



More than 120 Jaguars remain in service with the IAF and upgrades mean they will serve for at least another decade
All Peter Foster unless stated



J1004 was one of the 18 RAF Jaguar GR.1 aircraft loaned to the IAF while its own airframes were produced. It was built for the RAF as XX117 and later returned to RAF service. It remains in use as a ground instructional airframe at RAF Cosford to this day Via Peter Foster

requesting an unusually low price. At the same time an approach by Libya for 39 aircraft was also vetoed whilst the interest by Turkey for 24 and Saudi Arabia for 80 to 100 came to nothing. While the following year, Pakistan's interest in an initial order of six aircraft foundered on funding difficulties.

Pen to Paper

Finally, in September 1978 India selected Jaguar, or 'Shamsher' as it is known locally, to meet its deep strike capability with an eventual requirement of 200 aircraft although the ITP (Intent to Proceed) document was to cover only an initial 160. These were to be ordered in batches of 20 with the initial 40 to be built at Warton and the remainder under licence. On October 21 an ITP was signed by Sir Freddie Page for SEPECAT and S.S. Banerji, the Indian Defence Secretary.

Given the leisurely pace of this decision, the urgency to get the aircraft into squadron service was almost indecent. This resulted in the loan of 18 RAF aircraft to equip No 14 Squadron at Ambala. These loan aircraft consisted of 16 Jaguar GR.1 and two Jaguar T.2 aircraft. The first two loan aircraft, one single seater and one twin, were handed

over at Warton in a ceremony to the IAF on July 19, 1979 and were flown to India a week later arriving in Ambala on July 27.

The first four IAF pilots commenced training at 226 OCU at RAF Lossiemouth in February 1979 and upon completion of the 45-hour course, they were attached to 54 Sqn at RAF Coltishall for 20 hours of tactical training before being declared limited combat ready. A further eight pilots followed and these were to form the nucleus of IAF aircrew to oversee the type's induction into service.

First Unit

The Indian Air Force's 14 (Bulls) Sqn was the inaugural unit to operate the Jaguar from



JS110 was built at Warton in 1981 as G-27-342 and has been in IAF service ever since. It has constantly been upgraded to ensure it remains a capable front line combat aircraft

Left: Jaguar JS108 is another ex-Warton aeroplane, having been built as G-27-340 in 1981. As can be seen its cockpit has been thoroughly overhauled and upgraded in recent years

Far left: A number of two-seat aircraft have been built for the IAF, both in the UK and in India

THE BEST IS STILL TO COME

INDIAN AIR FORCE JAGUARS

Although retired from RAF service, the Jaguar is still an important part of the Indian Air Force. Peter Foster offers a special look at the Indian Air Force's Jaguar fleet

As we lament the premature passing of the Jaguar in RAF service and look around to see that in France, Ecuador and Nigeria the venerable lady has also been laid to rest, we could be forgiven in thinking that the sands of time were also running out with the last two operators, Oman and India.

It may therefore come as a surprise to many that although Oman is considering an imminent replacement, in India the type is not only still going from strength to strength but has only just recently finished production, the last aircraft coming off the line as late as 2010. Should that, however, really be a surprise in a country where both the Royal Enfield motorcycle and the Austin Ambassador car are still in production!



Ten of the 40 Jaguars built by BAe Systems at Warton, Lancs for the Indian Air Force Via Peter Foster

Ambala Air Station. Previously a Hunter F.56A unit, 14 Sqn was declared operational on the Jaguar in September 1980, shortly after the arrival of the last of the initial loan aircraft.

The 40 Warton produced aircraft were of a similar standard to the then current RAF jets with Adour Mk 804E engines and NAVWASS (NAVigation and Weapon-Aiming Sub-System) avionics. The first delivery of these took place on February 21, 1981 with completion of the order in November 1982. These replaced the former RAF aircraft on loan to 14 Sqn but only after its co-located 5 (Tuskers) Sqn had been equipped.

The first aircraft of this batch, twin-seater JT051, was handed over on February 10, 1981 and delivered to India on March 5, 1982 when the last two aircraft (JS133 and JS135) were delivered.

5 Sqn became operational on the type in the summer of 1981 allowing for the return of the loan aircraft back to the UK from February 1982 – the last returning on April 19, 1984.



