

“Sale of the Century”

A reappraisal of the procurement of the F-104 Starfighter



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Introduction

“All fighter aircraft are political aircraft”. - Luftwaffe Brigadier General Merkel in an interview with the author.

The aim of this dissertation is to examine the relationship between Lockheed and governments that procured Starfighter in the 1950s and 1960s and how this influenced the development of the aircraft. It will examine the controversial Lockheed sales campaign of the F-104 both in the United States and abroad and the resultant procurement of Starfighter by fifteen nations (listed in fig. I). It will also examine the investment by Lockheed and purchasing Western governments, and the operational evolution of the aeroplane.

In the Cold War between the Capitalist West and Communist Soviet Union few industries personified capitalism as much as the Western arms market. In the grand strategies of the Cold War Dwight D. Eisenhower's 'military-industrial complex' was to play a vital role in eventually causing the collapse of the Soviet Union and promoting the liberal democratic values of the West. This dissertation will focus on one company, Lockheed, within this arms market and one product of this company, namely the F-104 Starfighter.

The F-104 Starfighter was first conceived as a concept in 1952. Lockheed eventually sold over 2.559 F-104s in a variety of models and manufactured in a variety of different countries. Starfighter is renowned for a variety of reasons. It was the first aircraft to hold the airspeed and altitude records simultaneously and its bold, innovative design is considered by many as a technological masterpiece. Yet the procurement of the F-104 Starfighter has been labelled as a scandal of bribery and corruption at the highest levels of big business and politics. The aircraft itself was accused of being inherently dangerous and labelled by the German press whilst in Luftwaffe service as “The Flying Coffin”, or “The Widow Maker”. As the introductory quote suggests Starfighter was more than just a fighter jet.

<u>Starfighter Operator</u>	<u>Numbers of aircraft</u>
Belgium	113
Canada	239
Denmark	51
Germany	916
Greece	159
Italy	360
Japan	230
Jordan	36
NASA	14
Netherlands	139
Norway	43
Pakistan	12
Spain	21
Taiwan	281
Turkey	379
USAF	277

Figure I. Numbers of Starfighter and their Operator¹

Notes on historiography:

The height of the Starfighter story is the 1950s and 60s, the time gap from then till the present day means that government secrecy legislation has released almost all material relating to the Starfighter story. Unfortunately but intriguingly the files relating to certain key areas of Starfighter procurement in the former West Germany were found to have disappeared in the summer of 1976 and have never been recovered. Nevertheless the time gap is sufficient to allow unfettered access to most material. Additionally, the withdrawal of Starfighter from all aircraft active inventories and the end of the Cold War means that much of the pressure over revealing the truth behind the performance of Starfighter has been removed, and this also allows a clearer picture to be drawn.

Chronology of Starfighter

¹ Figures drawn from Bowman (2000), Appendix III.

1951	Clarence 'Kelly' Johnson visits Korea.
November 1952	Johnson and team begin to design a lightweight air superiority fighter
January 1953	Model 83 design selected by the Pentagon under Weapon System WS-303A.
January 1954	First XF-104 is produced in strict secrecy
30 March 1955	USAF places order for 17 YF-104A's
26 January 1958	Production delivery of Starfighter to USAF begins.
7 May 1958	F-104 becomes first aircraft to simultaneously hold world airspeed and altitude record.
18 March 1959	Franz Josef Strauss signs contract to begin licences production in FDR
17 September 1959	Canada signs licences production to build 200 CF-104 Starfighters.
14 December 1959	F-104C beats previous Starfighter records for altitude and airspeed.
29 January 1960	Japan signs licensed production contract.
20 April 1960	The Netherlands signs license production contract.
20 June 1960	Belgium signs license production contract.
1960	USAF Air Defence Command begins withdrawal of Starfighter from inventory.
February 1961	US signs MAP (Military Assistance Program) for F-104G's
2 March 1961	Italy signs license production contract.
29 March 1961	Luftwaffe loses first Starfighter.
April 1961	F-104 reaches 100,000 flight hour.
25 January 1962	First Luftwaffe pilot killed in Starfighter
April 1965	F-104C's of 436 Squadron sent to South Vietnam
3 September 1965	PAL Starfighter shoots down Indian Mystere IVA. First air-to-air victory for Starfighter
July 1967	Last F-104C in USAF inventory transferred to National Guard
March 1979	Starfighter production finally stops totalling 2,578
October 1987	Last operational Luftwaffe F-104 Squadron finally retires

The experience of the USAF in Korea

The concept of Starfighter was forged in the skies over Korea. The Far East Air Force (FEAF), the composite name for the United Nations (UN) Air Force, had been heavily engaged by the Chinese Communist and North Korean Air Forces in the first war in which jet against jet combat had occurred. The USAF had acquitted itself well in air-to-air combat against the Communist Air Forces, with the star of USAF air superiority, the F-86 Sabre, having a probable success rate of ten kills for every loss, when compared with its chief opponent the Mig-15². Overall the FEAF achieved considerable success, claiming 976 enemy aircraft destroyed. However, these figures tended to hide many factors that worried the USAF. The propeller driven P-51 Mustangs and F-80 Shooting Stars were shown to be obsolete by the new wave of fast fighter jets that had benefited from German research into swept wing design. In October 1951 the high tide of Communist Air efforts had seen heavy losses sustained by the FEAF and UN air superiority over Korea had been challenged. The principal facet of USAF doctrine, that of gaining and maintaining air superiority, had been brought into question by a supposedly third rate air force.

As the air war progressed the importance of the F-86 Sabre became increasingly apparent. For example in the first sixteen days of October 1951 nineteen Mig 15s had been destroyed, all by F-86 Sabres with no USAF loss.³ It had also been found that the Sabres were the only truly effective bomber escorts when confronted with the Migs, far more so than the slower Shooting Stars and Thunderjets. This small aircraft, produced by the defence contractor North American, was found to be vital for USAF success. Like Starfighter was to be, the Sabre was a single-engine, single-seat jet.

When the Korean War ended it was clear to observers that air superiority had been a key factor, especially considering the numerical

² Futrell (1961), pg. 649

³ USAF Hist Study No. 127, USAF Opns in the Korean Conflict, 1 Jul 52-27 Jul 53, from <http://www.army.mil/cmh-pg/books/korea/truce>.

disadvantage of the UN troops. To quote General Weyland, the USAF commander in Korea.

There is little doubt in my mind that the outcome of the conflict would have been vastly different had enemy domination of the air reversed the military positions of the Communist and the United Nation Command.⁴

Weyland's point was not only a reflection on the Korean Air War but also an anticipation of the expected war with the Soviet Union. In Korea, the USAF was able to destroy large amounts of the enemy air forces on the ground and therefore started with air superiority and then fought to maintain it. Additionally, they were able to conduct missions such as close air support and strategic and tactical bombing with the advantage of air superiority won early at relatively little cost. In the projected war with the Soviet Union the fight for air superiority would be much bloodier and longer and would have much heavier losses. It was thus felt that the battle for air superiority should have a very high priority, second only to nuclear strike; it would be the principal element in a conflict in determining who won not only the air war, but the war itself. It would be fought by dedicated air superiority aircraft. All the other tasks of an air force that occurred in the Korean War due to the initial success of the FEAF, such as close air support, reconnaissance and transport would be extremely risky if the initial battle for air superiority was lost. This motivation is partially reflected in the increased budget and the manpower of the USAF, which more than doubled in size during and immediately following the Korean War from 416,314 personnel in 1949 to 1,210,000 personnel in 1955.⁵ The lesson of the air superiority battle was heeded and contributed to these rises. Thus, development of more capable pure air superiority fighters was seen as a necessary part of the renewed importance of the air war. A requirement for air-to-air aircraft had been created which defence contractors such as Lockheed would rush to fill.

