 21 aircrafts (partly with and partly without test flights) were stored with a long-term preservation for the purpose of a later upgrade and transfer to the BABwMTT for storage at Manching AB according to an order as of 03.07.1962. 19 aircraft were later upgraded when enough retrofit kits were available. 2 aircrafts were not upgraded and used for special purposes in the Air Force.

Affected serial numbers: 7007-7015, 7020, 7022-7027, 7046-7050.
factory numbers 7010+7011 were not upgraded.

Project "Columbus":

As the delivery of retrofit kits for the upgrades was very sluggish, the BWB decided in the fall of 1962 (using this project designation) to send 50 aircrafts to Lockheed in order to bring them to the highest available modification status "2220". These 50 aircrafts consisted of 35 already delivered aircrafts, including the 3 F-104G, which were still in the US for special tasks.

factory numbers: 2002 (USA), 2018, 2021-2028, 2030-2042, 2068 (USA), 2080 (USA), 8002, 8003, 8007-8009, 9001-9005.

15 modification (reassembly) aircrafts from Manching:

factory numbers: 2011-2016, 2020, 2076, 2086, 2091-2093, 2095-2097.

As one can see, some aircrafts were taken from the "Loreley" program because project "Columbus" had a higher priority. The configuration and equipment level of the aircrafts sent to USA was also not uniform. Basically, all aircrafts should have the modification status "2097D". On some aircrafts, parts were even removed before shipping because they needed them urgently for other aircrafts.

In November 1962 it turned out that the pilot training in Germany was very handicapped due to the constantly bad weather conditions. Negotiations were started with the USAF for a F-104 training in the United States. On 04.04.1963 this training contract was signed. The wing for this training, the 4510 CCTW, was set up at Luke AFB, Arizona.

After this decision it was decided that the Columbus aircraft should be flown over to Luke AFB after the upgrade at Lockheed in order to train the German pilots. From now on the term "Columbus", even in later years, was used for the posting of the F-104s via Palmdale to Luke AFB for the pilot training.

Responsible for dismantling and dispatching was Messerschmitt-Manching (MTT). All aircrafts were taken as return freight from the Lockheed CL-44D airfreighter, which brought the TF-104G to Germany.

On 03.07.1963 it was ordered that the factory number 2068 will not be upgraded, but used for special tasks. As a replacement, the factory number 2010 was included in the project.

On February 12, 1964 the first upgraded German F-104G was flown over to Luke AFB.

Project "Balance":

This program, set up in late 1962, included all the remaining 19 F-104G (excluding project "Replace"), which had not yet been assigned to a modification status "2097D". They were practically the leftovers from the program "44", which was not carried out. Since all aircrafts were already delivered, the Luftwaffe was responsible for the implementation. The upgrade was to be carried out at Erding AB at the LPR 1, but initially only for 11 aircrafts, because 7 flew with the ErpSt.61 and one was still in the USA.

Intended factory numbers: (2004 in the USA), 2005-2007, (2008-2010, 2017 at the ErpSt.61), 2050, 7001, (7002+7003 at the ErpSt.61), 7004+7005, (7006 at ErpSt.61), 8001, 8004-8006.

This was the plan in late 1962; but it did not happen. According to contract a large part of the Columbus aircrafts should have been set to the modification status "2097D" before they were dispatched to the USA. Therefore, the project "Balance" had to be re-planned from scratch in early 1963. Since there were already 19 retrofit kits available in Erding according to the order of 12.02.1963, the aircrafts which had not yet been upgraded for the USA were the first flown over

from JaboG 31 to Erding. Of the remaining 7 F-104G, only 3 were used compared to the original plan. The additional 4 were added from Büchel.

In the spring of 1963 the following factory numbers were now selected:

2021, 2033, 2071, 2079, 2082, 2085, 7005, 8002-8005, 8007-8009, 9001-9005.

Around February of 1963, these aircrafts went to the LPR 1 at Erding AB and received DR+xxx codes with their old three-digit squadron numbers. The only exception was serial number 8004, it received DR+111, because the serial number 2071 already had DR+101.

