Of the six fighter types which are generally acknowledged as having constituted the much-vaunted "Century Series", Convair's F-106 Delta Dart was the last to attain operational status, and was produced in fewest numbers. Yet, insofar as the US Air Force is concerned, it has proved to be the longest-lived, with two regular squadrons and a quartet of Air National Guard (ANG) units still employing the "six" at the present time.

However, the final chapter is currently in process of being written. The past few years have witnessed the progressive withdrawal of the F-106 from the front-line inventory in favour of the much newer McDonnell Douglas F-15 Eagle, whilst the remaining ANG examples are expected to be replaced by the General Dynamics F-16 Fighting Falcon in the not too distant future.

The Delta Dart is unique in being the only member of the "Century Series" not to have been employed in a combat capacity in South-East Asia and, indeed, virtually its entire 27-year career has been spent within the confines of the USA, interrupted only by brief overseas sojourns at air bases in South Korea and Europe. Its lack of combat experience, however, cannot be attributed to any failings on the part of the aircraft, but stems mainly from the fact that the requirement for dedicated air defence fighter interceptors in South-East Asia was limited and could be adequately met by the Convair F-102 Delta Daggers already present in that area of the world as part of PACAF (Pacific Air Forces) resources. Had the need for additional interceptors arisen, it seems reasonable to assume that the F-106 would also have found its way to the combat zone in modest numbers.

In view of the strong physical resemblance between the Delta Dagger and the Delta Dart, it is scarcely surprising that the F-106 was essentially a derivative of the F-102, albeit a much improved one. Its origins can thus be said to date back to the late 1940s and the XF-92A, which provided the basis for the F-102, and it clearly had its roots in the Advanced Development Objective of January 1949, which was directly responsible for the appearance of Convair's first delta wing interceptor.

Recapping briefly on the saga of the Delta Dagger, as related in AIR INTERNATIONAL/January 1986, the USAF elected in December 1951 to pursue a two-stage development programme in which an interim variant with the service designation F-102A would appear first, as an interim programme intended to provide the Air Force — and, specifically, Air Defense Command — with an advanced interceptor capable of attaining operational status by 1954, or thereabouts.

To be produced in only modest quantities, this interim interceptor was intended eventually to be replaced in production by the so-called "Ultimate Interceptor", or F-102B. Both sub-types were to employ a common airframe, but the F-102B was to be a much more capable machine, featuring a licence-built version of the Bristol Olympus engine known as the Wright J67, as well as the considerably more advanced MX-1179 electronic control system (ECS) then under development by the Hughes Aircraft Company specifically for F-102B installation.

Production of the "Ultimate Interceptor" was expected to far outstrip that of the F-102A, and some idea of the importance attached to the F-102B is provided by the fact that, at one time, in the latter half of the 1950s, Air Defense Command anticipated the procurement of more than 1,000 Delta Darts for service with no fewer than 40 Fighter Interceptor Squadrons (FISs). Unfortunately, like so many of the planning objectives of that era, the task of translating theory to reality proved embarrassing in the extreme, and the objective remained elusive.
In view of the common heritage of the two Convair interceptors, it is hardly surprising that the aerodynamic problems encountered by the Delta Dagger had a profound influence on the Delta Dart. Of necessity, Convair’s design staff capitalised on the hard-learned lessons of F-102A development to produce a machine which was radically different if not in terms of physical appearance. Nevertheless, there were numerous problems that would remain unique to the F-102B, foremost amongst these being delays with the J67 engine which resulted, in early 1955, in the decision to switch to the Pratt & Whitney J75 — itself basically an advanced model of the F-102A’s J57. By this same time, development of the Hughes MX-1179 ECS — later redesignated as the MA-1 Automatic Weapon Control System (AWCS) — was also falling badly behind schedule.

These and other problems naturally took time and money to resolve, and both resources were in short supply. Convair and the USAF were inevitably concerned with problems of a more pressing nature as they endeavoured to bring the F-102A up to an acceptable standard. In consequence, while it would not be strictly accurate to say that the F-102B was neglected, it certainly assumed lower priority on a day-to-day basis, and this inevitably had a far-reaching impact on the future of the “Ultimate Interceptor”.

By late 1955, the emphasis had swung markedly in favour of the Delta Dagger, which, clearly, was no longer viewed as merely an interim interceptor. Indeed, in November of that year, the number of F-102As on order was given a massive boost by the award of a contract covering 562 aircraft, raising planned procurement to 749. At the same time, however, Convair also received its first letter contract for the F-102B, covering a mere 17 aircraft. Six months later, on 18 April 1956, this initial contract was finalised by the USAF, which stipulated that all 17 would be assigned to research, development, test and evaluation purposes. Delivery of the first two aircraft was scheduled to take place in December 1956 and January 1957, with the remaining RDT&E examples following on from July 1957.