⁴ Futrell (1961) pg. 647

⁵ This huge rise is also due to the increased importance of nuclear weapon delivery under Strategic Air Command as well as the increased emphasis on air superiority

The second key aspect of the Korean conflict that influenced the creation of Starfighter was the technical capabilities of the MIG-15. Although it is generally accepted that the F-86 Sabre was a superior aircraft, especially after the defection of a Mig-15, flown by Lt. Ro Kum Suk, gave US pilots a chance to examine it in detail. The Mig out performed the F-86 in several key areas: it had a higher operational ceiling, a higher rate of climb and a higher rate of initial acceleration. Essentially, the fundamental difference between these two single-engine, one-man air superiority aircraft was that the Mig was lighter than the Sabre. This factor would greatly influence US aircrew who contributed to the Starfighter concept. Essentially, Sabre pilots wanted a lightweight, highly manoeuvrable, dogfighting aircraft to counter jets such as the Mig 15.⁶ This is the key lesson that Clarence 'Kelly' Johnson the chief engineer of Starfighter took away from the Korean War and the fundamental tenet of the Starfighter. It was to be a lightweight, fast and hard accelerating fine weather, pure air superiority aircraft; an aircraft with its origins in the F-86 Sabre.

The USAF did not draw the wrong lessons from Korea. They realised that in a war with the Soviet Union they would not be able to win initial air superiority with the same ease. Therefore the initial battle for air superiority would need better machines that could out perform anything the Soviets put into the air. 'Mig Alley', the Korean area where Migs challenged the FEAF for air supremacy, and the hesitant days in 1951 had emphasised the dangers of any lag in capabilities to control the air. The performance of the Mig 15s had worried USAF pilots enough for them to believe that a direct countermeasure was called for and that the future of any air superiority fighter was lightweight and fast, thus the stage was set for an aircraft such as Starfighter.

This aim of technological superiority was fundamental to the US and the West as a whole. They did not seek to counter the massed divisions of the Soviet Armed Forces in Eastern Europe through a straight balance of forces but instead placed their faith in nuclear deterrence and technological advantage.

⁶ Gunston (1976) pg.186

The evolution of the F-104 Starfighter

Clarence 'Kelly' Johnson was Lockheed's most famous designer and the creator of the renowned 'Skunk Works,' more properly known as the Advanced Development Projects Section. Skunk Works was established in 1952. Johnson had visited Korea in 1951 at the height of the air war to evaluate the performance of Lockheed's F-80 Shooting Star. Whilst on this trip he had spoken to the pilots fighting the Soviet designed Migs and came away with the concept of a lightweight, fine weather air superiority fighter. Advanced electronics and pilot aids such as a radar and complex gun aiming equipment were considered by many to be superfluous, as Colonel Francis 'Gabby' Gabreski, a Korean War ace, said 'I'd rather sight with a piece of chewing gum stuck on the windscreen'.⁷ The heavy avionics and primitive radar of an all-weather fighter would have contradicted the perceived more important requirements of speed and manoeuvrability, hence the fine-weather only constraint. The cry from the pilots was for an aircraft that could out-climb, out-maneuvre and out-pace anything the Soviets would field. Johnson did what any good company man did and listened to his end users. On his return from Korea he set about creating such an aircraft. It was here that the basic design problem of the Starfighter occurred, that Johnson, Lockheed and all the subsequent Starfighter customers (most notably West Germany) would have difficulty with; namely that, as a general trend, fighter aircraft were becoming heavier and more complex. The USAF really wanted all-weather, long range aircraft capable of intercepting Soviet nuclear bombers,⁸ which were to be crammed full of acquisition systems, radar and navigation equipment. These requirements meant that planes became heavier and more complex, not lighter and simpler. By the following generation of combat jets, even a 'lightweight' fighter such as the F-16 Fighting Falcon had a Maximum Take Off Weight (MTOW) of 17,010 kgs.⁹ Johnson had taken the wrong path in Starfighter's fundamental design and would pay the price, the weight of

⁷ Gunston (1976) pg. 186

⁸ Chap 3, The Supersonic Revolution. RAND Corporation, The Cutting Edge, A Half Century of Fighter Aircraft R&D. (RAND, 1998)

⁹ Spick (1995) pg.170

Starfighter from the initial design proposed to the USAF of 5,216 kgs MTOW would eventually balloon to 13,171 kgs MTOW in the G version that the Luftwaffe flew.¹⁰ Johnson had been overly influenced by his experience in Korea. The need to cram more advanced avionics and pilot aids into aircraft would make them heavier but increased weights allowed for increased payloads and more flexible, multi-role fighters. The F-4 Phantom was the contemporary pinnacle of this trend of increased complexity and increased flexibility. Starfighter was swimming against the tide from the very beginning with its radical design ethos.

This contradiction in trends between Starfighter and the USAF's real requirements of all-weather, long-range interdiction fighters was in part due to Colonel Bruce Holloway.¹¹ Johnson had designed the Starfighter prototype before showing it to Holloway at the Pentagon in January of 1953. Holloway's enthusiasm for the radical design was marked and he immediately promised to form a requirement for the design. He is even quoted as saying, 'Well if there isn't a requirement I'm going to make one, stick around Kelly. Come back in a couple of hours!'¹² Essentially, Johnson had managed to reverse the accepted practice of a contractor examining a weapons requirement written by the Pentagon and "expressing an interest in it". He had convinced Colonel Holloway to form a requirement for a system that he had designed. This was the start of Johnson and the Starfighter programme swimming against the tide of procurement and operational trends. Starfighter had gone from being essentially a private venture for Lockheed to the (apparently) ultimate prize of being destined to become a major part of the USAF inventory.

Starfighter's rapid early development and its look owed much to a process of knowledge transfer from existing and previous projects in the US aviation world. The X-3 Stiletto built by Douglas is a good example of this; Johnson had access to the wind tunnel tests of this aircraft and carried over

¹⁰ Bowman (2000) pg. 58

¹¹ Head of USAF procurement working within the Pentagon.

