

= FMA IAe 33 Pulqui II =

The FMA IAe 33 Pulqui II (in the indigenous language Mapuche , Pulquí : Arrow) was a jet fighter aircraft designed by Kurt Tank in the late 1940s in Argentina , under the Perón government , and built by the Fábrica Militar de Aviones (FMA) . Embodying many of the design elements of the wartime Focke @-@ Wulf Ta 183 , an unrealized fighter project , the FMA envisioned the IAe 33 Pulqui II as a successor to the postwar Gloster Meteor F4 in service with the Fuerza Aérea Argentina . The Pulqui II 's development was comparatively problematic and lengthy , with two of the four prototypes being lost in fatal crashes . Despite one of the prototypes being successfully tested in combat during the Revolución Libertadora , the political , economic and technical challenges faced by the project meant that the IAe 33 was unable to reach its full potential , and the Argentine government ultimately chose to purchase F @-@ 86 Sabres from the United States in lieu of continuing development of the indigenous fighter to production status .

= = Background = =

In the late 1940s , Argentina benefited from the recruitment of prominent German aerospace scientists and engineers , fleeing Europe following the defeat of the Nazis and seeking sanctuary in Latin America . The first group of these refugees had also included French designer Émile Dewoitine , castigated as a collaborator in his homeland , who headed the IAe 27 Pulqui I experimental fighter program with Argentine engineers Juan Ignacio San Martín , Enrique Cardeilhac and Norberto L. Morchio . The Pulqui I was the first jet aircraft designed and built in Latin America . In 1947 , flight tests revealed a mediocre performance resulting in the cancellation of the IAe 27 program . The Aerotechnical Institute (Spanish : Instituto Aerotécnico) , under the leadership of Morchio , persevered with its efforts to build a successful indigenous jet fighter and , at first , attempted to modify the earlier aircraft . When it became apparent that the Pulqui I had little potential for further development , the Aerotechnical Institute initiated a new design utilizing the more powerful (20 @. @ 31 kN (4 @, @ 570 lbf)) Rolls @-@ Royce Nene II turbojet engine . In early 1948 , the Institute completed a scale model of what it called the IAe @-@ 27a Pulqui II . This design featured trapezoidal wings , swept back at an angle of 33 ° , and used a NACA 16009 laminar flow airfoil section . A revised model was built later that year with the wings relocated to a shoulder @-@ mounted position and the tailplane changed to a T @-@ tail configuration .

= = = Kurt Tank = = =

Like Dewoitine , German designer Kurt Tank , the former technical director of the Focke @-@ Wulf Flugzeugbau AG , had been similarly hired in 1947 to work on a jet fighter project for Argentina . Tank , along with 62 of his compatriots at Focke @-@ Wulf , had emigrated to Latin America to restart his career in aerospace ventures . Surreptitiously entering the country with a passport identifying him as Pedro Matthies , he found a warm welcome and did not maintain the subterfuge of a secret identity . Along with his former employees , he was instrumental in the evolution of the Instituto Aerotécnico into Argentina 's military aircraft factory , the Fábrica Militar de Aviones at Córdoba . Tank was both an engineer as well as a test pilot , who had designed the Fw 190 fighter , but his design team had also been responsible for the Focke @-@ Wulf Ta 183 , an unbuilt project that had been declared the winner of the 1945 Emergency Fighter Competition . The diminutive , swept @-@ wing , jet @-@ powered Ta 183 , designed by Focke @-@ Wulf engineer / designer Hans Multhopp , had only reached the stage of wind tunnel studies before the end of hostilities .

= = Design and development = =

After his appointment as project director for a new indigenous fighter program , Tank adapted the basic Ta 183 airframe for the Nene II engine , substantially resulting in a new design that bore only a passing resemblance to its forebear . The Nene was larger , heavier and more powerful than the

Heinkel HeS 011 turbojet that had been planned for use in the Ta 183 , and therefore required a new , redesigned fuselage with a larger cross @-@ section primarily due to the Nene 's centrifugal rather than the HeS 011 's axial compressor design .

Due to the similarity of the IAe @-@ 27a and Tank 's redesign of the Ta 183 , Juan Ignacio San Martín , the director of the Institute merged the two parallel projects as the IAe 33 Pulqui II . The fuselage of Tank 's design was further adapted to use the IAe @-@ 27a 's undercarriage . The shoulder @-@ mounted , negative @-@ incidence wings were swept back 40 ° , an even greater sweep angle than that of the Ta 183 , and given a small amount of anhedral . Comparable to the Ta 183 's engine placement , the Nene engine was situated aft of the cockpit , near the center of gravity with engine maintenance and service facilitated through the removal of the tail section . The airframe featured a graceful , 50 ° swept @-@ back T @-@ shaped empennage and a pressurized cockpit topped by a clear bubble @-@ type canopy , faired into the dorsal fuselage . Armor was provided around the cockpit and a bulletproof windscreen was incorporated . Fuel capacity was initially 1 @,@ 250 l (275 Imp. gal .) internally and 800 l (176 Imp. gal .) in the wings . Armament was planned to include four 20 mm cannon , a pair mounted in a staggered , near @-@ ventral position along each side of the fuselage slightly set back from the jet intake .