A couple of months after that milestone was negotiated, the radically different nature of the two designs was formally recognised by the USAF when, on 17 June 1956, it allocated the new designation F-106 to the F-102B, thus severing the final tenuous links with the original interceptor submissions of December 1951.

The Delta Dart emerges
Thenceforth, the Delta Dart was essentially on its own, and its new status was clearly defined in a system development directive issued by the USAF in late September of that year. Basically, this stipulated that the F-106 would become available in August 1958, and would carry armament comprising
guided missiles and rockets with nuclear warheads. With this it was expected to be capable of intercepting and destroying hostile aircraft in all weather conditions at altitudes from sea level to 70,000 ft (21,336 m) within a combat radius of 375 naut mls (695 km). Furthermore, it was to achieve these objectives automatically, operating in conjunction with ground-based SAGE (Semi-Automatic Ground Environment) direction centres. These were expected to furnish steering instructions by either data link or voice in order to position the F-106 at a point where its onboard fire control system could take over for the terminal stages of an interception.

The result was undoubtedly an elegant machine and one which, while bearing a strong resemblance to the earlier Delta Dagger, was aerodynamically much cleaner and more aesthetically appealing lines. In truth, it might be described as "an F-102 which had got its act together", for the unsightly bulges around the latter's aft fuselage had been discarded, giving way to smooth area-ruled contours, topped off by a square-cut vertical tail. The air intakes were also much revised and no longer extended forward to a point adjacent to the cockpit, whilst the wing was generally much cleaner. As on the F-102, missile armament was housed internally in a weapons bay located in the centre fuselage section. A typical load was to comprise a single nuclear-tipped Douglas AIR-2A Genie unguided rocket plus four Hughes AIM-4 Falcon air-to-air missiles, the latter weapon being available in both semi-active radar homing and infra-red homing versions.

The great majority of Convair's work force was no doubt at home enjoying the Christmas festivities when the prototype F-106A performed its maiden flight on 26 December 1956. As was customary, this milestone event took place at Edwards AFB, California, the aircraft concerned (56-451) being essentially an aerodynamic test vehicle bereft of mission-related avionics systems. The second Delta Dart to take to the sky (56-452) was more representative of the planned production configuration and this also got airborne from Edwards for its first flight which took place on 26 February 1957. Both machines had been transferred to the desert test site from Convair's major manufacturing facility at Lindbergh Field, San Diego.

Problems with the F-106 soon began to manifest themselves. Not surprisingly, the complex nature of the Hughes MA-1 AWCS was at the heart of many of the difficulties experienced at this time. Equally unwelcome, but perhaps not unanticipated, were the poor overall performance figures revealed by formal USAF Category II testing, accomplished between May and July 1957. Concern centred around two major areas of deficiency, Convair's estimates being proved to be somewhat overly sanguine with regard to maximum speed and acceleration — although these were by no means the only shortcomings. Airframe modifications — most notably to the inlet ducts — went some way towards resolving these difficulties, but problems relating to the MA-1 took rather longer to rectify, this avionics package being destined to provide a source of some embarrassment as well as frustration until well into the next decade.

Difficulties such as these were compounded by failings experienced with the Pratt & Whitney engine. Production of this power plant had fallen behind schedule during the summer of 1957, while the J75-P-9 variant, which was initially selected to power the F-106, proved less than ideal in terms of reliability, a situation which eventually prompted its replacement by the more powerful J75-P-17 derivative.

Vacillation on the part of the USAF with regard to cockpit layout also contributed to the Delta Dart's protracted gestation, and added to the overall cost at about the same time. One key factor in this respect was the control column. Originally, this occupied the conventional centre-cockpit location, but it was soon moved to one side so as to provide the pilot with an unrestricted view of the Horizontal Situation Indicator (HSI). Then, the USAF changed its mind again, dictating that the stick revert to its original position on production aircraft — a decision which added $10m to the cost at a time when many plans and projects were coming under the hammer in a period of financial austerity.

Against this background, it was hardly surprising that the F-106 fell victim to defence economies which at one time looked as though they could even result in complete cancellation of the programme. In the event, Convair's interceptor programme survived, albeit in somewhat truncated form from the mid-1957 planned total of no fewer than 40 squadrons. The first major reduction had occurred by the end of 1957, when the number of squadrons was limited to 26, but even worse was to follow in September 1958 when procurement was cut back to barely one-third of the original figure — a level which prompted the USAF to bring some 35 test-dedicated F-106As up to full production configuration so as to permit Delta Darts to be issued to a total of 14 ADC squadrons as well as a training unit located at Tyndall AFB, Florida.