¹² Bowman (2000) pg. 29

this knowledge to Starfighter. The RAND Corporation study of F-104 design mentions this phenomenon of knowledge transfer,

The F-104 history illustrates that research and development in one program can have a great carry over value to another. (Apart from the low aspect stubby wings, other features used on the X-3, such as smoothly-faired engine intakes mounted on the sides of the fuselage, an all-moving horizontal stabilizer, and a downward-firing ejector seat, were evidenced later in the Starfighter design.)¹³

Lockheed itself had previous experience in designing high performance supersonic fighters. Their first major foray into replacing the F-80 Shooting Star was the XF-90 Penetration Fighter¹⁴. This was intended to fly long-range escort missions for bombers, much as the P-51 Mustang had in the Second World War. It eventually lost out to the McDonnell XF-88A Voodoo in September of 1950. Additionally, classified Navy and Air Force flight data from the X-1 tests was also available and Lockheed itself was conducting research into very high Mach numbers, up to Mach 4.0. Much of this previous knowledge boiled down to the thin, stubby wings of the Starfighter. A wing such as this solved the two main problems of pressure shifts at transonic speeds, which caused massive instability and adverse drag divergence at high Mach numbers.¹⁵ The most radical feature of the Starfighter, its wings, was thus formed by a concept that had evolved from several previous projects and was finally incarnated on Starfighter; it was a technological leapfrog. Starfighter's wing had a thickness ratio of 3.36% and a leading edge of 0.00046mm (almost sharp enough to serve as a knife.) The technology required to do this was insurmountable to any company but Lockheed, who even then had to employ cutting edge techniques such as chemical milling and zero draft forging to make the aircraft production viable.¹⁶

Another technical characteristic of note in Starfighter is the long, high tail. The problem of "pitch up", i.e. the tendency of an aircraft to rise at the

¹³ Chap. 3. RAND Corporation, *The Cutting Edge, A Half Century of Fighter Aircraft R&D.* (RAND, 1998)

¹⁴ The X denotes an experimental design.

¹⁵ Gunston (1976) pg. 189

¹⁶ *Ibid* pg.190

nose when accelerating, was one that had been almost insoluble until October 1953 when the final answer was the creation of a one slab, irreversible tail with an Automatic Pitch Control (ACP) system to compensate for this tendency. Here the design ethos of a simple lightweight fighter was already being diluted. The necessity of the complex tail and ACP system was the opposite of what the Korean pilots wanted and would make maintenance more complex, this was to be a theme of Starfighter production; Johnson and his team eternally struggling against increasing the weight and complexity of the aircraft. Other areas of note were the highly advanced General Electric J-79 engine, selected after much delay and design work, and the downward firing ejector seat, included to compensate for the high tail plane, which will be discussed later.

What is obvious even in this very brief look at the engineering behind Starfighter is that this was an aircraft that was pushing the envelope of contemporary technology. In all of the author's interviews with German Starfighter pilots¹⁷ the point was stressed that much of the technology involved was essentially immature. Second generation lightweight fighters such as the F-16 Fighting Falcon show a far more rounded ability, specifically due to a greater understanding and harnessing of the technologies in use. Starfighter was the key test bed for Lockheed for these new technologies. It was a radical aircraft; even the most casual observer can see it is very unusual when compared to all other fighter jets before or since. Whilst Johnson got the basic design philosophy wrong, there should be no doubt over the engineering ability of Johnson, his team, or Lockheed as a whole. It is revealing to note that Chinese fighter jet engines are only now achieving comparable performance figures to those of the J-79 engine¹⁸. Starfighter was an aircraft ahead of its time. Criticism of the Starfighter's performance, as is levelled in David Boulton's *The Grease Machine*, ignores the cutting edge nature of Starfighter. The F104 was an aircraft of compromises, the high tail and ACP being one such example. However, all fighters are compromises, if anything Starfighter was one of the most uncompromising fighters ever built.

¹⁷ Brigadiergeneral Hubert Merkel (Luftwaffe ret.) and LtCol Peter Wamser (Luftwaffe ret.)

¹⁸ Jane's Defence Weekly. 'The China Puzzle.' (Vol.41, Issue no.3. January 2004)

Johnson's emphasis on pushing the performance envelope to extremes ensured this. It was to be a technological masterpiece but this did not ensure it was an operationally viable aircraft.

Starfighter took four years from the initial requirement being formed to clearance for service on 26th January 1958. Not unusually for a cutting edge weapons system design phase, the entire process took twice as long and \$30 million¹⁹ more than initially proposed. Unfortunately, by this date Lockheed was still having much difficulty with such serious flight problems as compressor stalls and fuel supply problems. More worryingly 22 Starfighter test vehicles had been written off and eight test pilots had been killed in the design process. Conversely, Starfighter was set to break both the world speed records and the world altitude records. It is this paradox that exemplifies the problem with Starfighter, at its heart it was an unaccommodating machine that would kill the unwary. The USAF continued with Starfighter for only a short time until, the programme was ended by the seemingly endless technical problems and the high accident rate combined with the arrival of new aircraft that were more suited to evolving operational needs.

Essentially, the USAF design of Starfighter (the F-104C model) was supposed to intercept and destroy Soviet nuclear bombers over US air space. To a lesser extent it had a tactical nuclear and ground attack role. It was an aircraft designed to win the air war as perceived by the pilots of the Korean War that had been given a new role of air interception in a nuclear environment. It failed to adequately fulfil this new role of air interception mainly due to its insufficient fuel capacity and various technical difficulties in its production and deployment. The Starfighter in USAF service was not an abject failure. It was, more accurately, overtaken in utility by aircraft such as the F-4 Phantom. The USAF wanted 'push-button' aircraft²⁰ that were marvels of technology and complexity (and therefore heavy and complex) that could soar to great height at speed, for long distances and intercept the Soviet

¹⁹ \$30 million corrected for inflation by GDP per capita is approximately \$423 million as of 2003 values. *Source:* www.eh.net

²⁰ Chap. 3. RAND Corporation, *The Cutting Edge, A Half Century of Fighter Aircraft R&D.* (RAND, 1998)

bombers. A lightweight and difficult to operate aircraft such as the Starfighter was simply pushed aside.

Starfighter mutates and survives

So the Starfighter should have been consigned to the dusty rooms of aviation museums after its early withdrawal from USAF service. Instead it became the mainstay of the NATO fighter inventory. The wondrous mechanics of this ‘Sale of the Century’ are analysed elsewhere in this dissertation but by 1959 an aircraft pushed aside by the changing strategic requirements of the USAF had been selected to equip the Luftwaffe in huge quantities.

Whilst there is huge controversy over the fairness and validity of the West German selection process for Starfighter, two pertinent facts remain:

1. Starfighter held the world altitude record and the world speed record.
2. Starfighter had won the “fly-off” competition arranged by the Luftwaffe.

The controversy and accusations over the procurement process in the literature on Starfighter repeatedly seem to miss these two points. In an excerpt from *The Grease Machine*, Boulton comments on the procurement process in Japan.

Much was made, reasonably enough, of the Starfighter’s new world records, for altitude and speed. But the circulating of highly selective data was by no means Tanaka’s [Japanese Premier] most telling contribution.

Boulton does not explain why this was ‘highly selective data’; Boulton goes on to make the implication that there were serious fundamental flaws in Starfighter as an aircraft. This is unfair on Johnson and his team, as we have repeatedly seen, this was an aircraft on the cutting edge of technology. At the fundamental level it was flying faster and climbing higher than any other being

produced at the time. In this respect Johnson had not failed Colonel Gabreski and the other Korean pilots that he had originally talked to.

