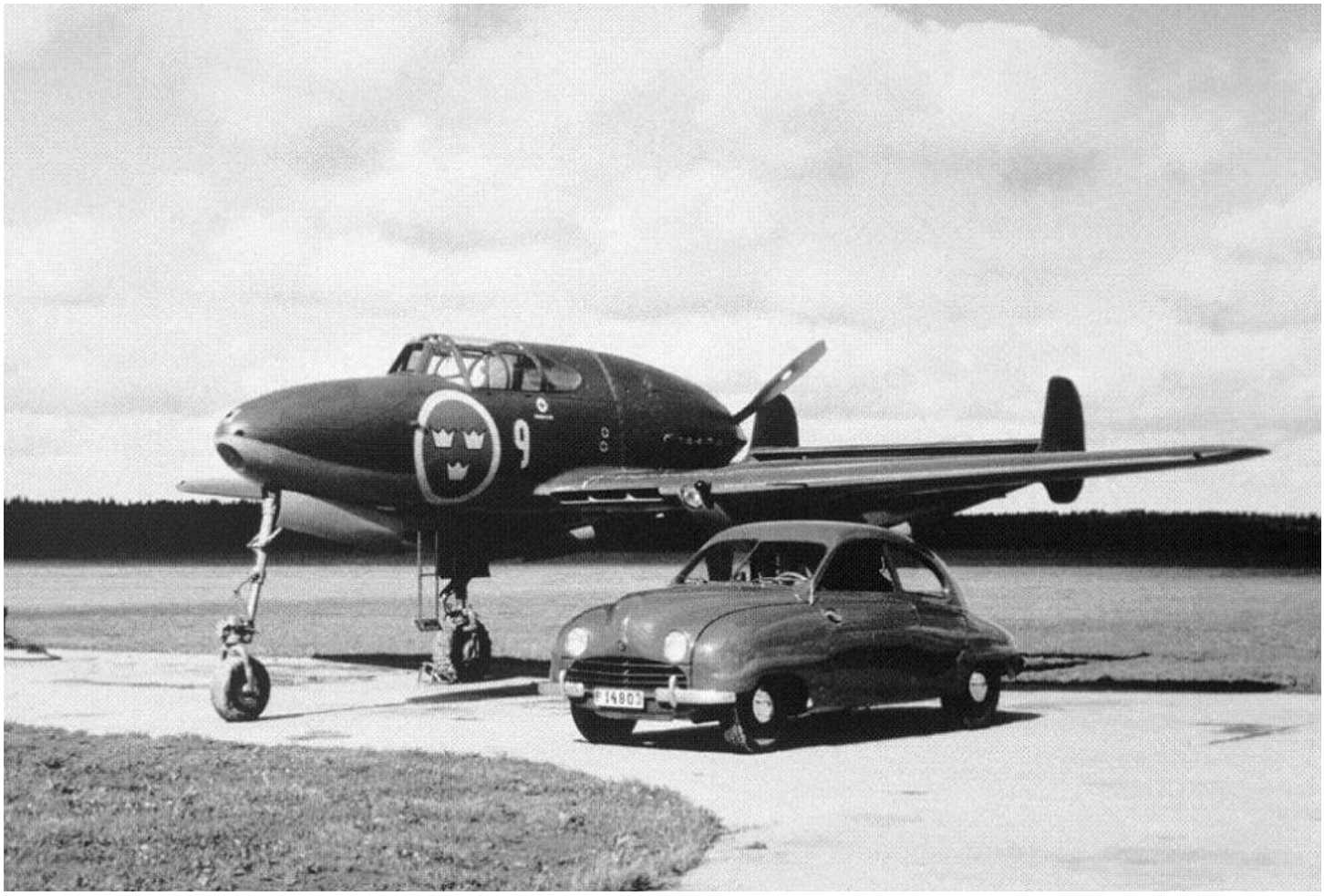
SAAB J 21



A la fin des années 1930, la Scandinavie, au nord de l'Europe, restait globalement à l'écart des préparatifs de guerre sur le reste du continent. Les nations scandinaves n'avaient pas l'intention d'entrer dans un conflit, et défendaient leur statut de pays neutres. Leurs forces armées étaient d'ailleurs globalement réduites, et purement défensives. Toutefois, elles existaient bel et bien, et au moins deux pays eurent à les utiliser, avant l'offensive allemande en Scandinavie : la Finlande (directement, contre l'URSS) et la Suède (qui envoya des volontaires en Finlande). A cette époque, le royaume de Suède disposait d'une force aérienne réduite, et largement fournie en matériels de conception étrangère, notamment américaine et italienne. Dans le souci de développer son économie mais aussi de produire elle-même ses appareils, la Suède décida dans les années 1930 de lancer sa propre filière aéronautique. C'est ainsi que naquit l'entreprise publique Saab, en 1937, entreprise qui existe toujours aujourd'hui, et qui a produit l'essentiel des chasseurs-bombardiers mis en ligne par la force aérienne suédoise. Saab commença d'elle-même à travailler sur un modèle de chasseur à partir de 1939, mais sans grand zèle. A sa décharge, la société avait déjà d'autres appareils en développement, dont le futur bombardier Saab 17. Les choses