As if those difficulties were not enough to contend with, testing of the Delta Dart proved to be a most time-consuming
business, delays being exacerbated by inadequate logistical back-up and the need for constant configuration changes in the light of experience gained as the programme progressed. Category II evaluation was conducted entirely at Edwards and continued until the summer of 1959, while Category III testing did not actually get under way until July of that year, a couple of months after the F-106 entered operational service. Responsibility for this phase was entrusted to ADC’s 539th FIS at McGuire AFB, New Jersey, which, in view of the type’s complexity, relied heavily on the support of the 73rd Air Division at Tyndall, an organisation that was functioning as the Command’s “fighter and weapons school” and was thus operating examples of all combat types to be found in the ADC inventory.

Entry into service
It wasn’t all bad news, however, and both Convair and the USAF had good cause to rejoice in 1959. Of greatest import was the Delta Dart’s entry into operational service with the 498th FIS at Geiger AFB, Washington, during May. Attaining an initial operating capability (IOC) in the ensuing October, the 498th demonstrated the type’s potential in classic style in July when it launched five aircraft on a simulated combat mission which culminated in all targets being detected and “destroyed”within ten minutes of take-off. Less significant in the long term but probably the subject of more immediate interest was the fact that the F-106 regained the absolute world speed record for the USA on 15 December 1959, when a test specimen thundered over an 11-mile (17.7-km) course at Edwards at a speed of 1,525-695 mph (2,455,301 km/h), setting a mark which stood unchallenged for almost three years.

Despite the multiplicity of configurations and the many headaches still being encountered with regard to system reliability, the re-equipment programme was accomplished surprisingly swiftly. Five ADC squadrons had converted to the Delta Dart by the end of 1959, with the remaining nine following by autumn 1960, although quite a few still had some way to go before they could claim to be fully operational.

Of the squadrons which picked up the “six” during 1959, four (the 27th, 95th, 456th and 498th FISs) had all previously utilised the F-102A. The 539th FIS traded in F-86L Sabres, a type also formerly used by two of the units (11th and 94th FISs) which converted in 1960. Convair’s “Deuce” had also served with no fewer than six of the squadrons which accomplished transition in 1960, these being the 5th, 48th, 71st, 318th, 329th and 438th FISs. The only other squadron to re-equip in 1960, the 319th FIS, had previously employed the veteran Northrop F-89J Scorpion.

In common with all the other “Century Series” fighters, a two-seat conversion trainer variant of the Delta Dart was also developed and purchased for service with ADC, authorisation to proceed being given by the USAF on 3 August 1956. Initially, the two-seater was expected to function only as a trainer, lacking the F-106A’s operational capability, and accordingly it began life designated as the TF-106A. Less than a month after giving the go-ahead for the trainer, however, the USAF decreed that the two-seater should possess comparable tactical capability to that of the F-106A, and it was therefore redesignated as the F-106B.

Physically, the “B” differed little from the F-106A, although it was not quite so long-legged, fuel capacity being reduced slightly in order to accommodate the second cockpit. The second, in-tandem, cockpit rather marred the clean lines of the Delta Dart and bestowed a somewhat hump-backed appearance on this model. Procurement of the F-106B began in April 1957, when an initial batch of 41 aircraft was ordered. The first of these (57-2507) essentially served as a prototype and this made its maiden flight on 9 April 1958, being one of a dozen or so examples assigned to the test programme. Subsequent orders for five F-106Bs in FY58 and 17 in FY59 raised total procurement of the two-seater to 63, but, once again, a shortage of aircraft prompted the USAF to undertake

(Above right) A trio of F-106A-CO-85s in service with the 498th Fighter Interceptor Squadron at Geiger AFB, Washington. This was the first squadron in Air Defense Command to reach IOC with the Delta Dart, in October 1959. (Below) An F-106A-CA-1 (the nineteenth example built), prominently identified as “Big Red” whilst in service with the 87th FIS at Sawyer AFB, Michigan.
an extensive modification programme so as to bring the first 12 F-106Bs up to operational standard for issue to front-line units of ADC.

In view of its marked similarity to the single-seater, the F-106B suffered more or less the same problems during the flight test phase. As a result, it did not attain IOC until July 1960, despite the fact that the first example to be earmarked for the operational inventory had been accepted well over a year earlier, in February 1959.