The USAF had experienced major problems in the earlier versions of Starfighter but the West German government had never proposed to buy this aircraft, instead they would purchase the F-104G version. The G or “Super Starfighter” was a different aircraft from the versions flown by the USAF. The avionics suite had been completely changed and was now installed in modular units improving the maintenance capability; radar and navigation had been substantially improved; cold weather capability had been added; anti-skid mechanisms installed and there were a host of other improvements. Lockheed’s coup of selling a weapons system that had been disparaged by its own country was accomplished by far more than just fancy repackaging; it had effectively rebuilt much of the aircraft and improved it dramatically as a fighter. Whether or not the procurement was entirely corrupt as many believe, the fact remains that the Germans were not as ignorant of the Starfighter’s defects as many thought; they brought a heavily modified version of the original design. However it should be noted that the handicap of the original lightweight design was once more apparent. The more new electronics and gadgets that were packed into the airframe, the more the original design ethos was lost.

What the Luftwaffe and other subsequent buyers of Starfighter desired was a multi-role fighter that could fulfil their requirements of air defence and, importantly, nuclear strike. Starfighter eventually mutated into a multi-role aircraft and it is clear from all the pilots’ accounts and interviews that the author has read and heard that the aircraft was, for a competent pilot, a dream to fly. Its utility as a low-level ground attack aircraft was highly praised by all who flew it, it was steady and extremely fast at low level. It could intercept and, if handled correctly, could be successful in air-to-air combat. The Starfighter is not without precedent or antecedent in this mutation of roles. However it was always handicapped by its lightweight roots and its skinny, bantam weight design.

Essentially what Lockheed had done was mutate Starfighter into something approaching what the West Germans wanted. This theme of adaptation in aircraft design is exemplified in F-104 procurement. The aircrews, early in the First World War, who started shooting at other reconnaissance aircraft with rifles, were the original forefathers of this mutation of roles. The Starfighter change is archetypal of the modern theme of economic, not combat, led change, which enabled Lockheed to sell the F-104 abroad. A modern example is Eurofighter Typhoon, which is currently undergoing this almost inevitable change from a pure air superiority aircraft to a multi-role aircraft. We can see that in Eurofighter, its utility for pure air superiority is extremely useful to the relatively wealthy air forces of Western Europe who can afford to purchase such a specialist aircraft of this type but to win sales in countries with more limited budgets it must demonstrate its competence as a multi-role aircraft. This is seen in the current Singapore competition²¹ where Eurofighter Typhoon is competing primarily with the F-15T Eagle, another 'mutated' multi-role aircraft that has been completely redesigned to suit various customer needs. The economic pressures to sell aircraft change the nature of the aircraft, as was the case with Starfighter and as will continue to be the case.

So Starfighter became a success abroad, filling the gap in NATO inventories by ferocious sales techniques and a mutation of the aircraft as a whole, from the lightweight, daylight pure air-to-air aircraft (with limited nuclear and ground attack capabilities) to a multi-role combat jet in its G and later models. In the process it saved Lockheed as a company and the estimated 15,000 jobs reliant on its success. The next section examines the infamous Starfighter safety record.

²¹ Felstaed, Peter. Asian Aerospace 2004: Singapore Fighter contest heats up. (Jane's Defence Weekly 01/03/2004)

Widow Maker

The most controversial part of the procurement and subsequent use of Starfighter is its accident rate. Fig II shows perhaps the most useful statistical comparison of Starfighter's safety record. It compares Starfighter with its peers and, usefully, the first 750,000 hours flight time of each of these aircraft. It does not, however, show the early years of Luftwaffe service where the loss rate was even higher

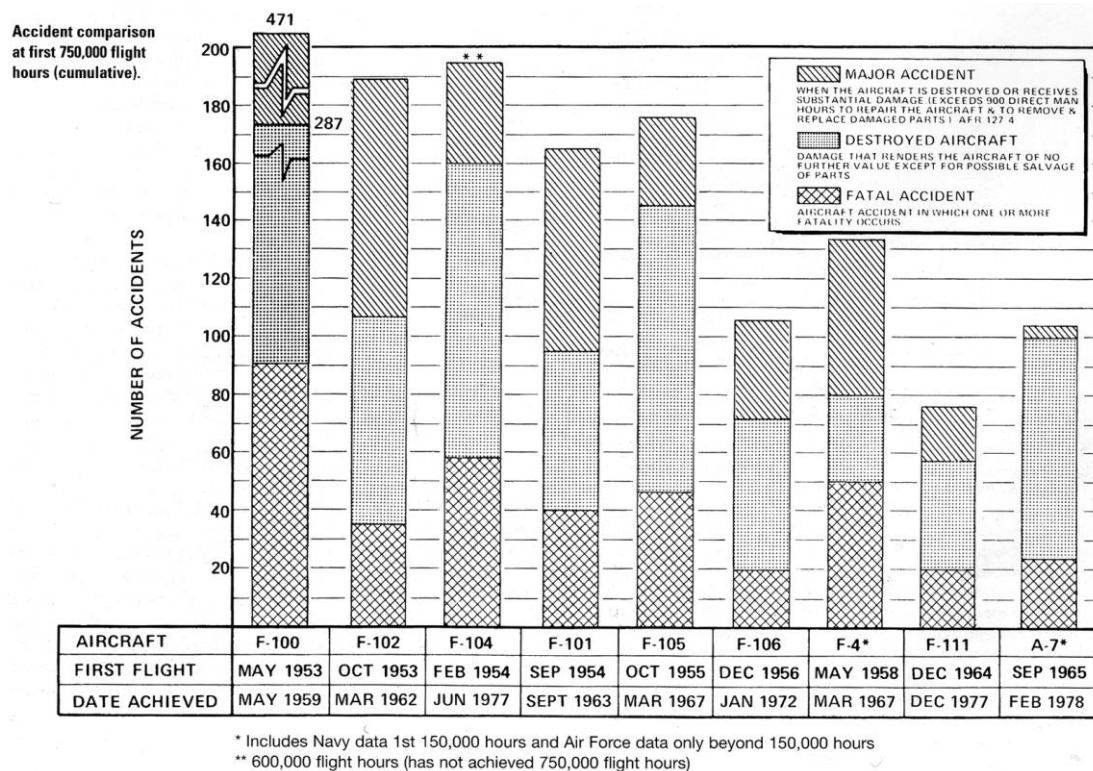


Figure II. USAF accident comparison of the first 750,000 hours²²

Comparable statistics from contemporary aircraft in the Soviet Union have proved impossible to obtain; but the pertinent fact was that Starfighter had a high accident rate and, to make matters worse, the pilot fatality rate was high per number of accidents. The German press entered a 'feeding frenzy' over this issue, *Die Welt* coined the term 'Widow-Maker' and morbid jokes abounded about Starfighter. By the end of its service 292 F-104 G's had been lost or written off and 120 pilots had been killed in accidents. The 1971 West

²² Figures drawn from Bowman (2000) pg. 21

German Auditors²³ report strongly criticized Franz Josef Strauss and his decision to purchase Starfighter stating the purchase had, "...weakened materially and psychologically the defensive power of the air force, and entailed additional costs running into hundreds of millions of marks".

Pilots' accounts acknowledge the fact of the high initial accident rate but disagree with the premise that this was a dangerously flawed aircraft. Typical of the feeling is Lt Col Peter Wamser (who had flown over 3,250 hours on Starfighter); in an interview with the author he states, "It was demanding but it was a beautiful aircraft to fly". This captures the pilot's view that it was technically challenging but not fundamentally flawed.

