



ISRAELI PHANTOMS

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F-4E KURNASS 2000

» Kurnass Alpa'im Upgrade «

By 1975 the debate had begun to address the next generation replacement for the F-4E fighter/bomber fleet.

To counter every possible threat, the adjustment and modernization of an aircraft is a high priority for any modern air force. Of course, the air forces and the manufacturers would prefer to buy or sell new weapons systems instead of modernizing existing ones, but the rising cost for development and purchase prevent many countries from buying new equipment in great numbers.

Another problem poses the operational demand by the military. As in most cases it is not possible to have one weapons system to perform all of the required tasks, therefore a multitude of aircraft types exist. A small number of modern systems usually contrast with a large number of systems that have been in service for more than 20 years. Constant evaluations of these weapons systems are needed to ensure that they are up to the tactical and technical demands¹.

For the IDF/AF, it was only necessary to look over the fence at the threat posed by Israel's neighbours. The potential of the Arab air forces had substantially increased

in the past decades by the introduction of new generations of fighters like the MiG-23 "Flogger", the MiG-29 "Fulcrum" and the Su-24 "Fencer". In the area of surface-to-air missiles, older systems were, in general, replaced by a similar number of modern systems (i.e. older SA-6 and SA-3 were replaced with SA-8, SA-10 or SA-12). Another cornerstone for the improvement of combat potential was, and is up to this date, an often limited and tight budget so that upgrade programs often can only be partially realized.

Too, Israel was trying to develop an independent defence capability that cut more of the reliance on outside assistance, such as the massive re-supply effort required in October 1973. One of the programmes pursued was the acquisition of McDonnell Douglas F-15 Eagles. The decision to supply such a new system created a lot of political and international diplomatic debating. In the end, however, the US Congress allowed the sale to go through and the F-15 soon thereafter joined the IAF inventory.

Two other programmes were soon to follow: on 15 April 1975 the locally developed Kfir C1 fighter was rolled out. On



Cloth badge worn by airmen of Kurnass 2000 equipped 'The One' and 'The Bats' squadron.

¹ Born In Battle/Defence Update no. 81, 1986, NEW LIVE TO AN OLD WORKHORSE by Tamir Eshel, p56.

The Super Phantom prototype Kurnass #334 (Nickel Grass F-4E Block 32 66-0327) took to the air for the first time on July 30, 1986 with only one PW 1120 installed to the starboard nacelle as part of the Lavi test programme. On April 24, 1987 the aircraft lifted off with both Pratt & Whitney engines, becoming the Super Phantom demonstration aircraft.



The 'Kurnass' in IDF/AF Service 1989 until Today



Kurnass #334 being pulled from the static display at Le Bourget air show in Paris in 1987. Major benefits for aircraft performance were an improved thrust/weight ratio (1:1.04), a 15% better sustained turn rate, a 27% increase in medium level acceleration and a by 36% higher climb rate than the J79 equipped Phantom. Due to the improved power and reduced fuel consumption supersonic penetration speeds could be reached without the use of after burners (super cruise), thus doubling the combat radius.

March 1, 1980 came the announcement of the advanced Lavi (LION) fighter project. By the time the 1980s arrived the IAF had a growing inventory of new production Kfir C2, F-15 Eagles and F-16 Falcons, with a declining inventory of F-4Es. In 1985 the final Kurnass squadron 'The Bats' had lost its air-to-air task and the F-4E was destined for air-to-ground duties, precision strike and specialized work, such as the SEAD and Wild Weasel mission. However these aircraft needed a combat efficiency upgrade to keep pace with the weapons system the Phantoms were to employ.

The Super Phantom and the Phantom 2000 (Kurnass 2000) were both designed to extend the service life, enhance mission capability, improve flight safety and improve reliability and maintainability of the Phantom II.