A Jaguar from 14 (Bulls) Sqn prepares to receive fuel from an IAF 78 Sqn Ilyushin IL-78 Midas aerial refueling aircraft in 2004. In IAF service the Jaguar is known as the **Shamsar (Sword of Justice)** USAF / SSGT Mathew Hannen



Jaguar IS JS184 heads a line up of Jaguar IM variants. The IM has a nose-mounted Agave radar that can be presented either in the HUD or through the normal COMED display. The type is optimised for maritime air-to-surface operations but can also be used in the air-to-air role. Two-seat Jaguar IT JT066 brings up the rear of the line up Simon Watson



Pair of IAF Jaguars and Indian Navy Sea Harriers escort a two-ship of US Navy F/A-18E Super Hornets over Indian Navy aircraft carrier INS Viraat during exercise Malabar 07-2 in 2007. US Navy / Jarod Hodge

Indigenous Production

The 45 'Phase Three' aircraft (35 single-seat Jaguar IS and ten two-seat Jaguar IT machines) were built from Anglo-French CKD (Completely Knocked Down) kits by HAL at Bangalore and the first (JS136) undertook its maiden flight on March 31, 1982.

These differed from the earlier BAE assembled examples incorporating a more modern avionics suite known as DARIN (Display Attack and Ranging Inertial Navigation). This featured a wide field-of-view Smiths (GEC) Avionics Type 1301 HUDWAC (Head-Up Display & Weapon Aiming Computer), a GEC-Ferranti COMED 2045 (Combined Map & Electronic Display), a SEGAM ULIS 82 INS and a LRMTS (Laser Ranger and Marked Target Seeker).

All of this and other indigenous instrumentation were built around a MIL-STD-1553B digital databus, allowing for

the integration of a wider range of stores, systems and ordnance. Power also differed with the aircraft being fitted with the RT172-58 Adour Mk.811 engine, each rated at 8,400lbs of thrust.

Initial Operating Capability (IOC) was achieved in 1984 and Full Operating Capability (FOC) in 1985, these examples going to equip 16 (Cobras) Sqn in October 1986 and 27 (Flaming Arrows) Sqn in the summer of 1982, both at Gorakhpur. Each unit had 16 strike and two twin-seat aircraft.

The first all-Indian built Jaguar was scheduled from Phase Four with delivery in January 1988. Phase Four had originally been planned as 56 aircraft of entirely local manufacture but would ultimately be amended, according to BAe Systems, to a more modest total of 31 kits comprising of 23 Jaguar IS (JS171 – JS193) and eight Jaguar IM (JM251 – JM258).

Radar Equipped

The IM variant was unique in the Jaguar world with a nose mounted Agave radar that can be presented either in the head-up display (HUD) or through the normal COMED display. Optimised for maritime air-to-surface operations, although it can be utilised in the air-to-air mode, it could scan through 140-degree azimuth and through 6 or 12 degrees in elevation (from a 60-degree arc).

The aircraft went on to equip one flight of 6 (Dragons) Sqn at Poona and the variant first flew in 1985. However, it took a further seven years before all eight aircraft had been delivered, at which time the IAF ordered a further batch of 15, comprising eleven Jaguar IS and four Jaguar IM aircraft, under Phase

INS (Ring Laser Gyro/Inertial Navigation System) with GPS, a new HUD and smart MFDs (Multi-Functional Displays) and employed jointly in operational training and the night attack role utilising laser-guided weapons. Eight of the aircraft were delivered to the IAF by September 2004 and the remaining nine on July 15 2005.

Non-Standard?

This batch of aircraft, however, caused some controversy when the IAF refused to fly two of the aircraft and declined to accept a further five due to the alleged use of non-standard parts. This, according to HAL, revolved around the use of the small



This Jaguar IM (JM260) is in service with 6 (Dragons) Sqn at Poona. The IM variant first flew in 1985 but it took a further seven years before all eight aircraft had been delivered. The IAF then ordered a further four under Phase Five. The squadron also operated the IDS version of the Jaguar Simon Watson

“The Jaguar was never designed to fulfill the medium-level role”

Five. The squadron also operated the IDS version of the Jaguar drawn, it appears, also from the Phase Four production run.

Again, the aircraft in both Phase Four and Phase Five utilised the Adour 811 engine and incorporated the DARIN avionics suite. Deliveries were completed in 1999 and in March of the same year the IAF ordered an additional batch of 17 Jaguar IT twin-seaters for delivery commencing 2003. These were to be equipped with the upgraded DARIN II nav/attack system incorporating new RLG/

BT nuts used in connecting the hydraulic systems. The larger nuts used are drilled for wire locking that is mandatory in the original specification. The smaller nuts were not drilled and therefore not wire locked. For some reason the batch of small BT nuts used in the construction of these Jaguar ITs had erroneously been drilled but in accordance with the laid down procedure, were not wire locked. It was the discovery of these BT nuts with holes that caused the concern and the seven aircraft involved had to be returned to HAL for a complete replacement with the approved materials.



JS136 was the first example to be built in India from a CKD kit. It first flew on March 31, 1982 and is seen here boasting an array of armament

Final production

The final order for Jaguar came on March 31, 2006 when, as Phase Six, 20 single-seat Jaguar ISs were funded. This would keep the aircraft in production until 2010.