One of the contributing factors to the high fatality rate was the Lockheed C-2 ejector seat. The original downward firing ejector seat, introduced over concerns about the high tail, had been replaced before production with the conventional Lockheed C-2 upward firing seat. This seat did not have true zero altitude and zero speed ejection capability and has been criticised for having narrow height and weight pilot constraints.²⁴ Lockheed also strenuously objected to its proposed replacement by the Martin-Baker ejector seat, which once it was placed in the majority of European Starfighters significantly reduced pilot fatalities.²⁵

A further factor in the unusually high loss rate of Starfighter when it arrived in Germany was the demanding mission profiles flown by the Luftwaffe. This was combined with the initial training cycle being in the generally fine weather of the United States, with pilots then moving to Germany and experiencing very much worse flying conditions. The daylight air interceptor/superiority aircraft was now performing in its changed role of an all-weather multi-role aircraft flying in the complex environment and changeable weather of West German air space. Additionally, Germany was also still recovering from the disastrous effects of the Second World War and

²³ From Bowman(2000) pg. 22

²⁴ Luftwaffe Brigadier General Merkel comments in an interview with the author

²⁵ Gunston (1976) pg. 208

essentially had to train large numbers of inexperienced pilots to fly the new supersonic Starfighter from an inadequate training infrastructure. It is revealing to note that a third of Luftwaffe pilots in one Starfighter squadron (31)²⁶ were reassigned to the slower and more stable F-84; a further indication of the exceptionally difficulty of flying the F-104G.

As ever, an element of rationality has to be used in discussing the accident rate of Starfighter. Throughout its various modifications there is no doubt that the F-104 had an unusually high initial accident rate. This, when added to the controversy over the alleged bribery in the Starfighter procurement process, makes an unwholesome brew (and a good newspaper headline) of corrupt officials being bribed to buy a fundamentally dangerous aircraft. The reality is more complex than that. Initially the accident rate was high, especially in Luftwaffe service, but it then came into acceptable margins (10 accidents per 100,000 hours) when full squadrons were flying regularly. The following chart (Fig. III) shows the substantial drop in Starfighter loss rates and particularly pilots and aircrew killed as the aircraft increased in technical maturity and it became better understood by its operators.

²⁶ Ibid

	Luftwaffe Starfighter losses	Pilots/Crew killed.	Marineflieger Starfighter losses	Marineflieger Pilots/Crew Killed
1961	2	10	-	-
1962	7	6	-	-
1963	-	-	-	-
1964	10	3	-	-
1965	25	15	2	2
1966	19	10	3	3
1967	11	3	2	-
1968	15	7	4	4
1969	16	9	-	-
1970	14	5	3	1
1971	14	4	5	3
1972	11	5	1	1
1973	15	5	-	-
1974	7	-	3	2
1975	9	6	2	1
1976	11	2	1	
1977	8	3	2	1
1978	10	2	3	-
1979	5	-	5	1
1980	10	5	1	1
1981	8	2	1	-
1982	9	2	3	2
1983	2	-	-	-
1984	6	1	2	1
1985	1	-	3	-
1986	1	-	-	-
1987	-	-	-	-
1988	-	-	-	-
1989	1	-	-	-
TOTALS	246	97	46	23

Total German F-104 Losses: **292**

Total USAF pilots (included): **8**

Total German pilots/crew killed: **120**

Source: Bowman (2000) pg. 67

It follows that Starfighter's poor accident record was caused by a combination of factors and it was not fundamentally flawed. A fundamentally dangerous aircraft would have continued to experience high accident rates throughout its career, the F-104 did not.

An interesting comparison is with the current high accident rate in the Indian Air Force. In essence, this is being caused by Indian pilots being forced into a very steep learning curve from slower training aircraft to Mig-21s. This has resulted in a loss rate in the last three years of 56 fighters, 35 of which were Mig-21s. The Hindustan Times recently applied the sobriquet of the "Flying Coffin" to the Mig-21²⁷. However like the Starfighter story, subtler reasons such as the lack of, until very recently, an advanced jet trainer and inadequate training procedures may be highly influential. The press hysteria over the F-104G's basic design was unjustified, Johnson had not built a fundamentally dangerous aircraft.

²⁷ The Hindustan Times, *MiG-21: The 'Flying Coffin' haunts IAF*. (May 21st 2002)

Lockheed's sales strategy

If you don't pay some kind of money, you don't get the business. Politicians can get up in the House of Commons and say this must not happen. But they do not live with the consequences of it not happening. - Sir Frederick Catherwood commenting on the British Leyland affair in 1977.

The views of Sir Frederick could be easily applied to the attitude of Lockheed in its sales strategy of the Starfighter and other aircraft around the globe. Lockheed's practise of using agents, agents commissions, cash payments to 'influential' figures and a host of other methods that often amounted to straight forward bribery was not unusual, nor was Lockheed by any means the first defence company to indulge in such practices. The scale of money involved and the systematic and organised nature of Lockheed's payments to influence the procurement process was the exceptional factor in the Starfighter sales campaign. Throughout all of Lockheed's sales strategy, some of which will be detailed later on, it is of primary importance to maintain perspective on their business practice. Lockheed was a huge company with massive economic and political influence but throughout the Starfighter campaign it was dealing with governments and officials of First World developed countries offering a product. Lockheed was a legitimate company that was prepared to use any means necessary to sell Starfighter. For the Lockheed salesman Starfighter was not the main issue. The main issue was the sale, to them Starfighter was a product like any other and its good and bad aspects were not of primary importance. The primary aim was to sell the product to the customers and Lockheed's salesmen were truly in a class of their own. By fair means or foul they did their job and pulled off what has been dubbed as the "Sale of the Century"²⁸

The dubious techniques of Lockheed's sales campaign were exposed in the corporate blood letting of the Senate committee hearings led by Senator

²⁸ Vankin (1998) pg. 214

Church²⁹ in 1976. These hearings investigating Lockheed and its policy of bribery were a product of the time. The Watergate scandal had led to a reappraisal of government contacts with business and a by-product of this was that all big business was to come under far greater scrutiny. Lockheed was to be exposed by its archrival Northrop when Tom Jones (CEO of Northrop, another US aviation manufacturer) in his first hearing was driven to agree with the question put forward by Senator Church, “Was this whole arrangement [of Northrop’s bribes] not patterned after the Lockheed arrangement?”

To be fair to Jones he had tried not to implicate Lockheed, as this would have in turn exposed more of Northrop’s dubious practices. However the cat was out of the bag and the whole elaborate infrastructure of Lockheed’s corporate bribery was to be exposed in the pious light of the Church Committee.