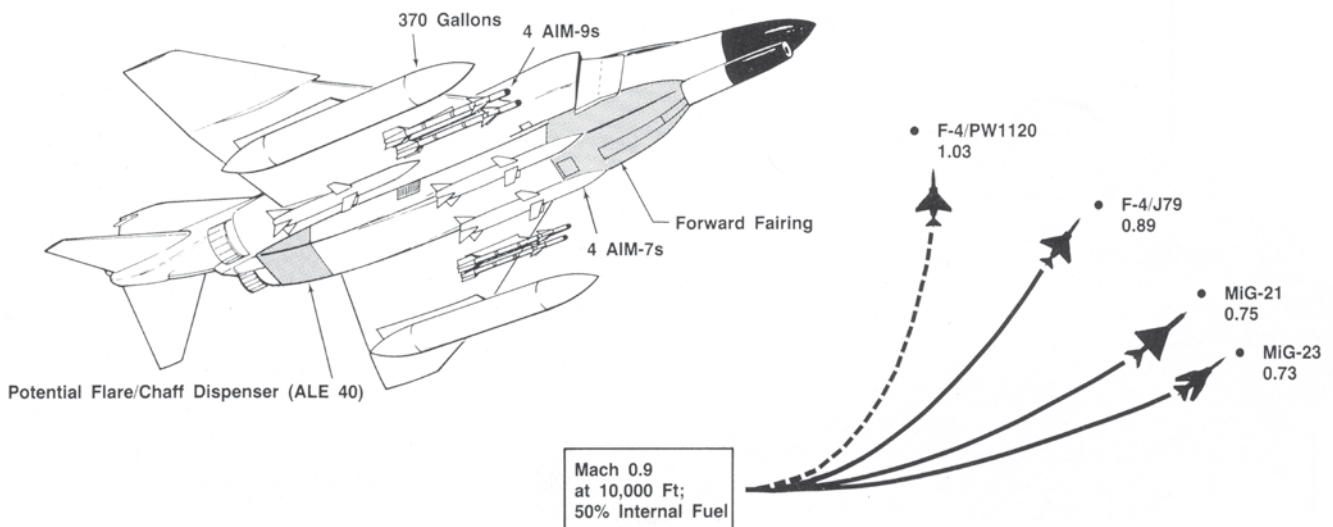
UPGRADING THE KURNASS

In the early 1980s there were two modernization plans involving the IAF F-4E

SUPER PHANTOM

The Super Phantom was a joint Boeing Military Airplane Company (BMAC) and Pratt & Whitney (P&W) proposal initiated in October 1982 as an unsolicited proposal to the USAF. This was to be a two phase programme: Phase one would have involved re-engining with the Pratt & Whitney PW1120 engines, installation of the BMAC Conformal Fuel Tank (CFT) and installation of the candidate modern avion-

Boeing and Pratt&Whitney Super Phantom Proposal
Load Diagram and Turn Performance





RF-4E Kurnass Tsilum



Long-range recce operations often dictated complicated in-flight refueling planning. Until the mid-1980s, IAF tankers were the A-4 and the KC-130. Kurnass #491 was photographed taking on fuel from a KC-130 tanker during a long-range recce mission as part of 'Montenegro' flight to H-3 airfield in Iraq on December 30, 1981. As the mission was unsuccessful due to bad weather in the target area, it had to be repeated on January 3, 1982. That day Kurnass #491 shared a 'manoeuvring' kill with 'Shablul' #498, piloted by Gideon Sheffer.



Ramat David RF-4E #498 was immediately re-coded #488, while #499 became #489. During the late 1970s and mid-1980s the original six Block 43 aircraft were subject to frequent unit changes, whenever the tactical need arose. RF-4E #488 returned to 'The Bats' in January 1977, however without the KS-127 camera. The aircraft was the first of the Photo-Phantoms to be written from use when it was put on storage at the IAF Museum in Hatzerim in 1997.

In 1977 four Block 63 RF-4Es were issued to Squadron 107 (#485/75-0418, #486/75-0423, #487/75-0421 and #493/75-0419). All four aircraft were equipped with the AN/APD-10 real-time SLAR mapping system and the Goodyear AN/UPD-4 real-time data link⁸, distinguishable by the so-called 'Top Hat' antenna mounted on the bottom of the nose instead of the no.2 camera window. However, this hatch could be exchanged with a standard camera window making the aircraft available for non-Termin ops. In addition Kurnass #487 and #493 could operate the KS-127 'Mazleg' camera, distinguishable by two optical sights attached to the rear canopy sills. 'The Knights of the Orange Tail' Termin Flight was opened on 1 April 1977. Squadron 107 CO Omri Afek and Yossi Yaari – first commander of the Termin Flight – delivered the first RF-4E to Hatzerim on August 21, 1977.

Two aircraft, #490/75-0420 and #497/75-0422, featured the late style standard camera nose with the round nose design. In July 1977 #490 entered service with Squadron 119, however, throughout the years it was occasionally operated by the Termin-flight of Squadron 107. In 1978 the final Block 63 aircraft, Kurnass #497/75-0422, was delivered to the IAF and operated by Squadron 69 at Ramat David.

In 1977 the RMK-A 15/23⁹ camera with a focal length of 6 and 12-inch started to replace the AN/AAS-18¹⁰. To accommodate the downward looking camera the meanwhile re-coded Kurnass #488 and #489 were fitted with an additional camera window just at of the forward landing gear bay (later in its service career Kurnass #491 was to receive the same conversion).

The high speed of the un-slatted RF-4E was one of the trump cards in IAF recce operations. A world-wide saying goes: "... nothing can stop a charging Rhino..." This was especially true with the RF-4E. Until

⁸ IDF/AF codename Termin.