After the upgrade, these aircrafts either returned to their squadrons or directly to Manching for disassembly for the Columbus program. The former regained their old tactical marks of their wing.

Project "19":

After completion of the "Replace" project, LAAO (Lockheed Advisory Office) personnel in Nörvenich inspected all Lockheed aircrafts to determine the modification status. It turned out that there was still no uniform configuration "2056D" achieved. According to the latest Lockheed construction documents, which apparently only the LAAO submitted, up to 60 SB's (Service Bulletins) were missing on the individual aircraft. There is an LAAO report from 14.10.1962.

It was therefore decided that the affected 19 F-104G should be retrofitted again by staff of Heinkel from Speyer at Nörvenich. With the instruction of the BWB FS 173/51315 of 30.10.1962 this action was initiated. But for the reasons already mentioned, this work could not begin until January 1963.

The following aircrafts were re-modified again:

factory numbers: 2043, 2044, 2046 - 2049, 2053 - 2058, 2060 - 2066.

8 aircrafts were changed to such an extent that they received a new tactical code:

2049 - DA+253 to DA+232

2057 - DA+122 to DA+112

2058 - DA+254 to DA+234

2060 - DA+257 to DA+237

2061 - DA+258 to DA+240

2062 - DA+129 to DA+119

2063 - Da+259 to DA+239

2066 - DA+126 to DA+120

10 of these aircrafts took part in the Category III tests: 2043, 2044, 2046, 2047, 2048, 2053, 2054, 2055, 2056, 2057.

"Category III" were tests of operational mission profiles and system tests from April until July 1963.

Project "Green Hill":

Under this code word 42 AWX airplanes were delivered to the Fighter Wing 71 (Jagdgeschwader 71) at Wittmund. 32 aircraft came from the ARGE North and 10 aircraft from the ARGE West production. They were brought up to construction level "2097D" by Fokker and SABCA before delivery.

factory numbers: 8010 - 8012, 8015, 8017 - 8021, 8023 - 8044, 8046, 9006 - 9015.

Project "Bacchus":

This project enclosed 42 aircrafts RF-104G. They were built as F-104G by the ARGE North and were modified before delivery either by Avio Diepen or by Weserflug with the installation of ECP-195 "Recce Provisions" in the Recce version (ECP: Engineering Change Proposal). The construction level was now "2130". Almost all aircrafts which were modified by Avio Diepen made their first flight at Schiphol and then flew immediately to Hague-Ypenburg. The aircrafts planned for Lemwerder probably did that too. However, this could not be determined exactly anymore. All RF-104G were intended for Reconnaissance Wing 51 (AG 51) at Manching and had all the standard camouflage scheme "TA-196":

factory numbers: 8085 - 8087, 8094, 8095, 8102, 8106, 8108, 8111, 8113, 8116, 8118, 8122, 8124, 8126, 8128, 8130, 8132, 8134, 8136, 8137, 8139, 8140, 8142, 8144, 8146, 8148 - 8163.

Project "Zeus":

The ARGE-Süd (MTT) was responsible for this project. It was the equipment for the 1st Squadron of the Naval Aviation Wing 1 (MFG 1) at Schleswig-Jagel. Planned were 22 aircrafts with the factory numbers 7077 - 7096. However, in order to obtain a uniform construction level "2130" without retrofitting, the following 21 Fighterbomber were delivered to the MFG 1: factory numbers: 7081 - 7097, 7099 - 7102.

Factory-Nr.7098 remained at LVR 3 at Manching. Originally, these aircrafts were to be delivered with built-in "AS-30" and "Kormoran" anti-ship missile delivery wiring system. But since no kits were available, they were delivered without this system. The long-distance tanks were installed, the Vulcan M61 20 mm machine gun was supplied as a loose device. The "AS-30" system was later retrofitted.

Project "Roland":

Under this project name, 21 AWX (All Weather Fighter) aircrafts were modified by Fokker to the modification status "2130" + SB 479 "Wing Pylon Bomb Provision" before delivery. Originally, these fighters were intended for JG 71 (FW 71). Because the re-equipment of the wing was delayed, these aircraft remained at the LVR 3 in Manching until 1964. In 1964, however, the plan changed again. Some F-104G went to the JG 74, others had long been shipped to the US as part of the "Columbus" project.
Factory numbers: 8064, 8067 - 8081, 8088, 8092, 8096, 8097, 8100.