Once the F-106B was in service, it became usual practice for each ADC fighter squadron to include two examples in its inventory to fulfit combat proficiency training and check flights as well as some interception missions — although it is doubtful if the two-seaters ever stood alert duty. As ADC’s principal training base, Tyndall naturally also operated the F-106B, the number of aircraft on charge being commensurately greater and probably around the 30 mark throughout the 1960s. Later in its career, as the training requirement diminished, the fleet of two-seaters was to be spread more widely.

Production of both variants of the Delta Dart eventually ceased during December 1960. By that time, totals of 277 F-106As and 63 F-106Bs had been built. As already noted, concurrent development and production meant that ADC’s fleet of the Convair interceptors was by no means to a common standard. The main culprit was without doubt the so-called Cook-Craigie production policy, which, whilst being beneficial in permitting the process of re-equipment to be greatly accelerated, almost inevitably resulted in significantly different configurations of the same aircraft being in service simultaneously, as modifications arising from the various aspects of the test programme were incorporated on the assembly line. In the case of the F-106, the differences between early and late production examples were particularly profound, and by early 1960, ADC was able to specify fewer than 130 changes that would have to be made to bring early aircraft up to the same basic standard as the latest examples to roll from Convair’s production line at San Diego.

**The updating programmes**

Project “Wild Goose” was intended to put these matters right, and took exactly a year to complete, beginning in September 1960. This consisted fundamentally of a retrofitting modification programme and was accomplished by field teams of specialists from the Air Materiel Command, working in conjunction with ADC’s own maintenance troops.

**Convair F-106A Delta Dart Specification**

**Power Plant:** One Pratt & Whitney J75-P-17 turbojet rated at 24,500 lb st (11130 kgp) for take-off with afterburner, 16,100 lb st (7300 kgp) military 30-min power and 14,300 lb st (6486 kgp) normal continuous. Fuel capacity, 1514 US gal (5731 l) in integral wing, transfer and fuselage tanks; two external tanks of 227 US gal (859 l) each.

**Performance:** Design speed limit, Mach = 2.0; max speed, 1153 kts (2136 km/h) at 35,000 ft (10686 m); combat speed, 588 kts (1089 km/h) at 52,000 ft (15850 m); cruise speed, 40000 ft (12200 m); initial rate of climb (max weight), 42800 ft/min (217 m/sec); service ceiling, 45000 ft (13720 m); take-off distance to 50 ft (15.2 m), 5390 ft (1643 m); landing distance from 50 ft (15.2 m), with braking 'chute, 4260 ft (1298 m); combat radius, area intercept, 426 naut mls (790 km) with max internal fuel, 533 naut mls (1173 km) with external fuel; ferry range, 1571 naut mls (2910 km).

**Weights:** Empty, 24315 lb (10929 kg); combat, basic payload, 31480 lb (14280 kg); max take-off, 39195 lb (17779 kg); max landing, 36114 lb (16381 kg).

**Dimensions:** Span, 38 ft 4 in (1167 m); overall length, 70 ft 8 in (2155 m); height, 20 ft 4 in (619 m); undercarriage retracted, 15 ft 6 in (472 m); wing area, 69783 sq ft (6483 m²); aspect ratio, 2.2:1; leading-edge sweepback, 60 deg; dihedral, nil.

**Armament:** No guns. Fuselage weapons bay contains one AIR-2A Genie plus four AIM-4F or AIM-4G Sparrow air-to-air missiles.

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**Convair F-106A Delta Dart Cutaway Drawing Key**