⁹ IDF/AF codename Tarmil.

¹⁰ IDF/AF codename Glula (Pill).

This images proves the fact that all Israeli RF-4E aircraft had provisions for the operation of pressure suits during high level mission (above 50.000ft). Such a suit protected Gideon Sheffer when he had to eject from Kurnass #194 in November 1974.

RF-4E Kurnass Tsilum



Recce bird Kurnass #498 was re-numbered #488 in November 1976 to enable the allocation of the prestigious '98' tail number to F-4E(S) Shablul #498. It is seen heading out into the Mediterranean Sea armed with two AIM-9L AAM and a single AN/ALQ-119.

1978 the escorts for the recce flights were un-slatted F-4Es. When the last F-4E, re-equipped with manoeuvring slats, entered operational service the standard Kurnass was no longer able to keep pace with the faster recce birds: the installation of slats gave more manoeuvrability to the aircraft, however, the maximum speed was reduced by 80kts. As IAF RF-4Es could carry the AIM-9 for self defence and usually were piloted by combat proven crews with several hundred hours of combat experience on F-4E achieved during the YKW, the RF-4E simply took over the escort for the recce Rhinos (on some occasions paired with the F-15 and F-16).

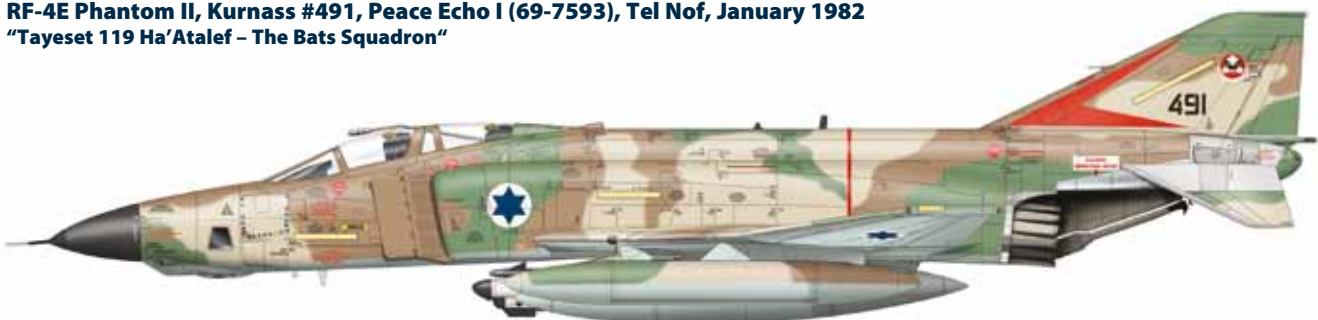
A major conversion of two of the recce Kurnass took place during late 1978. On November 2, 1976, the F-4E(S) had started to employ two panoramic KA-80I¹¹ together with two HIAC-1¹² LOROP cameras. By late 1977, KA-80I operations were reduced in favor of LOROP operations. A third HIAC-1 was purchased for aircraft #492 that had



This photo, taken in May 1974, shows Kurnass #499 forming part of squadron 199 'The Bats'. On October 22, 1976 Kurnass #499 was re-numbered #489 to enable the allocation of tail number '99' to Shablul #499. The same day the aircraft was handed-over to Squadron 69 where it saw extensive usage. Note the optical-sights for 'Mazleg'-camera operations attached to the rear canopy frames.

¹¹ IDF/AF codename Citrus.
¹² IDF/AF codename Shablul (snail).

RF-4E Phantom II, Kurnass #491, Peace Echo I (69-7593), Tel Nof, January 1982 "Tayaset 119 Ha'Atalef - The Bats Squadron"





F-4E(S) PHANTOM II

» Tsalam Shablul – Snail «

The 'Peace Jack' programme had its origins of the CIA-funded General Dynamics (GD) RB-57F modification of the original Martin-built versions of the English Electric Canberra. The key element in that programme was the GD-designed and manufactured 66in (168cm) focal length HIAC-1 high-altitude, high-resolution reconnaissance camera.

Originally planned to be carried by the RB-57F during peripheral information gathering flights around hostile airspace, the HIAC-1 was a heavy, ultra-long focal-length camera optimized for Long Range Oblique Photography (LOROP).

During the course of RB-57F service career, the HIAC-1 was steadily improved and lightened, its weight being reduced from the prototype camera's 3,500lbs (1,588kg) to a late production model weight of 1,228lbs (557kg). (Further development continues and newer versions, such as the Japanese KS-146B LOROP POD have weights of 750lbs/340kg or less – making them suitable for transport by smaller aircraft such as the F-16.)