However, after an aircraft with factory number 8080 made a belly landing in Schiphol during a test flight, the factory number 8041 was taken as a replacement into this program.

Project "Diana":

This was the delivery of 42 Fighterbomber with built-in Vulcan M61 20 mm machine gun with modification status "2130" for the 1st and 2nd Squadron of Jagdbombergeschwader 34 (FBW 34) in Memmingen.

factory numbers: 7109 - 7150; later the number of aircraft was increased to 48
factory numbers 7173 - 7177, 7184 were added!

Project "Recce":

This project included 66 RF-104G from ARGE-Nord, which, like the "Bacchus" project, were converted to RF-104G before delivery. They all had the modification status "2160" and were mainly intended for the second squadron of WaSLw 10, AG 51, AG 52 and project Columbus (11).
factory numbers: 8164 - 8198, 8200 - 8202, 8204 - 8206, 8208 - 8211, 8213 - 8215, 8217 - 8219, 8221 - 8223, 8225 - 8227, 8229, 8230, 8232, 8233, 8235, 8236, 8238 - 8240th

Project "Columbus II":

In addition to the Columbus program of 1963, three more aircrafts were shipped to the United States in July 1964.

factory numbers: 8183, 8188 + 8196.

Project "Yoga":

This lot were 22 F-104G Fighterbomber for the 2. Staffel (Squadron) of MFG 1 at Schleswig-Jagel with modification status "2190", with built-in Vulcan M61 20 mm machine gun, built-in "AS-30" and "Kormoran" anti-ship missile delivery wiring system, long-distance tanks and Sidewinder launchers as loose equipment.

factory numbers: 7151 - 7172; later the number of aircrafts was increased to 28
factory numbers 7178 - 7183 were added.

Project "Bacchus II":

This lot were 21 RF-104G from the ARGE-Nord, which were converted to RF-104G like in the case of the "Bacchus" project with modification status "2190" for the 2.Staffel (Squadron) of AG 52 at Leck AB.

factory numbers: 8241, 8242, 8246-8249, 8251-8255, 8261, 8262, 8264, 8265, 8269-8271, 8274, 8276, 8278.

Project "Prince":

Delivery of 25 fighter-bomber for the 2. Staffel (Squadron) of MFG 2 at Eggebek with modification status "2220", built-in Vulcan M61 20 mm machine gun, built-in "AS-30/Kormoran" anti-ship missile delivery wiring system, long-distance tanks and Sidewinder launchers as loose equipment.

factory numbers: 7185 - 7207, 7209, 7210.

Project "Columbus III":

After the many losses in 1965-1967 further 23 F-104G were sent on the usual way to the USA under the project name "Columbus III".

factory numbers: 2069, 7001, 7007, 7015, 7023, 7039, 7098, 7120, 7132, 7133, 7177, 8021, 8064, 8067-8069, 8071, 8077, 8177, 8191, 8192, 8204, 8230.

Project "Earl":

These were 27 RF-104G from the ARGE-Italy for the 1.Staffel (Squadron) of MFG 2 at Eggebek. with modification status "2190"+"2220", built-in "AS-30" and "Kormoran" anti-ship missile delivery wiring system.

factory numbers: 6629, 6630, 6639-6642, 6661-6665, 6672-6679, 6686-6693.

Reproduction F-104G

In the summer of 1969, it was decided to build more single-seat Starfighter due to the many losses. Actually, this order was more for the utilization of the southern German aviation industry because the introduction of the Weapon Systems RF-4E and F-4F would have provided enough aircraft with relatively few flying hours. They would have had only to be upgraded. Also, in the US were a lot of F-104G in long-term preservation storage.

Planned with the project name "Ikarus" were 14 F-104G Fighterbomber for the Luftwaffe with modification status "2220 plus" (collective TA 800).

With the project name "Neptune" 30 F-104G Fighterbomber for the Navy should be built. Modification status also "2220 plus" (collective TA 800) with built-in "AS-30" and "Kormoran" anti-ship missile delivery wiring system.