The immediate history of Lockheed up to the Starfighter campaign explains much of the business practices used in the sales push. Lockheed was under enormous pressure in the late 1950s because of the failure to sell Starfighter in sufficient quantities to the United States and the disastrous Model 188 Electra. The Electra was a short to medium range passenger jet that was the mainstay of Lockheed’s post war diversification attempts to expand into the civil aviation market. It first flew on December 6th 1957 and seemed destined to make up for large losses in the shrinking post war³⁰ military market. Orders came for the Electra and in early 1959 it began service with American Airlines. On February 3, an Electra crashed on landing in New York killing 65 people. Eight months later a crash in Texas killed 34 people and early the following year a third crash in Indiana brought the total killed in Electra crashes in a little over a year to 164³¹. It was discovered that a weakness in the engine mountings led to chronic failure. In essence the engines fell off and public confidence in the Electra 188 was shattered. Lockheed then spent \$25 million dollars in the Lockheed Electra Achievement

²⁹ Sub-committee on Multinational Corporations of the Senate Committee on Foreign Relations was the rather long-winded official title.

³⁰ Both the Korean and the Second World War, Lockheed had lost 150 million dollars worth of orders in 1957.

³¹ Francillon (1987) pg. 118

Program that identified and fixed this problem, but it was too late. The Electra was a private venture aircraft that Lockheed had solely funded and its failure to sell was a serious problem. The self-funded nature of the Electra meant Lockheed bore the entire costs of the research and development of this aircraft.³² A large company such as Lockheed could survive one such misfortune as this but if Starfighter failed as well they were in deep trouble. So a depression in the post-war (including the Korean War) military aircraft industry and a resultant loss in orders combined with the failure of the Electra programme had left Lockheed desperately needing a big sale.

The problem for Lockheed was the failure of Starfighter in USAF service. The United States Air Force (USAF) had ordered 296 Starfighters before phasing the aircraft out of service in favour of the McDonnell-Douglas F-101A/B Voodoo and Convair F-106A (for a variety of reasons that are examined elsewhere in this dissertation.) What was very apparent was that Lockheed were nowhere near their target of 2,500 aircraft that they needed to manufacture in order to profit from the Starfighter programme. It is estimated that some 15,000 Lockheed jobs were directly related to the success of the Starfighter.³³

So Lockheed found itself in a situation where the normal pressures to sell were combined with the failure of the diversification efforts in the form of the Electra and the failure of the USAF to buy Starfighter in sufficient quantities. This captures much of the essence of the problems defence companies have in marketing their products. The research and development costs are enormous even if they are helped by government funding (as was the case of the Starfighter) and the entire direction of the company is focused on one or two models of aircraft on which the company's whole future is reliant. This limited range of products is then marketed to a very limited number of nation states that have the funds and the gap in their inventory that a defence contractor such as Lockheed could meet. It is a very high-risk

³² The Electra 188 did go on to form the basis of the P-3 maritime patrol aircraft reducing Lockheed's long-term losses.

³³ Bowman (2000) pg. 12

environment in which to sell. This trend has led to the increasing reduction of aircraft manufacturers and the frequent mergers in the industry creating huge multi-nationals such as BAE systems, Lockheed Martin and Boeing's merger with McDonnell-Douglas to name some prime examples. Only huge companies such as these are able to absorb the costs and the risks of the modern aircraft industry. Lockheed at the time of the Starfighter was the world's biggest defence company but even it was utterly dependent on the success or failure of Starfighter.

Fortunately for Lockheed there was salvation at hand, in the form of the Cold War. The rise of Communism and the conflict between the capitalist West and the Soviet Union was to create a massive market for the defence industry. The former Axis Powers in Europe that had now become part of NATO were a prime market for the defence industry. The threat of German militarism had now diminished and events such as the Communist Coup in Czechoslovakia and the general creation of the Eastern block formed a view among the victorious allies that "controlled normalisation"³⁴ was preferable to any westward expansion of Communism. Figures such as the creation and maintenance of 100,000 jobs in the US armaments industry through export sales were also being bandied around in Washington³⁵. Lockheed were well aware of this fact and saw a chance to sell Starfighter.

The destruction wrought by the Second World War in Europe and Japan had also created a vacuum in the defence industry. The virtual total destruction of German heavy industry and, importantly from Lockheed's point of view, Germany's indigenous aircraft industry had created a fertile sales area. This had been temporarily filled by aircraft such as the Republic F-84F Thunderstreak and the F-86 Sabre, both Second World War design era jet aircraft, but now the newly resurgent post-war economies of Western Europe needed new aircraft to combat the Soviet threat. Only the United Kingdom and France had indigenous aircraft industries that were able to compete with

³⁴ Boulton (1978) pg. 65

³⁵ Ibid

the American dominated market. This left numerous countries such as the Netherlands, Germany, Italy and Japan that found themselves on the frontline of the Cold War with a need for modern aircraft, 'new shoppers with empty baskets.'³⁶ It was this massive market with fantastic amounts of money involved that was to form the basis for the "Sale of the Century." It was the biggest market for fighter aircraft in history.

NATO policy was to make the stakes even higher. A concerted drive for interoperability with the associated cost saving measures that could be made in areas such as training and weapons fit was being made. The rationalisation strategy was championed by the Pentagon and Secretaries of Defence such as Robert McNamara and the arms salesman in chief for the US administration Henry Kiss³⁷ and this meant that the honours would most likely go to the first aircraft to be procured in large numbers. A large procurement by one country would induce others to follow. The arrival of Germany into the alliance in 1955 and the large number of aircraft that it would buy made it the number one target for defence companies.

Lockheed was considerably helped by a vested US interest in seeing US arms being sold to Europe. The Military Assistance Program (MAP) was to be decisive in the Netherlands final choice of Starfighter. The US essentially paid for 25 Starfighter out of 95 ordered through this programme. Additionally, Lockheed offered with the Starfighter a production line in Europe itself e.g. at the FIAT motor works in Italy. This provided the European buyers with the benefit of being able to form a weapons production infrastructure in their own country, providing jobs, training and a workforce that would aid the country in question far more than simply importing weapons. It was these two factors that were to destroy the chances of the major non-US contender, France with the Mirage III. Dassault (manufacturers of the Mirage III) accused Lockheed of "Yankee bribery"³⁸ when the details of the MAP deal with the Netherlands

³⁶ *Ibid* Pg. 67

³⁷ Sampson (1977) Pg. 117

³⁸ Boulton (1978) pg. 77

emerged. Additionally Dassault could only offer a limited production “in country” deal to the prospective buyers.

It was into this market that Lockheed and the Starfighter were to arrive; they were not alone. Their American rivals came in the form of Northrop marketing the N-156 prototype, later to be known as the “Tiger” and Grumman with the “Super Tiger”. European contenders were the French Dassault Mirage III and the British Saunders Roe 177. Immediately Lockheed had an advantage over the Saunders Roe and the Northrop aircraft both of which were still in prototype form compared to the production model F-104A. The British contingent had “shot themselves in the foot” from the start by not offering the English Electric Lightning, considered by many aviation experts to have been an aircraft ahead of its time.³⁹ The SR.177 only existed in a mock-up form on the Isle of Wight and its chances were hampered by the old world attitude of the British sales team. Anthony Sampson in *‘The Arms Bazaar’* describes this effort succinctly,

The man from Rolls-Royce (who would make the engines) drove around in his Rolls-Royce car and made stately statements: to the watching journalists he seemed not so much a salesman as the ambassador from Derby.⁴⁰