s'accélérèrent en 1941, quand les autorités suédoises firent connaître leur besoin d'un nouveau chasseur conçu pour des missions de défense aérienne. Il était à ce moment-là impossible d'acheter des appareils étrangers, la Suède ayant dû également souffrir de réquisitions sur des appareils qu'elle avait acheté (par exemple, en octobre 1940, 60 Seversky P-35 furent bloqués par les Etats-Unis). Après avoir cherché à concevoir un modèle conventionnel, les ingénieurs de Saab décidèrent de remettre au goût du jour un ancien concept, beaucoup plus radical, et qui avait été remis en lumière par Fokker et quelques autres constructeurs : le chasseur bipoutre à moteur propulsif. Cette configuration très particulière, plaçant le moteur au centre de l'appareil derrière le cockpit, permettait une meilleure concentration du feu vers l'avant et offrait à l'équipage une meilleure visibilité. Le gouvernement suédois approuva les études de Saab et autorisa la poursuite du projet. Le développement du chasseur posa de notables problèmes. La configuration même de l'appareil exigeait des solutions techniques très particulières. La structure devait être assez solide pour supporter le poids du moteur, et ce dernier devait être assez puissant pour propulser l'avion. L'hélice placée à l'arrière rendait également impossible ou du moins très délicate la sortie en urgence du pilote depuis son cockpit, en vol.