As the third variant (using the project name "Osko") 6 MARINE Reconnaissance aircrafts should be manufactured with built-in "AS-30" and "Kormoran" anti-ship missile delivery wiring system and with the modification status "2220 plus". Planned factory numbers 7451-7456. These 6 aircrafts were not ordered for the MARINE Reconnaissance aircraft according to TA 1401, but added to the project "Neptun" as a simple F-104G.

From November 1969, ARGE-Süd and VFW began building these 50 Fighterbomber with the factory numbers 7301-7314 for the Luftwaffe and 7401-7436 for the Navy.

Segment-split-up:	Dornier:	241,	249,	255,	256,	610,	parts for 220.	
	MBB-SIAT	210,	211,	233,	234,	235,	236,	243, 246, :
		260,	261,	270,	271,	273,	280,	Parts for :
	VFW	106,	244,	245,	400,	410,	420,	430, 440, :
		530,	620,	800.				
	MBB	100,	105,	110,	111,	112,	220,	231, 250, :

Camouflage

The corrosion problem noted in the German F-104 in 1963 was caused by the bad weather conditions in Germany.

It was therefore decided that all aircrafts should receive a weather-proof surface protection.

Initially, all F-104 flew in the "silver finish" with white wing tops, gray wing bottoms and a glareshield protection on the aircraft nose in "FS.34079" waldgrün (forest green).

As early as 1962, some F-104 camouflage pattern were applied on an experimental basis, but these were not satisfying.

After a decision of FÜL 11/5 from 26.02.1963 painting drawing was tested already on 17.04.1963, which was introduced on 28.08.1963 with the "TA 196".

The camouflage paint, also known as NATO painting, featured a speckle pattern on the top of the aircraft in the colors RAL 6014 "yellow olive" and RAL 7012 "basalt gray", while the underside was uniformly RAL 9006 "white aluminium". This new patch pattern was the same for both arms: Airforce and Marine.

The introduction of this "TA 196" was done either "in line" or during a major inspection.

On 16.06.1969 this TA was changed with a new modification in "TA 196-3". Now all Marine aircraft got their own paint pattern: the upper surface of the aircraft became RAL 701,2 "basalt gray" throughout, while the underside remained in RAL 9006 "white aluminium" color. All Marine F-104 received this new coloring on the next major inspection.

At the beginning of the eighties, the camouflage concept was revised throughout the Bundeswehr. In order to avoid early visual detection as well as detection by sensors, a more effective camouflage was introduced.

On March 25, 1983, the special order BesAn TTLw Technik Nr.101 was issued by the Luftflotten-Kommando A 3 I c/TTLw.

All Armed Forces (Bundeswehr) equipment received a new camouflage pattern. The F-104 was affected as well.

It was given a new patch pattern with a wraparound pattern as follows:

1) All aircrafts which are still subject to a major overhaul (IRAN) receive the paint called "Norm 1983": RAL 6003 "olive green", RAL 7021 "black gray" and FS 34079 "forest green".

2) All F-104 of the Jabo G.34, which will not receive the "Norm 1983" pattern, are modified in camouflage pattern "Norm 1962 Ü/83". This standard only adds colors on the underside to the existing paint with the already existing RAL.

Licensed production of the GE J79-11A engine for European F-104

The license production and delivery of the GE J79-11A engine for European F-104 production involved three companies:

- BMW Triebwerksbau GmbH at München-Allach (MTU Aero Engines)
- Fabrique Nationale (FN) at Herstal, Belgium
- Fiat Aviazione at Turin, Italy

Each of these companies had a manufacturing share of about one-third of the total engines, with each partner delivering its construction share for all engines. Final assembly then took place in all three companies, which also had their own test benches. The first 144 engines were still made from American kits.

BMW delivered the first engine with its own construction component on January 30, 1962.

A total of 1,228 engines were manufactured:

- BMW: 632 engines
- FN: 334 engines
- Fiat: 262 engines

The MTU, which emerged from BMW engine construction and MAN turbocharged engines, delivered an additional 50 improved J79-MTU-1K and about 1,000 conversion kits for the J79-11A.

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