Needless to say despite much technical interest in the SR.177 the British attitude destroyed their chance of success. Grumman were poorly established in Europe and the prototype nature of Northrop’s Tiger did not seem to fulfil West Germany’s immediate need. After the first round of lobbying two serious contenders were left. The F-104 Starfighter and the Mirage III - the only design to have flown in combat (briefly in the Suez crisis). It was at this point that Lockheed’s sales efforts were to be put into effect. The details and machinations of their Europe campaign are complex and

³⁹ For an in depth analysis of this debate see Bowman, Martin. *English Electric Lightning*. (Crowood 1997)

⁴⁰ Sampson (1977) pg. 126

numerous. The main facets of the sales campaign were similar in all the countries that Starfighter was sold. They were:

Ruthless salesmen A highly motivated, well funded and numerous sales team was the foundation of the campaign. This was most notable in West Germany where by the end of 1958 the Grand Hotel in Bonn was so full of Lockheed sales people and lobbyists that journalists started to call it the “Lockheedshof”. Franz Josef Strauss the West German defence minister was quoted as saying “These salesman are everywhere. I can’t open a drawer in my desk without a Lockheed man falls out of it”. Clearly this was in marked contrast to the British effort and the glamour and money of the Lockheed sales team was unknown in austere post war West Germany which was only just beginning to enter its “economic miracle” phase i.e. its post-war economic boom. At the very least these tactics made it impossible for the buying countries not to be aware of the Starfighter. This style of sale was a departure from more traditional methods of sales in the defence industry. Before the Second World War aircraft salesmen had been similar to “door to door brush salesmen”⁴¹. They worked on a straight commission basis but with a massive increase in the stakes both in the commercial and the military field an increased professionalisation of sale techniques occurred. Lockheed’s Starfighter campaign was the contemporary pinnacle of this.

A network of string-pullers. Lockheed had a well-established network of influence peddlers and agents wherever they were to sell aircraft. In Japan this was Yosho Kodoma, a Japanese ultra-nationalist who had made his fortune in the Japanese invasion and occupation of Manchuria. He was to be a very successful agent for Lockheed. The monies paid to agents such as Kodoma have never been accurately detailed but it is known that from 1969 to 1972 for his involvement in the Tristar sales he received \$6,274,000.⁴² In Europe, Lockheed also had its influential agents. A Dutchman named Frederick Meuser was the linchpin of the Lockheed European network, with

⁴¹ Boulton (1978) pg. 69

⁴² Boulton (1978) Chap.10

Hauser his main agent in West Germany. Meuser had helped with the sale of Super Constellations to the Dutch national carrier KLM. He was in turn connected to Prince Bernhard of the Netherlands, another player in the Lockheed network. Indeed the whole network was peopled by characters seemingly from a bad spy novel; a Dutch Prince; Meuser who was an RAF war hero and, importantly, Ernest Hauser who had led a military intelligence unit in the Second World War. There is a danger when discussing these stories to descend into details of this shadowy web which, although interesting, are only descriptions. The key issue is that these shadowy players exchanged money for Lockheed contracts. Hauser had a deal with his friend Franz Strauss, the aforementioned West German Defence Minister that a percentage of each Starfighter sale would go the coffers of the Christian Social Union⁴³, the total paid to the CSU was estimated by Hauser to be around \$10 million. Dan Haughton, the Chairman of Lockheed, was to be deeply mired in this scandal in the Church Committee hearings and proceeded with a policy of stonewalling and refusal to name names. Perhaps the most telling factor about the Lockheed Starfighter campaign in Europe was the discovery in 1976 that all files relating to the purchase of the F-104G had gone missing from the Ministry of Defence in Bonn. In Italy the scandal was to revolve around sales of the C-130 Hercules, similar tactics were used here with large sums of money going to Italian Air Force officers and politicians. Worldwide Lockheed greased the wheels of the Starfighter programme with huge amounts of money in the right places.

Above all Lockheed was a fiercely driven and motivated company and was focused on the sale; moralities and business ethics took a back seat. Lockheed followed this policy of paying money for influence throughout their sales campaigns for various aircraft in countries throughout the world. The Church hearings only finally put a stop to these practices in 1976 and even then the reforms made lacked teeth. The most obvious sea change was the

⁴³ Hauser, 'The Lockheed European Caper.' Sourced from interviews with David Boulton for Granada television's *'How to sell an airforce.'*

publishing of “Lockheed Principles of Business Conduct” in May 1977⁴⁴ that emphasised the importance of ethical business practice. The cynical may question the sincerity of such corporate publishing as this but on the face of it Lockheed (as a company) was to mend its ways.

It is unwise to emphasise the role of Lockheed’s payments to the exclusion of all else when discussing the “Sale of the Century”. Certainly they substantially helped Starfighter’s cause but there were other deeper strands to the choice of Starfighter. West Germany and Japan, the two initial foreign purchasers, had been substantially moulded by the occupying powers in the post Second World War period. Politically unreliable people in positions of authority, such as those with strong links to the Nazi Party in Germany or ultra-nationalists in Japan, were removed from their positions and people who would have a favourable attitude to the US and its allies were promoted in their place. The effects of this purging of the reins of power had a profound effect on Starfighter. Perhaps the most obvious example is the friendship between the aforementioned Ernest Hauser (a US citizen and a translator for the US Army) and Defence Minister Franz Strauss. Strauss had been a translator for the occupying forces in post-war Germany and in this capacity had made friends with Hauser. Strauss eventually became the godfather to one of Hauser’s children who was named Franz. So by the time Hauser had left the US Army and was a Lockheed man, his connections with the German Defence Minister formed in the rebuilding of Germany were exceptionally close.

In Japan, where the US influence was even more pervasive, a network of ex-occupation administrators, covert diplomats and ex-pats helped Lockheed overturn the procurement of Grumman’s Super Tiger at the eleventh hour and eventually changed the procurement to Starfighter. At the core of this change was the awesomely powerful Kodoma who had been recruited for Lockheed by an American born Japanese named Taro Fukada; both of these individuals had been imprisoned by the US for war crimes!

⁴⁴ Lockheed Life. (1977)

Thus, it was through the US involvement in post-war rebuilding and restructuring that Lockheed was able to find contacts sufficiently well placed and with a pro-American or highly mercenary stance. The infrastructure of Japan and Germany had been severely damaged by the war and in its regrowth it had blended with the US to Lockheed's commercial advantage.

Personal experience of the air force personnel of Germany and Japan may also have had an effect on the procurement of Starfighter. General Minoru Genda, who became chief of the Japanese Air Staff in July 1959, had been responsible for planning the attack on Pearl Harbour eighteen years earlier, became one of the greatest Starfighter supporters in Japan. Similarly the first German pilots to fly Starfighter for testing were decorated Second World War aces. Oberstleutnant Günther Rall, one of the first to train on Starfighter, had been shot down by a USAAF P-47 Thunderbolt. It is, of course, subjective how much the Second World War experience flying against US aircraft affected these airmen but it is not purely speculative to suggest that many of these pilots coveted their former adversaries aircraft.