The HIAC-1 had been designed and fabricated by General Dynamics' Fort Worth Division. It was the result of a total systems approach to LOROP and was characterized by simplicity of construction, versatility, and the maximum use of off-the-shelf sub-assemblies. General Dynamics, at the time, claimed the HIAC-1 to have the highest ground resolution of any available airborne camera. Test results, under laboratory conditions using high contrast Estarbase 3414 film, had shown that compared with the predicted resolution of 190 lines/mm the actual resolution was 240 lines/mm. Airborne at 20NM (37km) range, the predicted resolution had been twelve to five inches (32cm) but actual resolution was ten inches (25cm), while at 40NM (74km) range, the predicted resolution had been 27in (69cm) and actual resolution was 22in (56cm). Airborne at a range of 68 NM (126km), the predicted resolution had been 43in (109cm) and actual resolution was 38in (97cm).

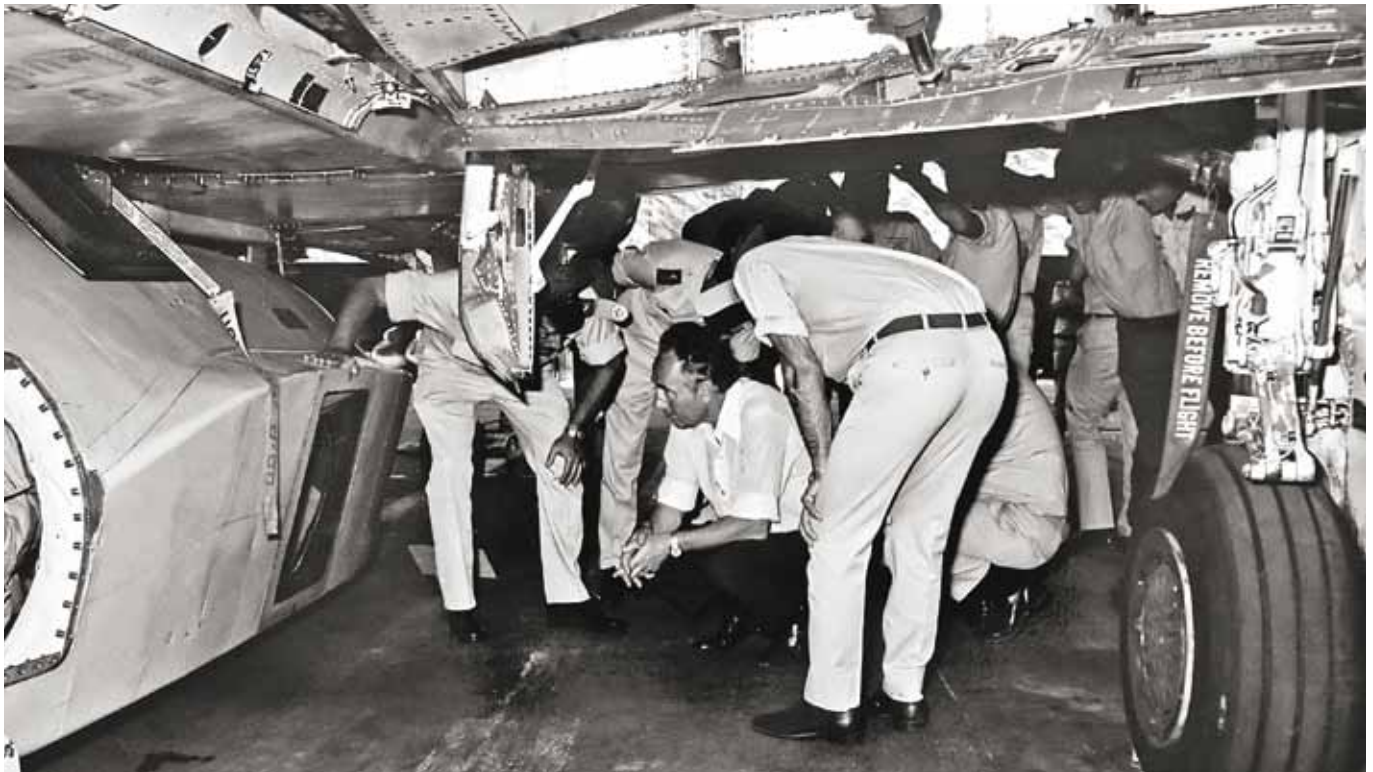
Israel had, during the period of the RB-57F's operational recce-career, on a

When an integrated Soviet air defence system was established in Egypt in 1970, Israel was faced with a major threat to its air superiority in the region. In order to counter this threat, intelligence had to be gathered concerning the position of the SAM sites – a task which only a high and fast flying aircraft with long-range cameras could conduct safely. This resulted in the conversion of three standard IDF/AF F-4E Phantom aircraft, which became known under the designation 'Operation Peace Jack'.