- 1 Pitot head
- 2 Radome
- 3 Radar scanner dish
- 4 Radar tracking mechanism
- 5 Hughes MA-1 weapons system radar unit
- 6 Radar mounting bulkhead
- 7 Pulse generator units
- 8 TACAN aerial
- 9 Angle of attack transmitter
- 10 MA-1 weapons system electronics units
- 11 Electronics bay access door
- 12 Infra-red detector fairing
- 13 Retractable infra-red detector
- 14 Knife-edged windscreen panels
- 15 Central vision splitter
- 16 Instrument panel shroud
- 17 “Head-down” tactical display panel
- 18 Canopy external release
- 19 Rudders pedals
- 20 Cockpit front pressure bulkhead
- 21 Electrical relay panel
- 22 Nose undercarriage wheel bay
- 23 Nosewheel door
- 24 Taxiing lamp
- 25 Twin nosewheels
- 26 Torque scissor links
- 27 UHF aerial
- 28 Nose undercarriage leg strut
- 29 Oxygen filler point and gauge
- 30 Nosewheel leg pivot fixing
- 31 Liquid oxygen converter
- 32 Cockpit air conditioning ducting
- 33 Cockpit pressure floor
- 34 Control column
- 35 Two-handed control 2 grip, radar and flight controls
- 36 Engine throttle lever
- 37 Pilot’s ejection seat
- 38 Radar display
- 39 Optical sight
- 40 Cockpit canopy cover
- 41 Ejection seat headrest
- 42 Ejection seat launch rails
- 43 Cockpit rear pressure bulkhead
- 44 Side console panel
- 45 Ground power supply connections
- 46 Doppler navigation unit
- 47 Air upper electronics compartment
- 48 Equipment bays, port and starboard
- 49 Electronics bay door
- 50 Cockpit rear deck
- 51 Overpressurisation relief valve
- 52 Canopy pneumatic jack
- 53 Canopy hinge
- 54 Air exit louvres
- 55 Starboard engine air intake
- 56 Fuel tank access panel
- 57 Upper longeron
- 58 Fuselage fuel tank. Total internal capacity, 1514 US gal (5731 l)
- 59 Fuselage frame construction
- 60 Ventral weapons bay
- 61 Missile pylon hinge arms
- 62 Bottom longeron
- 63 Boundary layer splitter plate
- 64 Port engine air intake
- 65 Variable area intake ramp
- 66 Ramp bleed air louvres
- 67 Air conditioning system intake duct
- 68 Intake duct framing
- 69 Starboard side pressure refuelling connection
- 70 Forward missile pylon pneumatic jack
- 71 Air conditioning plant
- 72 De-icing fluid reservoir
- 73 Heat exchanger air exit duct
- 74 Air refuelling ramp door, open
- 75 Pneumatic system air bottles
- 76 Bilfurred intake ducting
- 77 Air intake to air missile housing
- 78 AIR-2 Genie air-to-air missile
- 79 Hydraulic accumulators
- 80 Hydraulic reservoirs, duplex systems
- 81 Intake truncking
- 82 Wing spar attachment fuselage main frames
an extensive modification program so as to bring the first 12 F-106s up to operational standard for issue to front-line units of ADC.

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Production of both the variants of the Delta Dart eventually ceased during December 1960. By that time, totals of 277 F-106As and 63 F-106Bs had been built. As already noted, concurrent development and production meant that ADC's fleet of the Convair interceptors was by no means a common standard. The main culprit was without doubt the so-called Cock-Crashie production policy, which, whilst being beneficial in permitting the process of re-equipment to be greatly accelerated, almost inevitably resulted in significantly different configurations of the same aircraft being in service simultaneously, as modifications arising from the various aspects of the test program were incorporated on the assembly line. In the case of the F-106, the differences between early and late production examples were particularly pronounced, and by early 1960, ADC was able to specify no fewer than 150 changes that would have to be made to bring early aircraft up to the same basic standard as the latest examples to roll from Convair's production line at San Diego.

The updating programmes
Project "Wild Goose" was intended to put these matters right, and took exactly a year to complete, beginning in September 1960. This consisted fundamentally of a retrofittable modification program and was accomplished by field teams of specialists from the Air Materiel Command, working in conjunction with ADC's own maintenance troops.

Convair F-106A Delta Dart Specification
Power Plant: One Pratt & Whitney J57-P-17 turbojet rated at 24,900 lb st (11,135 kgf) for take-off with afterburner, 16,100 lb st (7,300 kgf) military 30-min power and 14,300 lb st (6,484 kgf) normal continuous. Fuel capacity, 1,514 US gal (5731 l) in integral wing, transfer and fuselage tanks; two external tanks of 227 US gal (859 l) each.

Performance: Design speed limit, Mach = 2.0; max speed, 1,153 kts (2,126 km/h) at 35,000 ft (10,668 m); combat speed, 588 kts (1,100 km/h) at 52,000 ft (15,850 m); average cruising speed, area intercept mission, 516 kts (958 km/h) at 40,000 ft (12,200 m); initial rate of climb (max weights), 42,000 ft/min (217 m/s); service ceiling, 45,000 ft (13,710 m); take-off distance to 50 (15,2 m), 3,900 ft (1143 m); landing distance from 50 ft (15,2 m), with breaking climb, 4,200 ft (1,280 m); combat radius, area intercept, 428 naut miles (790 km) with max internal fuel, 631 naut miles (1,173 km) with external fuel; ferry range, 2,650 naut miles (4,910 km).

