

= Polikarpov TIS =

The Polikarpov TIS was a heavily armed Soviet heavy fighter designed during the early 1940s . Only two prototypes were built because its intended engines proved to be too unreliable to be placed into production and the engines ' manufacturer lacked the resources to fix the problems . The second prototype crashed in September 1944 and the program was canceled after the death of Nikolai Nikolaevich Polikarpov , the chief designer of his eponymous OKB , earlier that year .

= = Design and development = =

The original request for proposals for a heavy escort fighter (Tyazholyy Istrebitel ' Soprovozhdeniya) was received at the Polikarpov OKB in November 1938 , but the press of work with the I @-@ 180 and SPB prototypes prevented any significant design work until the third quarter of 1940 . Mikhail Yangel was appointed head designer , but his job was complicated by multiple changes in the role of the aircraft from escort fighter to interceptor , dive bomber , and eventually reconnaissance .

The prototype , internally designated as aircraft or TIS " A " , was a low @-@ wing , all @-@ metal , cantilever monoplane with two Mikulin AM @-@ 37 engines and a twin tail . The monocoque fuselage had four 7 @. @ 62 mm (0 @. @ 300 in) ShKAS machine guns in the nose , each with 1 @, @ 000 rounds . The pilot and the gunner / radio @-@ operator were seated back @-@ to @-@ back , separated by an armor plate , under sliding canopies . The gunner had a dorsal ShKAS on a TSS @-@ 1 mount with 750 rounds that could be used once his canopy was slid forward . He also had a ventral ShKAS mounted below the armored floor that he could access by raising a hatch in the floor and kneeling down to fire the machine guns . The ventral gun was provided with 500 rounds of ammunition . A 12 @. @ 7 mm (0 @. @ 50 in) UBK machine gun with 400 rounds and a 20 mm (0 @. @ 79 in) ShVAK cannon with 350 rounds were mounted in each wing root . Underneath the wings were two racks each capable of carrying a single 500 kg (1 @, @ 100 lb) FAB @-@ 500 bomb . The wing had automatic leading edge slats and four split flaps separated by the engine nacelles . The single wheel landing gear retracted into the rear part of the nacelles , as did the tailwheel into the fuselage .

The ' A ' prototype first flew in September 1941 and reached a speed of 555 km / h (345 mph) at 5 @, @ 800 m (19 @, @ 000 ft) altitude . It suffered from a lack of directional stability and the engines were unreliable and vibrated above 5 @, @ 000 m (16 @, @ 000 ft) . Factory No. 51 attempted to fix the stability problem in late September by increasing the area of the rear fins , but was unsuccessful . Flight testing continued in October in Novosibirsk , to where the LII (Russian : ????? @-@ ?????????????????????? ?????????? ? Flight Research Institute) had been evacuated . Eliminating the stability problem took until March 1942 , although the engines remained as unreliable as ever .

By the summer of 1942 it was clear that the Mikulin OKB lacked the resources to fix the problems with the AM @-@ 37 and that the TIS would need a new engine , but the OKB 's resources were fully utilized on the I @-@ 185 and ITP programs and the TIS program was put on hold . Work did not resume on the TIS until the second half of 1943 , after the I @-@ 185 had been canceled , and the Mikulin AM @-@ 39 engine was selected . A new prototype was built , internally called the " MA " , with a completely revised armament . Two ShVAK cannon replaced the nose ShKAS machine guns and a UBT machine gun in a VUB @-@ 1 mount replaced the dorsal ShKAS , while the ventral machine gun was removed entirely . Two 37 mm (1 @. @ 5 in) Shpitalny Sh @-@ 37 or 45 mm (1 @. @ 8 in) 111P cannon replaced the wing root guns . The intended AM @-@ 39s were unavailable and therefore two Mikulin AM @-@ 38Fs were used as a temporary expedient . The engine radiators were moved from the nacelles into the wings . They were fed by inlets in the leading edge and outlets on the undersurface of the wing .

= = Operational history = =

The " MA " was flight tested from June to September 1944 and generally met its expected performance figures . The engines were optimized for low altitudes and the aircraft could only reach

a maximum speed of 535 km / h (332 mph) and a ceiling of 6 @, @ 600 metres (21 @, @ 700 ft) . It did , however , have an initial climb rate of 13 @. @ 5 m / s (44 ft / s) and , on the basis of the flight tests , it was concluded that it would be capable reaching 650 km / h (400 mph) at 7 @, @ 150 m (23 @, @ 460 ft) and would take 6 @. @ 4 minutes to reach 5 @, @ 000 metres (16 @, @ 404 ft) once the AM @-@ 39s were fitted . A brake failure on 29 June damaged the " MA " , which required a month to repair , but a crash @-@ landing on 16 September caused by the failure of the undercarriage to extend proved to be the death knell for the TIS program . The OKB was being shut down after Polikarpov 's death at the end of June and there was no one willing to champion the TIS .

= = Specifications (TIS (A)) = =

Data from Gunston , The Osprey Encyclopedia of Russian Aircraft 1875 @-@ 1995

General characteristics

Crew : 2

Length : 11 @. @ 7 m (38 ft 5 in)

Wingspan : 15 @. @ 5 m (50 ft 10 in)

Height : 4 @. @ 35 m (14 ft 3 in)

Wing area : 34 @. @ 8 m² (375 sq ft)

Airfoil : NACA @-@ 230

Empty weight : 5 @, @ 800 kg (12 @, @ 787 lb)

Gross weight : 7 @, @ 840 kg (17 @, @ 284 lb)

Fuel capacity : 2 @, @ 430 l (530 imp gal ; 640 US gal)

Powerplant : 2 x Mikulin AM @-@ 37 liquid @-@ cooled V12 engines , 1 @, @ 044 kW (1 @, @ 400 hp) each

Propellers : 3 @-@ bladed VISH @-@ 61SF

Performance

Maximum speed : 555 km / h (345 mph ; 300 kn)

Range : 1 @, @ 720 km (1 @, @ 069 mi ; 929 nmi)

Service ceiling : 10 @, @ 250 m (33 @, @ 629 ft)

Time to altitude : 7 @. @ 3 minutes to 5 @, @ 000 m (16 @, @ 404 ft)

Armament

Guns : 2 x 20 mm ShVAK cannon (wing roots)

2 x 12 @. @ 7 mm UBK machine guns (wing roots)

4 x 7 @. @ 62 mm ShKAS machine guns (nose)

2 x 7 @. @ 62 mm ShKAS machine guns (flexibly mounted)

Bombs : up to 1 @, @ 000 kg (2 @, @ 200 lb)