The 'Kurnass' in IDF/AF Service 1989 until Today

F-4E(S) Tsalam Shablul



Minister Shimon Peres examining the G-139 'Miflas' pod attached to a standard F-4E during a visit to Tel Nof in January 1974. The imaginary results of the podded HIAC were extraordinary, however, the sheer size of the 'Miflas' and encountered aircraft handling problems prevent an extensive use of the podded HIAC.

How the G-139 pod restricted the aircraft performance is evident in this picture: the Phantom had to take-off at a rather shallow angle to prevent the pod from hitting the ground. Once air borne it could not operate at peak efficiency as the drag produced by the pod limited the aircraft to a maximum speed of only Mach 1.5 and an altitude of just over 50,000ft.

number of occasions expressed strong interest in obtaining one of several RB-57Fs for reconnaissance duties, based on the capabilities of the HIAC-1. These requests repeatedly had been denied by the US State Department on the grounds of concern for the proprietary technology involved in the HIAC-1 system and the strategic aspects of the B-57 carrier aircraft.

THE G-139 "MIFLAS" POD

By early 1971, the weight of the camera had been reduced to the point where it was grossing less than 1,500lbs (680kg). It thus became apparent that a carrier other than the RB-57F was a distinct possibility. General Dynamics, during the course of the various HIAC-1 developments, had

kept the Israelis briefed. Finally, in mid-1971, approval was granted by the State Department for sale of a pod-mounted HIAC derivative known in-house at General Dynamics as programme G-139, this unit, some 22ft (6,70m) long and having the ability to carry sensor systems weighing up to 4,000lbs (1,815kg), was built up of machined bulkheads and structural members and covered with aluminum skin. The nose and tail cones were made of fibre-reinforced plastics. It was equipped with its own environmental control system.

Following a short but intense flight test programme utilizing a USAF RF-4C (66-419), the first delivery of the podded HIAC took place in October of 1971. Shortly after delivery, however, it became apparent that the unit, although extra-ordinarily effective in its role, was not permitting the Phantom carrier aircraft to operate at peak efficiency. The problem was directly attributable to the pod, as the drag it created was adversely affecting aircraft performance; in fact, the drag factor was so high, it limited the F-4s maximum speed to just under Mach 1.5 and its maximum altitude capability to just over 50,000ft (15,250m).

From a tactical standpoint these performance losses were considered quite serious, as they increased exposure time of the reconnaissance aircraft to enemy anti-aircraft systems and curtailed excessive manoeuvring in the event of air combat or the need for evasive action. Most importantly, the altitude restriction drastically affected the extraordinary resolving power of the HIAC's unique lens.





F-4E(E) Tsalam Shablul

**F-4E(S) Phantom II, Kurnass #498 (69-7567, 'IAF Museum', Hatzerim, May 17, 2004
"Tayeset 201 Ha'Ahat – The One Squadron"**



Tel Nof air base commander Brigadier General (BG) Amir Eshel and Hatzerim air base commander BG Yochanan Locker had the honours to ferry Kurnass #498 to the IDF/AF Museum at Hatzerim on May 17, 2004.



All Squadron 201 aircraft were lined-up along one of Tel Nof's main taxiway to commemorate the unit's disbandment as Kurnass outfit. Phantom #498 is seen in all its splendour on May 12, 2004.

The 'Kurnass' in IDF/AF Service 1989 until Today

F-4E(S) Tsalam Shablul



Top: After the farewell fly-past Kurnass #499 returns to Tel Nof with wing leading edges and flaps fully extended. Center: The same aircraft seen taking-off on May 17, 2004, to commence its ferry flight to Ovda for storage.



Phantom #499 seen forming part of the farewell parade on May 12, 2004.



F-4E(S) Phantom II, Kurnass #499 (69-7576), 'Farewell Parade', Tel Nof, May 12, 2004
"Tayaset 201 Ha'Ahat - The One Squadron"





Kurnass 2000 Walkaround



66: TV guided RAFAEL AGM-142A Popeye attached to special purpose inner wing pylon with movable suspensions;

67: Close-up of the front portion of the Popeye air-to-surface standoff missile with its 340 kg (750lbs) blast-fragmentation warhead, revealing details of the main fin attachment to the missile body;

68: Rear end of AGM-142A with cruciform fins, solid-fuel rocket motor in the WPU-14/B propulsion section and tail-mounted FMU-124C/B impact fuze;

69: Close-up of the AN/ASW-55 data-link pod;

70+71+72: The Israeli designed Sparrow bay missile adaptor with standard LAU-7/A launch rail and AIM-9D 'Decker' AAM. The missile adaptor is attached to the standard suspension used with the ECM pods and can only carry the AIM-9 AAM.