Weights: Empty, 24,315 lb (11,029 kg); combat, basic point intercept mission, 31,480 lb (14,360 kg), max take-off, 39,195 lb (17,779 kg); max landing, 26,315 lb (12,381 kg).

Dimensions: Length, 53 ft 8 in (16.37 m); overall length, 70 ft 8 in (21.51 m); height, 20 ft 4 in (619 m); undercarriage track, 15 ft 8 in (4.72 m); area, wing, 697 sq ft (64.83 m²); aspect ratio, 2-2; 2-1; leading-edge sweepback, 60 deg; dihedral, nil.

Armament: No guns. Fuel capacity, 1,514 US gal (5731 l) plus four AIM-4 Falcon or AIM-4 Sparrow air-to-air missiles.

Convair F-106 Delta Dart Cutaway Drawing Key
1 Pylon head
2 Redome
3 Radar scanner dish
4 Radar tracking mechanism
5 Hughes Mk 1 weapon system radar unit
6 Radar mounting bulkhead
7 Pulse generator units
8 TACAN aerial
9 Angle of attack transmitter
10 MAI-1 weapons system electronics unit
11 Electronics bay access door
12 Intra-red detector fairing
13 Retractable intra-red detector
14 Knife-edged windscreen
15 Viper sight
16 Instrument panel shroud
17 Head-down (traditional) display panel
18 Canopy external release
19 Rudder pedals
20 Cockpit frontal pressure bulkhead
21 Electrical relay panel
22 Nose undercarriage wheel bay
23 Nosewheel door
24 Taxying lamp
25 Twin nosewheels
26 Torque screw links
27 Forward fuselage
28 Nose undercarriage leg strut
29 Oxygen filler point and gauge
30 Nosewheel leg pivot fixing
31 Liquid oxygen tank
32 Cockpit air conditioning ducting
33 Landing gear
34 Engine
35 Exhaust nozzle
36 Tail rudder travel limit
37 Pilot's ejection seat
38 Radar display
39 Optical sight
40 Cockpit canopy cover
41 Ejection seat headrest
42 Ejection seat launch rail
43 Cockpit rear pressure bulkhead
44 Side console panel
45 Ground power supply
46 Doppler navigation unit
47 All lower electronics compartment
48 All upper electronics equipment bay, port and starboard
49 Electronic bay door
50 Cockpit rear door
51 Control column
52 Asymmetric rudder control valve
53 Canopy pyrotechnic jack
54 Canopy hinge
55 Air egress louvre
56 Cockpit engine air intake
57 Fuel tank access panel
58 Upper longeron
59 Fuselage frame construction
60 Ventral weapons bay
61 Missile pallet hinge arms
62 Access cover
63 Boundary layer splitter plate
64 Port engine air intake
65 Variable area intake ramp
66 Ram air intake louvre
67 Air conditioning system duct
68 Intake duct framing
69 Forward power leading pipe and exhaust connection
70 Forward missile pallet pneumatic jack
71 Air conditioning plenum
72 De-icing fluid reservoir
73 Heat exchanger air exit duct
74 Air refueling ramp door, open
75 Pneumatic system air control lines
76 Bifurcated intakes ducting
77 Air intake pylons pneumatic jacks
78 AIR-2 Genie air-to-air missile
79 AIR-4 Genie air-to-air missile
80 Hydraulic reservoirs, duplex systems
81 Intake trunking
82 Wing pylons attachment fuselage main frames
83 Oil cooler air duct
84 Inlet comb-duct fairing
85 Engine intake compressor face
86 Bleed air ducting
87 Dorsal spine fairing
88 Fuel boost air duct
89 Starboard main undercarriage wheel bay
90 Forward fuel tank
91 Air refueling ramp door, closed
92 Cockpit mounting and connections
93 Fuel system piping
94 Starboard wing main fuel tank
95 Leading edge slot
96 Combined leading edge
97 Wing tip fairing
98 Starboard navigation light
99 Outboard elevator
100 Elevon hydraulic jack
101 Elevon jack ventral fairing
102 Rudder alavan
103 Starboard wing aft fuel tank
104 Fuel system vent piping
105 Engine oil tank, capacity 6 US gal (17 l)
106 Pratt & Whitney J57-P-17 turbojet engine
107 Forward engine mounting
108 Ventral accessory equipment compartment
109 Cooling air ducting
110 Wing and fin spar attachment main frame
111 Inboard pneumatic hydraulic jack
112 Engine turbine section
113 Exhaust pipe heat shroud
114 Exhaust nozzle mounting
115 Aerial tuning unit
116 Anti-icing system heat pilot intakes
117 Fin trailing edge
118 Tailfin identification (AAT) unit
119 Air-to-air identification (AAI) aerial
120 Fin tip fairing
121 UHF TACAN aerial
122 Tail navigation light
123 Rudder
124 Rudder control panel
125 Rudder hydraulic actuators
126 Split aileron panels
127 Brake parachute housing
128 Rudder hydraulic jack
129 Rudder link and steering control units
130 Airbrake open position
131 Divergent exhaust nozzle
132 Variable area exhaust nozzle
133 Detachable tail cone (engine removal)
Another major modification effort that began at more or less the same time was "Broad Jump", a longer-term programme intended to improve the operational characteristics of the still relatively new interceptor. Lasting until 1963, the most visible manifestation of "Broad Jump" was the fitment of an infra-red search/track sight ahead of the cockpit, this and other changes necessitating aircraft being called in to the Sacramento Air Materiel Area (SAMA) at McClellan AFB, California, where each F-106 spent approximately 60 days while the work was done.