This remaining batch of aircraft (JS206 – JS225) were to also be equipped with the upgraded DARIN II nav/attack system, a new LRMTS and the incorporation of the ELTA-built airborne self-protection jammer and an indigenous radar warning receiver within the aircraft's ECM suite.

It was thought that this additional batch would allow for the equipping of a sixth frontline Jaguar squadron to be used possibly in a night-attack, specialised target-marking and designation role. In fact 224 Sqn has reformed at Jamnagar with this role in mind, although new build aircraft have been going to current squadrons, and the first five aircraft from phase six had been delivered to 14 Sqn by February 2007.

Mid-life Upgrade

Upgrade of the remaining Jaguar fleet is seen as a priority and contracts were signed with Sextant of France and Elta of Israel to upgrade the avionics of the 'strike' Jaguars. In 2009 the 27 survivors of the 35 BAe-built NAVWASS equipped aircraft had all been upgraded with the Darin II avionics package

Jaguar IM JM259 returns at the end of a sortie. This was the first IM variant to be built in India, all previous examples having been assembled from kits Simon Watson



and it is expected (although funding remains uncertain), that the Darin I HAL built aircraft will be the first batch of aircraft to enter the future upgrade programme.

The upcoming Darin III and avionics upgrade introduces many new features including a mission Computer Dual in Hot Standby Mode to give high computing accuracy, high speed processing (thanks to a large memory growth), a Data Transfer System and a colour CCD video camera with 90 minutes of recording time. The first jet so modified was JM255 and it undertook its first flight in this configuration on November 28, 2012.

Hot and high

These modifications are thought to only be a first phase in the long-term future of the venerable Jaguar in IAF service and the engine is another major factor in the continuing saga of Jaguar. All operators have complained of the lack of power as supplied by the Adour, especially in hot and high conditions and this is particularly noticeable in the Mk804E engined example. My own experiences in Oman come clear in my mind as I accelerated along Seeb International

“The IAF refused to fly two aircraft and declined to accept a further five”

Airport's main runway with the end getting awfully close before we reached V1!

In early 2007 the IAF was considering the possibility of re-engining 126 Jaguars with the Honeywell F1251N powerplant. This engine offers a 9% increase in dry thrust over the Adour Mk811 and a 12% increase in burner. However, thoughts now appear to have turned towards the Adour Mk821 that takes the cold section of the Mk811 and the hot section of the Mk951 of the Hawk 132 to give an additional 15% thrust. No decision

is yet believed to have been taken but as the aircraft gets heavier, an engine upgrade will have to be considered at some point.

In November 2010 the IAF actually issued a Request for Proposals to Rolls-Royce and the US company Honeywell, the latter being quoted as offering to supply “more powerful engines at competitive rates.”

In March 2011 Rolls-Royce opted out of the tender, and faced with the single vendor situation, the Ministry of Defence cancelled the RfP. Air Chief Marshal Naik said that the government had now decided to process the case on the “single vendor” basis keeping in view what is available, and most suited, and negotiate with the selected manufacturer.

Acceptable Attrition

Simply by the nature of its operating environment, attrition in the Jaguar world was likely to be high, although the twin-engine concept gave a good measure of survivability. Alas, when things go wrong at low-level this will often lead to the loss of an aircraft.

In 34 years of operational service the RAF lost 67 aircraft or 29% per cent of

the overall fleet, which is less than one per cent per year. France, which received slightly fewer aircraft, lost 62 over 32 years or 31% per cent, which is comparable.

In India the air force has operated the Jaguar since 1979 or 28 years, and attrition is estimated at 35%, just over one a year or 20% per cent of the fleet, out of 167 aircraft operated to date – this figure including the interim loan aircraft.

This signifies a very good safety record in a country that sees lots of large birds at



Jaguar production was expected to cease in late 2008 but ultimately extended through to early 2010 with the last four aircraft, JQ098 – JQ101 still being on the line during Aero India 2009. This Jaguar IS would go on to become JS223 in IAF service



IAF Jaguars undergoing servicing in the hangar

low level (never a fighter pilot's best friend), especially when viewed against MiG-21 losses.

It is expected that the Jaguar will remain in service for at least another decade and whilst in the United Kingdom we mourn the passing of this venerable aircraft, it still has copious amounts of Eastern Promise! Its future will, however, possibly be determined by the recent announcement of an order for the Dassault Rafale. Reports indicate that the air base at Ambala will be one of the first recipients of this “down-market Typhoon”. ●

The author would like to thank British Aviation Review, Mach III publications and Warbirds of India.



On occasion IAF Jaguars have been deployed overseas for exercise, including this example which visited Eielson AFB in Alaska in 2004 for Exercise Cooperative Cope Thunder 04-01. It is seen here being refueled by members of the base's 354th Logistics Readiness Squadron USAF / Senior Airman Joshua Strang