Kurnass 2000 Walkaround



74

73

75

76

77

78

73: J79-GE-17B compressor with static vanes, the silver housing holds the 30 watt producing AC generator, its cables running inside the hollow V-struts;

74: Left side of the engine, which produces 14,500lbs and 17,900lbs thrust at minimum and full afterburner settings, note the fully opened variable nozzle;

75: Right side of the engine with fuel flow transmitter, digital fuel control, cartridge pneumatic starter, breech assembly, oil tank, 17th stage bleed air manifold and nozzle actuators. The engine support dolly features sliding rails to move the J79 in and out the engine nacelles;

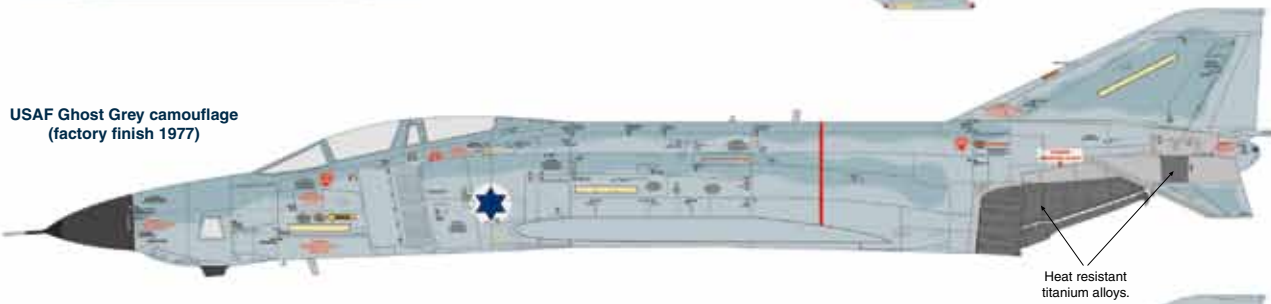
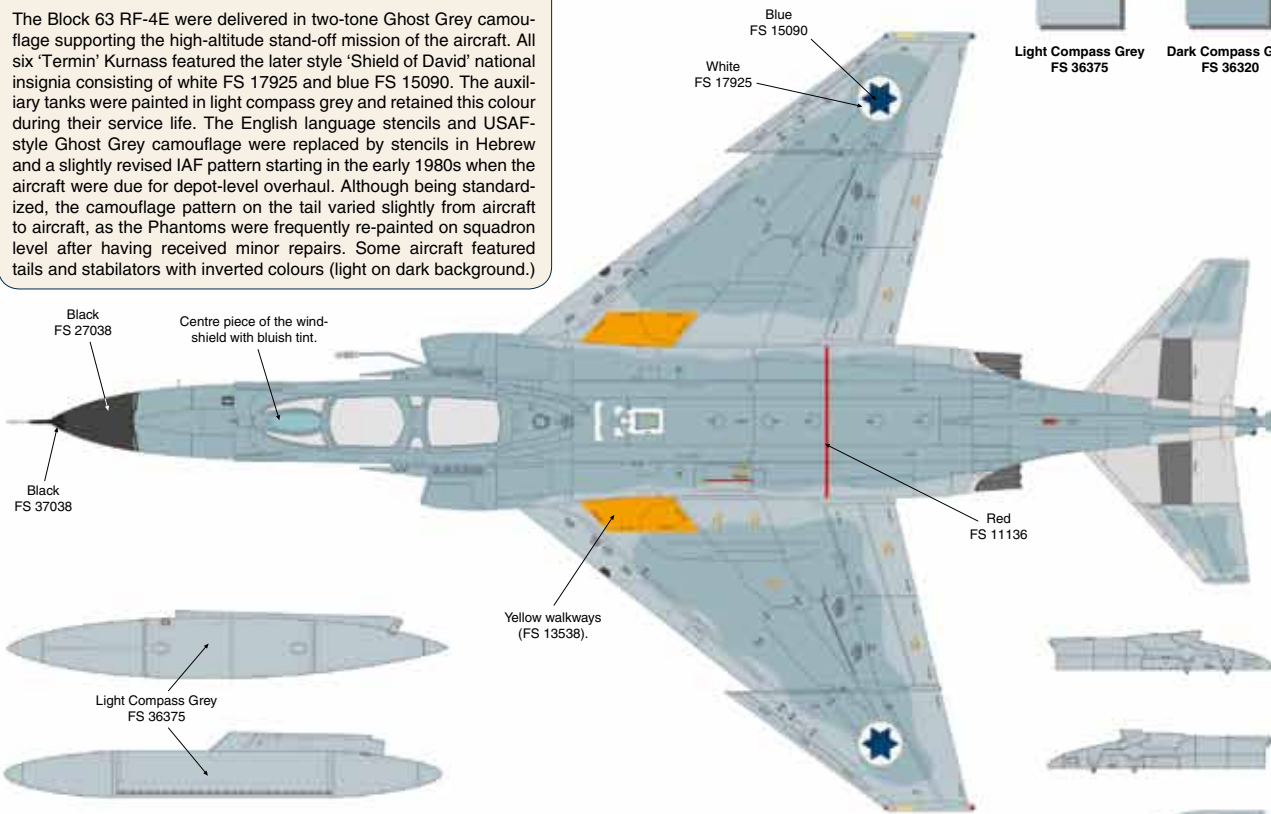
76: Close-up shot of the two variable nozzles and lowered arrestor hook with actuating mechanism;