= = = Testing and evaluation = = =

To prove the soundness of the IAe 33 design , two gliders built under contract by another expatriate , Reimar Horten , were constructed and used for aerodynamics testing in 1948 ? 1949 , including flights by Tank himself . These tests revealed significant problems with lateral stability , resulting in modifications to the tail to address this problem before construction began on two prototype airframes . Due to the lack of modern machinery , the all @-@ metal fabrication relied heavily on handcrafting , and fabricating the prototypes was a labor @-@ intensive procedure . President Perón envisioned that a benefit of setting up an aviation factory in Argentina would be to introduce production standards comparable to world @-@ class manufacturing facilities . However , Tank realized that production tools and jigs were not feasible at this stage and relied instead on essentially hand @-@ built examples . The first airframe (No. 01) reserved for static testing , was subsequently destroyed during the tests .

The first of the " flying " IAe 33 prototypes , (No. 02) built in 1950 , completed its maiden flight on 27 June of that year , with Captain Edmundo Weiss at the controls . On the second flight , ex @-@ Focke @-@ Wulf test pilot Otto Behrens encountered severe lateral stability problems at speeds over 700 km / h (435 mph) and returned to the airfield as a precaution . Landing at very high speed , the aircraft bounced with sufficient force to cause the right main undercarriage strut to fail . During repairs to the aircraft , in order to rectify the " tricky " landing characteristics , the front undercarriage strut was increased in length , which served to alter the angle of incidence of the aircraft , while the shock absorbers were adjusted to have a greater " throw " . Although never considered docile , the modifications improved the takeoff , landing and low @-@ speed characteristics of the IAe 33 . More serious aerodynamic problems persisted , stemming from tip stall ? in which the wingtip stalled before the wingroot resulting in an unpredictable " rolling moment " ? leading to a change in the wing leading edge near the wingroot , while the rudder was modified in an attempt to resolve the interminable lateral instability issues . In addition , the canopy was reinforced with two external frames and a small fairing was installed above the engine exhaust .

Tank , himself a capable development test pilot , took over the test program to investigate the aircraft 's stalling characteristics , although the requisite airframe changes took several months to complete , with the Pulqui II N. 02 (m) so modified not able to undertake its third proving flight until 23 October . During the ensuing high @-@ altitude test , on two successive occasions , the IAe 33 stalled inadvertently , although Tank had sufficient height at 9 @,@ 000 m for recovery . Adding ballast to the nose of the aircraft cured the problem . On 8 February 1951 , Tank publicly demonstrated the IAe 33 before Perón at the Aeroparque Jorge Newbery in Buenos Aires . The audience also included government officials , legislators and the foreign diplomatic corps in the military attaches of the embassies , along with a large crowd of spectators . Both the IAe 27 Pulqui I

and IAe 33 Pulqui II flew during the demonstration .

With the successful completion of the proving test flights , the Argentine Air Force requested a pre-production order of 12 IAe 33 aircraft . In 1951 , the air force established a team of service pilots to test fly the new aircraft in a series of acceptance flights . The first flight by Commander Soto on 31 May 1951 revealed severe vibration at about 1 000 kilometres per hour (621 mph) . Tank declared the sole prototype unserviceable pending an investigation into the problem , although this stricture appears to have been overlooked and the prototype continued to fly . On the eve of its 28th flight , Captain Vedania Mannuwal , assigned to the test program , was advised not to stress the aircraft , as the source of the vibrations experienced during the previous flight in the morning had not been discovered . Determined to " better " his team leader 's recent performance , however , he ignored the precautions and began practicing aerobatic maneuvers near Córdoba during his afternoon flight . Consequently , in a high g force turn , a structural failure occurred with the wing separating from the fuselage . After struggling with the Martin Baker Mk I ejection seat , Mannuwal ejected at low altitude while the aircraft was inverted . His parachute did not fully deploy , however , and he was killed . The defect in the Pulqui II was traced to faulty workmanship related to welding the joint pin that fastened the wing to the fuselage . Welding had been a dichotomy in the manufacturing process necessitated by the paucity of modern forging and pressing equipment in Argentina .