A third updating initiative was "Dart Board", which ran concurrently with "Broad Jump". This, too, was basically a retrofit project which took place between August 1961 and April 1962, and which entailed provision of a thermal flash hood, installation of Convair's Upward Rotational Ejection Seat and correctional treatment aimed at eliminating flameouts arising from fuel starvation. Naturally, such projects didn't come cheap; "Wild Goose" and "Broad Jump" between them cost the Air Force no less than $15m — an amount which might seem comparatively small today but which, in the early 1960s, was a major financial outlay.

Even then, the "six" was still far from full acceptability, with the most serious difficulties still relating to the MA-1 AWCS, which required continuous "tweaking" by maintenance personnel if it was to perform anywhere near satisfactorily. Modification programmes undertaken during the first half of the decade addressed many of the worst failings and also upgraded detection and lock-on range by a significant margin, but it was several years before the Delta Dart could be truly considered as reliable — and by then the type had fallen due for modernisation, a process which began in earnest in 1965 with the decision to install TACAN (Tactical Air Navigation) systems on a fleet-wide basis.

At the same time, in-flight refuelling receptacles were provided, together with new supersonic-rated underwing fuel tanks, these modifications permitting overseas deployment should the need arise, and it was not too long before the F-106 was to be deployed overseas. Aircraft of the McChord-based 318th FIS transferred to Osan, Korea, in March 1968 as part of a general build-up of US air power in that country following the seizure of the USS Pueblo by North Korea in January. Eventually, several more ADC F-106 units — including the 48th FIS from Langley AFB, Virginia, the 94th FIS from Selfridge AFB, Michigan and the 95th FIS from Dover AFB, Delaware — were to spend some time in the Far East.

Longer-term requirements drawn up in the 1967-68 timeframe identified the need for further improvements and modernisation initiatives but, as is so often the case, conflicting interests and vacillation on the part of those responsible for formulating defence policy conspired to delay implementation of many of the more promising ideas. One early package went by the acronym SLIM (Simplified Logistics and Improved Maintenance) and would have cost about $120m in 1967 terms. This programme was abandoned in late 1967 when the Secretary of Defense elected to cancel further development of the Lockheed F-12 in favour of a version of the Delta Dart which was then known as the F-106X and which would have been essentially a remanufactured aircraft featuring a larger radar antenna and a greatly modified fire control system offering "look-down/shoot-down" capability.

Expected to cost somewhere in the region of $600m, the F-106X proposal came to naught, expense undoubtedly being a factor in its demise. Political considerations probably also played their part, wrangling between the DoD (Department of Defense) which advocated the F-106X, and Congress which backed the USAF in supporting the F-12, degenerating into an impasse that culminated in the service getting neither type.

As a result, ADC went back to the SLIM proposal of 1967 for a starting point, rejigging this into MEISR (Minimum Essential Improvement in System Reliability), a $91m package covering 250 Delta Darts — single- and two-seaters — which was to raise radar, automatic flight control and DC electrical
(Top of page) The 119th FIS, New Jersey ANG, operates its F-106As from the Atlantic City FAA Airport. (Above) One of the last two regular Air Force squadrons to fly the Delta Dart is the 87th FIS at Sawyer AFB, Mich. (Below) Tipped as likely to be the last F-106A unit of all to trade-in its aircraft, the 186th FIS is the Montana ANG squadron at Great Falls AFB.
system reliability to more acceptable levels. Even then, it was to take several years for MEISR to see completion, with ADC’s F-106s being despatched to Hamilton AFB, California, for the necessary work to be done by personnel of Air Force Logistics Command.