77+78: Auxiliary air intake doors located at either side of the centerline station, providing extra air to the engine at slow speeds. The doors open whenever the landing gear is lowered and remain open on the ground.



'Ghost Grey' Camouflage Scheme

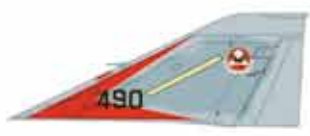
The Block 63 RF-4E were delivered in two-tone Ghost Grey camouflage supporting the high-altitude stand-off mission of the aircraft. All six 'Termin' Kurnass featured the later style 'Shield of David' national insignia consisting of white FS 17925 and blue FS 15090. The auxiliary tanks were painted in light compass grey and retained this colour during their service life. The English language stencils and USAF-style Ghost Grey camouflage were replaced by stencils in Hebrew and a slightly revised IAF pattern starting in the early 1980s when the aircraft were due for depot-level overhaul. Although being standardized, the camouflage pattern on the tail varied slightly from aircraft to aircraft, as the Phantoms were frequently re-painted on squadron level after having received minor repairs. Some aircraft featured tails and stabilizers with inverted colours (light on dark background.)



All dimensions given in millimetres!

Standard Kurnass tail code: **487** (Black FS 17038)

Starting in 1984 the tail code was repeated on the splitter plate: **487**



Squadron 119 'The Bats'
Complete unit insignia including red flash applied to both sides of Block 63 Kurnass #487, #490 and #493, which had been transferred from Squadron 107 in 1997. 'The Bats' squadron colours were retained until late 1998 when the Block 63 'Termin' recce aircraft were written from use.



Squadron 69 'The Hammers'
Unit insignia and yellow/black checkers (RAL 1021/ FS 17038) were applied to both sides of the fin. Only one Block 63 Kurnass (#497) had been operated by the unit, nicknamed 'Princess'. The Phantom was handed over to 'The One' squadron in 1994.



Squadron 201 'The One'
Squadron 201 received its Block 63 Kurnass #497 from 'The Hammers' in 1994, while #486 was added 1997, transferring from Squadron 107. Late style unit insignia and rudder decoration worn on both aircraft until written from use in May 2004.