Construction of a third prototype (No. 03) began immediately after this loss . The design team initiated a number of changes to rectify design flaws found in the first " flying " prototype , including an incorporating a larger rudder to improve lateral stability , increasing the size of the exhaust fairing and adding a unique air brake that rotated out from the sides of the fuselage near the tail , along with further reinforcement of the canopy . More fuel was also carried internally to extend the range from 2 030 to 3 090 kilometres (1 260 to 1 920 mi) . The new IAe 33 prototype completed its first flight on 23 September 1952 , piloted by Capt. Jorge Doyle . Flight testing resumed although the aircraft was prepared for a demonstration before President Perón on 11 October 1952 . Behrens , who was slated for the flight , had reservations about the flight characteristics of the Pulqui II at the extremes of its flight envelope , characterizing them as " ... the worst I 've ever experienced as a test pilot . " Two days prior to the exhibition , while practicing his display routine , Behrens stalled the Pulqui II at low level and was killed in the resulting crash , which destroyed the prototype .

In 1953 , Tank constructed a fourth prototype (No. 04) and , in an attempt to resolve the design 's deep stall problems at high angles of attack , added stall fences on each wing and four strakes on the rear fuselage . Other refinements included a pressurized cockpit , additional fuel capacity and it was also the first prototype to be fitted with the definitive four 20 mm Hispano Mark V cannon armament . Lt. Conan Doyle piloted the fourth IAe 33 on its maiden flight on 20 August 1953 and , along with Lt. Gonzalez and Lt. Balado , began armament testing in 1954 .

While an " all-weather " IAe 33 version adding a radar was considered , the Argentine Air Force made tentative plans for the acquisition of 100 Pulqui II aircraft , with the production version to be a dedicated interceptor , featuring an uprated Nene engine fitted with an afterburner and giving it an anticipated maximum speed of Mach 0.98 . A number of foreign buyers had equally expressed interest in the IAe 33 , including the Netherlands in 1951 and Egypt in 1953 , but the lack of a clear commitment to a production series hampered prospects for export sales , with both nations eventually settling on other readily available fighter aircraft .

= = Political ramifications = =

The IAe 33 Pulqui II project was inexorably linked to the machinations and fortunes of the Perónista regime . Although the Fábrica Militar de Aviones was charged with bringing aviation projects to completion , constant political interference contributed to the delays and disarray in aviation programs . Severe economic problems led in 1951 to the Perón government using the Fábrica Militar de Aviones to build cars , trucks , and motorcycles , including the IAME Rastrojero . Moreover , Tank 's team was not primarily focused on the IAe 33 , completing the design of the FMA IA 35

Huanquero multi @-@ purpose aircraft (transport , trainer and reconnaissance roles) , that eventually entered production at the Dirección Nacional de Fabricación e Investigación Aeronáutica (DINFIA) (Spanish : " National Directorate of Aeronautical Manufacturing and Research ") . The most devastating political decision was to divert the entire manufacturing program " seemingly overnight " to automotive products and agricultural equipment , essentially closing the aviation divisions . The competing DINFIA projects such as automotive manufacture served to further drain resources in time , money and personnel from the Pulqui II project .

While Argentina 's finances were extremely strained at this juncture following the economic crisis in 1953 , the most serious setback to the project came in January 1955 when Tank 's contract expired . He reputedly requested almost twice as much money to continue but President Perón instead canceled his contract outright . Despite four years of development and trials , the IAe 33 project was still encountering teething problems and its status remained unclear although no final decision had been made to abandon a project that had reached iconic stature in the Perónist era .

= = Operational history = =

In September 1955 , the sole remaining Pulqui II prototype was pressed into action in the Revolución Libertadora , a coup d 'état led by General Eduardo Lonardi against Perón . The exact details of its participation are unknown , but when rebel forces commanded by Lonardi captured Córdoba as their first conquest , together with the Meteor F 4s fighter @-@ bombers stationed at the Córdoba Escuela De Aviación - SACE (Military Aviation School) , the IAe 33 was enlisted in the struggle . After flying combat missions against Perónist stalwarts , it later appeared in a flyover during the victory parade at Córdoba celebrating the triumph of the coup over loyalist forces .

When the military junta came to power , the IAe 33 project was thrown into disarray . The new government released many of the leading air force staff ; similarly , most of Tank 's team was forced to leave Argentina with Tank himself going to India , where he worked for Hindustan Aeronautics Limited , and later developed the HF @-@ 24 Marut supersonic fighter .