Another modernisation scheme which began to move ahead in the late 1960s was “Project Sixshooter”, intended to provide the F-106 with the potential to undertake fighter-versus-fighter combat. Had it gone ahead in its original form, “Sixshooter” would have entailed the addition of a Vulcan M-61 20-mm cannon and a lead-computing gunsight, substitution of a clear canopy for the existing framed-top type, and provision of electronic counter-countermeasures (ECCM) equipment and a radar homing and warning (RHAW) receiver. Again, funds were scarce, and although the USAF effectively gave the nod to this complex update programme, finance delayed implementation of several of the planned measures until well into the 1970s, when the number of aircraft in the inventory had declined to just under 250. Eventually, most aspects of “Sixshooter” were adopted, although the belly-mounted gun seems to have been carried only rarely.

Although the F-106A and F-106B were the only sub-types to attain quantity production, at least two other variants were proposed during the mid-to-late 1950s. The first of these was the F-106C which would have been powered by the Pratt & Whitney JT4B-22 engine, overall capability being further enhanced by the adoption of a different 40-in (102-cm) radar offering greatly expanded search range and, in theory, increased kill probability. At one time it seemed that ADC would ultimately receive about 350 F-106Cs, but this version — continued on page 217

First flown on 9 April 1958, the F-106B retained the same overall dimensions as the F-106A, the second cockpit replacing some of the fuel capacity in the fuselage. Note the “vision splitter” ahead of the front pilot, that was a feature of both single- and two-seat Darts.
CONVAIR F-106A — from page 206

fell victim to cancellation on 23 September 1958, the two YF-106C prototypes then under construction eventually being used as radar test-beds. In contrast, the F-106D never progressed beyond the planning stage, but it seems reasonable to assume that this designation was to have applied to a two-seat equivalent of the F-106C.

As far as force levels are concerned, the number of F-106 squadrons remained constant until March 1963, when the 319th FIS moved to Florida and acquired the F-104A Starfighter, this change being prompted partly by the Cuban missile crisis and partly by attrition which had reduced the number of Delta Darts on charge.

The Dart in decline

No further change occurred until the summer of 1967 when two more units deactivated, leaving ADC with 11 operational F-106 squadrons. Apart from sporadic redesignation exercises and occasional shifts of base, this level was maintained until 1972 when the first examples of the “six” joined the Air National Guard, two ADC squadrons disappearing at this time. Over the next couple of years, ADC’s complement of F-106s declined further as ANG strength built up to its peak level. By the summer of 1974 the situation had stabilised, each organisation controlling the activities of six squadrons. ADC’s force then remained intact until June 1979 when, in an economy measure, the Command merged with Tactical Air Command to form ADTAC (Air Defense Tactical Air Command). Henceforth, this new organisation exercised command jurisdiction over the six surviving front-line Delta Dart units.

Continuing attrition reduced the numbers still further by the early 1980s, both the ANG and ADTAC losing a squadron apiece, but apart from aircraft written-off as a result of accidents, the fleet survived basically intact until 12 January 1982 when the first example (F-106A 59-116 of the 48th FIS) was consigned to the tender mercies of the Military Aircraft Storage and Disposition Center (MASDC) at Davis-Monthan AFB, Arizona.

Since then, the number of Delta Darts to be found at the desert storage site has steadily risen as more modern equipment has taken its place in ADTAC and ANG Fighter Interceptor Squadrons. At the present time, the number of Delta Darts in long-term storage exceeds the 100 mark, a level which seems certain to rise still further when the remaining few squadrons trade in their veterans for the F-15 and F-16 over the next couple of years.

Units still operating the type comprise ADTAC’s 49th FIS at Griffiss AFB, NY, and 87th FIS at Sawyer AFB, Michigan, plus the ANG’s four squadrons. These are the 101st FIS at Otis ANGB, Massachusetts, the 119th FIS at Atlantic City, New Jersey, the 159th FIS at Jacksonville, Florida, and the 186th FIS at Great Falls, Montana. The last-mentioned unit seems likely to be the last to operate the “six”, since no replacement plans have yet been made known.

Regardless of precisely when the last F-106 disappears from the operational inventory, it seems certain that this will not mark the end of the Delta Dart’s flying career, for it has been selected to follow in the footsteps of the earlier F-102 Delta Dagger and end its days as a pilotless target drone. It will be fitting indeed if, like the F-102, the Delta Dart finds worthwhile employment in teaching future generations of ADTAC pilots the finer points of tactics and technique which constitute the art of air defence. □
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