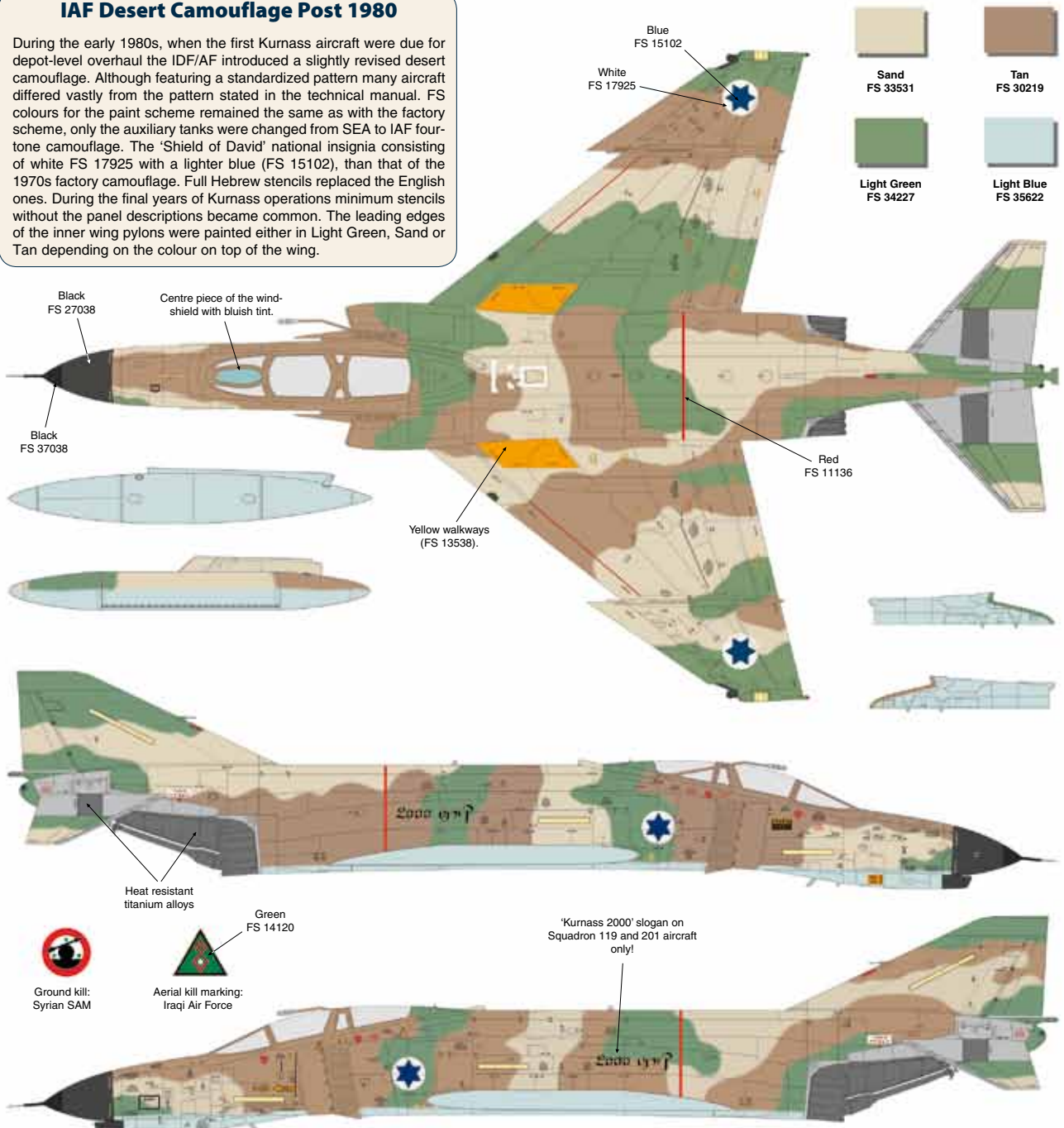
Squadron 107 'The Knights of the Orange Tail'
The squadron operated Block 63 Kurnass #485, #486, #487 and #493 on regular basis while #490 joined the unit when tactically necessary. The aircraft were operated until 1997 when the squadron disbanded. The crest was worn on both sides of the orange painted fin.



Appendix 5: Camouflage Schemes

IAF Desert Camouflage Post 1980

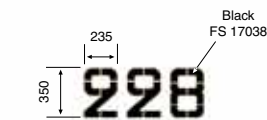
During the early 1980s, when the first Kurnass aircraft were due for depot-level overhaul the IDF/AF introduced a slightly revised desert camouflage. Although featuring a standardized pattern many aircraft differed vastly from the pattern stated in the technical manual. FS colours for the paint scheme remained the same as with the factory scheme, only the auxiliary tanks were changed from SEA to IAF four-tone camouflage. The 'Shield of David' national insignia consisting of white FS 17925 with a lighter blue (FS 15102), than that of the 1970s factory camouflage. Full Hebrew stencils replaced the English ones. During the final years of Kurnass operations minimum stencils without the panel descriptions became common. The leading edges of the inner wing pylons were painted either in Light Green, Sand or Tan depending on the colour on top of the wing.



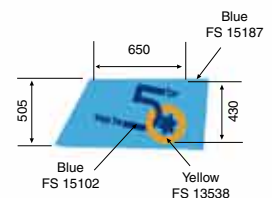
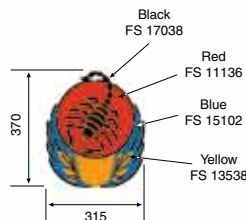
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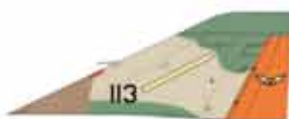
Squadron 105 'The Scorpions' operated the F-4E Phantom II from March 1975 to December 1987.



Larger non-standard Kurnass tail code found on Squadron 201 and 105 aircraft.



Squadron 69 'The Hammers' operated a handful of aircraft painted in non-standard IAF desert camouflage including #101. Yellow checkers were applied in RAL 1021.



The majority of 'non-standard' aircraft were operated by Squadron 107 'The Knights of the Orange Tail'. These included Kurnass #101, #113, #183, #205, #250 (see pages 267 to 271).



52 F-4E Phantom II aircraft were upgraded to 'Kurnass 2000' standards, which were operated by Squadron 119 'The Bats' and Squadron 201 'The One' in equal numbers. To distinguish these aircraft visually from non-converted Phantoms all Kurnass 2000 featured the 'Kurnass 2000' slogan in Hebrew on both sides of the rear fuselage. The '50 years of IDF/AF' insignia was applied from 1998 to 2000.