Whilst there is no doubt that the Starfighter procurement process was heavily influenced by payments made by Lockheed and its shadowy network of agents throughout the buying countries it is simplistic to scream 'scandal!' and condemn the procurement as an outrage in its entirety. This was a popular theme in the 1970s as big business was condemned in the wake of Watergate and the Church hearings. To accuse Lockheed as a sleazy corporation fobbing off a defective aircraft onto unsuspecting innocents is an uneasy analogy. The two chief foreign procurers of Starfighter, West Germany and Japan, were already drawn to buying a US aircraft as the influence of America was at its strongest in these countries. The US had emerged victorious and relatively unscathed from the Second World War and Korean War; it was the world's hegemonic power and the mainstay against Communism and had helped rebuild these two countries after defeating them. So a purchase of US aircraft was always likely. The relatively poor representation from the European manufacturers, with outdated sale techniques in the case of Britain and the French unable to compete

economically with the US companies, aided Lockheed considerably. The support of the Pentagon and Lockheed's ability to offer production in the buying country made the "Buy American" decision a certainty. In this reduced pool of contenders Lockheed was likely to emerge triumphant. It had the largest established network, the best contacts and was prepared to spend money in the right places to ensure the sale. Lockheed was always going to be one of the most likely candidates in the 'Sale of the Century' its willingness to go to any lengths to secure the sale was what ensured it finished first.

Conclusion

The procurement of Starfighter was a programme that started with a fundamental error. Clarence “Kelly” Johnson’s discussions with Korean War pilots laid the foundation for the aircraft. It was designed to be a lightweight and fast, daylight, dedicated air superiority fighter, in accordance with the stated desires of the pilots fighting enemy Migs. Starfighter was a radical and highly unconventional design, it will always be remembered as a “rocket with wings”, a bantam weight aircraft that broke the world speed records and altitude records. Unfortunately for Johnson and Lockheed, the Cold War requirements of the USAF and the weight of technological operational trends meant that the F-104 was the wrong aircraft for the tasks created by the Soviet bomber threat. The pilots that Johnson spoke to did not have the foresight and vision to perceive that future aircraft would need to be all-weather, long-range interceptors whose primary goal would be to protect US airspace. As the military requirements changed the Pentagon looked elsewhere for its aircraft and Starfighter was doomed to a short and unsuccessful period in USAF service.

At this point the fate of Starfighter programme undertook a drastic change. The curtailed procurement by the USAF, the failure of the Electra 188 and cancellations of other orders placed Lockheed in the position of either selling Starfighter or failing as a company. Salvation was at hand with the huge market of Western Europe and other Western allies who were in urgent need of new aircraft to combat Soviet expansionism and the threat of a conventional and nuclear attack. The need for interoperability between allies (particularly NATO allies) meant that most of these countries would purchase the same aircraft. Thus the stage was set for the “Sale of the Century”. Starfighter underwent an economics led change, driven by the untenable financial position of Lockheed without a major Starfighter sale and enforced by the demands of overseas buyers. Aircraft frequently change roles when military requirements force a change in existing roles; but the F-104’s change

was almost entirely driven by Lockheed's economic need to sell Starfighter rather than true military requirements.

The sales techniques of the Lockheed Starfighter campaign to non-US countries were a result of the pressure Lockheed was under to sell. The sales tactics were, without question, highly successful and saved Lockheed as a company. From a moral viewpoint they were of dubious ethical value as was revealed in the Church Committee hearings in the mid-1970s. The eventual fall-out from the Starfighter scandal rocked governments to the core. In Japan, an outraged Japanese nationalist crashed a light aircraft into Kodoma's house in revenge for his part in the Starfighter scandal.⁴⁵ Tanaka, the former Japanese Prime Minister, was arrested along with several others for his involvement with Lockheed. His successor Takeo Miki was ousted due to his connections with the now tainted Tanaka. In the Netherlands, West Germany and Italy the reverberations of the Starfighter story were also as severe.

Despite all of these political repercussions the sales tactics of Lockheed saved it as a company and it continues to be one of the key players in the defence industry. David Boulton in *The Grease Machine* focuses on Lockheed's business practices and places the blame for the fall out of the Starfighter sales scandal squarely on Lockheed. This is a limited viewpoint; the governments of developed nations such as Japan should be incorruptible, especially when dealing with such important issues as awarding defence contracts. Lockheed has taken much of the blame but the majority is more correctly assigned to the governments that allowed themselves to be influenced by such business practices.

The discussion of the rights and wrongs of Lockheed's sales tactics are heavily linked to the F-104's safety record. Starfighter, especially in Luftwaffe service, had an unusually high accident rate. When this was combined with the suspicious sales tactics, it is easy to assume that Lockheed was selling a

⁴⁵ Boulton (1978) pg. 270

dangerous aircraft. This is not true. Starfighter was not a fundamentally dangerous or flawed aircraft. The pilots' accounts are the ultimate testimony to this. The pilots acknowledge it was a demanding aircraft to fly but also that its performance was unprecedented. Its poor safety record was in reality due to a complex combination of factors, involving training, its changing role and equipment and its unconventional flight characteristics among others.

Future lessons to be drawn from the Starfighter procurement are numerous. The key one being that the initial design of an aircraft must have sufficient growth capacity to enable it to adapt to changing future roles. Eurofighter Typhoon is an example of an aircraft that is undergoing a mutation of roles from air superiority to multi-role capability due to a limited initial requirement. This change is being driven partly by the need to sell Typhoon to overseas customers with different requirements from the initial European consortium; increasing the complexity and cost of the aircraft, a trend clearly seen in the Starfighter programme. From a sales perspective, it is clear that Lockheed was successful in selling Starfighter despite the dubious means used. Whilst the industry should be self-regulating, the onus is on procuring governments to ensure a valid and competitive decision when purchasing defence systems. In the ultra-competitive market of military aircraft, the procurer must be in a position to make a fair and unbiased decision, and not rely primarily on the defence contractor's honesty.

Bibliography

- Martin W. Bowman with Matthias Vogelsang, *Lockheed F-104 Starfighter* (Crowood Press, Wiltshire 2000)
- Anthony Sampson, *The Arms Bazaar*. (Lowe & Brydone Printers Ltd, Thetford 1977)
- David Boulton, *The Grease Machine The Inside Story of Lockheed's Dollar Diplomacy*. (Harper and Row, New York 1978)
- Futrell, Robert, Brig. Gen Moseley, Lawson. *The United States Air Force in Korea 1950-53*. (Duell, Sloan and Pearce 1961)
- USAF Hist Study No. 127, *USAF Opns in the Korean Conflict, 1 Jul 52-27 Jul 53*, from <http://www.army.mil/cmh-pg/books/korea/truce>.
- RAND Corporation, *The Cutting Edge, A Half Century of Fighter Aircraft R&D*. (RAND, 1998)
- Gunston, Bill. *Early Supersonic Fighters of the West*. (Allan, 1976)
- Spick, Mike. *Designed for the Kill*. (Airlife Publishing, 1995)
- René J Francillon, *Lockheed Aircraft since 1913*. (Putnam, London 1987)
- Lockheed Life*. (Lockheed company magazine May 1977)
- An unpublished manuscript. Ernest Hauser, 'The Lockheed European Caper.' Sourced from interviews by David Boulton for Granada televisions 'How to sell an airforce.'
- Vankin, Johnathon. *The Big Book of Scandal*. (DC 1998)

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www.dfrc.nasa.gov/gallery/photo/index.htm