In 1956 , the air force , in an effort to gain political support , planned a record flight from Córdoba to Buenos Aires to demonstrate the combat potential of the IAe 33 . The Pulqui II would fly 800 km , strafe an air force practice range in the Buenos Aires area , and then return to Córdoba using only internal fuel . The only oxygen equipment available for such a long flight was scrounged from a FMA Meteor under repairs . Lt. Balado successfully completed the flight (including the strafing demonstration) at an average cruise speed of around 900 km / h , but the oxygen system failed on the return leg . The semi @-@ conscious pilot managed to perform an emergency landing at high speed , but the heavy landing and resulting stress broke the landing gear , with the Pulqui II overrunning the end of the runway , the aircraft being damaged beyond repair .

= = Cancellation = =

Shortly after Balado 's record flight , the Argentine Air Force reviewed its decision to acquire 100 Pulqui IIs for its fighter force . The Fábrica Militar de Aviones considered that , based on the spares and wing and fuselage components at hand , ten aircraft could be constructed relatively quickly , however the remainder of the order would take five years to complete . Up to this time , the attrition of the original 100 Meteor F 4s obtained in the late 1940s continued , with plans for an alternative replacement , initially centered on the acquisition of 36 Canadair F @-@ 86 Mk 6 Sabres , being rejected in 1956 when the Central Bank of Argentina was unable to provide the necessary foreign exchange .

When the Canadair Sabre was no longer a viable option , the Fábrica Militar de Aviones seriously considered having the Pulqui II enter series production . A new prototype was ordered in 1957 , despite the United States having offered 100 combat @-@ proven F @-@ 86 Sabre fighters that were available immediately . The fifth IAe 33 Pulqui II (No. 05) prototype , designated Pulqui IIe , was constructed in 1959 (visually identical to the fourth prototype although retaining the original frameless , clear canopy) and entered flight testing after its first flight on 18 September 1959 , with

Lt. Roberto Starc flying . The continual evolution of the Pulqui II had resulted in the design team solving its inherent instability at high angles of attack , as well as increasing fuel capacity through the use of a wet wing , to provide sufficient range . However the fighter was now considered obsolete , in addition to its being tainted politically by its association with Perón . Consequently , the Argentine Government decided to cancel the IAe 33 project at the zenith of its development , instead acquiring 28 F @-@ 86F @-@ 40 Sabres from the United States at a " bargain @-@ basement price " under the Mutual Defense Assistance Act .

In 1960 , after completing only 12 test flights in a new role as a transonic research platform , the last IAe 33 prototype was retired and placed into storage , bringing the Pulqui II project to a culmination . The remaining factory tooling and incomplete airframes were summarily destroyed soon after .

= = Legacy = =

Despite not having achieved production status , the IAe 33 Pulqui II is still considered a significant aviation achievement because it was the first swept @-@ wing jet fighter entirely developed and built in Latin America and , along with the Pulqui I , allowed Argentina to lay claim to becoming only the eighth nation in the world to develop such technology . . One tangible long @-@ term benefit that can be traced to the Pulqui II project was the creation of Argentina 's fledgling aviation industry , now restructured as the Lockheed Martin Aircraft Argentina S.A ..

= = Survivors = =

After decades in an outdoor display at the Aeroparque , Museo Nacional de Aeronautica in Buenos Aires , today , the final prototype , the sole surviving example of the IAe 33 Pulqui II project , is preserved at the Argentine Air Force 's Museo Nacional de Aeronáutica de Argentina at Air Base Morón and displayed , still in its original colors and markings , alongside the IAe 27 Pulqui I , both symbols of " lost dreams . "

= = Specifications (3rd and 4th prototypes) = =

Data from " Pioneers & Prototypes : Pulqui , Pulqui II and IA @-@ 37 / 48 . "

General characteristics

Crew : one

Length : 11 @. @ 68 m (38 ft 4 in)

Wingspan : 10 @. @ 6 m (34 ft 9 in)

Height : 3 @. @ 5 m (11 ft 6 in)

Wing area : 25 @. @ 1 m² (270 sq ft)

Empty weight : 3 @, @ 736 kg (8 @, @ 236 lb)

Gross weight : 6 @, @ 875 kg (15 @, @ 157 lb)

Powerplant : 1 × Rolls @-@ Royce Nene II turbojet , 22 @. @ 69 kN (5 @, @ 100 lbf) thrust

Performance

Maximum speed : 1 @, @ 080 km / h (671 mph ; 583 kn)

Cruising speed : 954 km / h (593 mph ; 515 kn)

Range : 3 @, @ 090 km (1 @, @ 920 mi ; 1 @, @ 668 nmi)

Endurance : 2 hours , 50 minutes

Service ceiling : 15 @, @ 000 m (49 @, @ 213 ft)

Rate of climb : 25 @. @ 5 m / s (5 @, @ 020 ft / min)

Armament

Guns : 4 × 20 mm (0 @. @ 79 in) Hispano @-@ Suiza HS.404 license @-@ built Bofors Oerlikon cannon