Sur ce dernier point, les ingénieurs innovèrent en mettant au point l'un des premiers sièges éjectables opérationnels. Ce système s'avéra efficace par la suite. Le problème de la motorisation accapara également les énergies. Le moteur choisi au départ, une version sous licence du R-1830 de Pratt & Whitney ne délivrait pas assez de puissance. Les Suédois n'ayant pas le temps de concevoir leur propre moteur, ils durent se fournir à l'étranger, en Allemagne. Plusieurs mois de discussions serrées furent nécessaires pour obtenir des autorités allemandes les plans du moteur en ligne DB 605. Finalement, après bien des tâtonnements, le premier prototype décolla en juillet 1943. Deux autres devaient suivre. Il fallut encore deux années de travaux et de difficultés à résoudre pour que les premiers appareils de série fassent leur apparition dans les unités suédoises, en décembre 1945. Soit après le conflit qui avait motivé leur développement. Le Saab J 21 (la lettre J correspondant au suédois Jagt, pour chasse) ne ressemblait pas vraiment à ses contemporains. Il s'agissait d'un chasseur bipoutre. Le cockpit et le bloc moteur étaient réunis dans un même ensemble, et greffés sur la voilure. La partie centrale de cette voilure était droite, tandis que les extrémités affectaient une légère flèche. Deux poutres parallèles à la structure partaient de la partie centrale de la voilure vers l'arrière. Elles étaient réunies par une troisième poutre plusieurs mètres derrière le moteur. Deux petites dérives se situaient entre ces poutres. L'appareil était construit entièrement en métal. Il disposait d'un train d'atterrissage tricycle quelque peu particulier, la jambe avant se repliant vers l'avant du fuselage, et chaque partie du train reposant sur une roue unique. Le cockpit offrait une excellente visibilité sur l'avant et sur les côtés, mais pas sur l'arrière, occulté par le bloc moteur. Ce dernier accueillait un Daimler-Benz DB 605, à refroidissement liquide, entraînant une hélice métallique tripale. Ce moteur était suffisamment puissant pour propulser le J 21 à des vitesses supérieures à 620 km/h. Débarrassés de l'hélice, les ingénieurs de Saab purent opter pour un armement plus lourd que la normale sur l'avant du fuselage. Le nez, situé juste devant le cockpit, fut conçu de manière à accueillir un canon de calibre 20 mm et deux mitrailleuses lourdes. Deux autres mitrailleuses de même calibre furent également montées dans la voilure. Par la suite, des points d'emport furent ajoutés sous la voilure. Des réservoirs auxiliaires de carburant furent également conçus pour accroître l'autonomie de l'appareil. Le J 21 devait finalement s'écarter de sa vocation de chasseur. Il fut décidé d'en faire un avion d'attaque au sol. Ce changement de vision devait donner naissance à d'autres versions. Les J 21 étaient de bons appareils pour leur époque, mais ils arrivèrent trop tard. Le développement de chasseurs à réaction de plus en plus performants condamnait déjà les moteurs à pistons. Ils ne furent pas exportés et servirent finalement peu de temps. Les appareils survivants furent retirés du service actif au milieu des années 1950 et, pour la plupart, ferraillés. Environ 300 exemplaires étaient sortis des chaînes de production. L'histoire du J 21 ne s'arrête cependant pas là. Les Suédois, désireux de poursuivre le développement de leur concept, décidèrent d'en construire une variante à réaction. Ces travaux devaient donner naissance au J 21R.

Source : https://aviationsmilitaires.net/v3/kb/aircraft/show/1276/saab-j-21

Version anglaise Wikipédia

The **SAAB 21** is a Swedish single-seat low-wing monoplane fighter and attack aircraft designed and manufactured by SAAB. It used a relatively unorthodox twin boom fuselage with a pusher engine, giving the aircraft an unusual appearance. Work began at SAAB following a Swedish Air Force decision to embark on a major expansion programme in preparation for the possibility of being drawn into the Second World War. The company designed a monoplane twin-boom aircraft, powered by a single Daimler-Benz DB 605B engine that was positioned to the rear of the fuselage nacelle, directly behind the pilot, and drove a pusher propeller. This arrangement allowed guns to be carried in the aircraft's nose while providing the pilot with good visibility. To enable the pilot to bail out without hitting the propeller behind him, they adopted an ejection seat. On 30 July 1943, the 21 performed its maiden flight and on 1 December 1945, the first examples of the **J 21A-1** were introduced to service. It was quickly followed by the improved **J 21A-2**, which featured heavier armament, and the **A 21A-3** fighter-bomber. Due to Swedish Air Force interest in jet fighters, SAAB produced a conversion using the British de Havilland Goblin as the Saab 21R. The 21 was replaced in the mid-1950s after less than 10 years of service by the similarly configured de Havilland Vampire and the Saab 29 Tunnan.

Design and development

Background

SAAB was carrying out design studies during the late 1930s into possible options for a new fighter aircraft. Many of these had been based around the use of a British Bristol Taurus radial engine and some were unconventional for the time.[1] One of the configurations studied was of a monoplane pusher configuration twin-boom aircraft, with the engine behind the pilot at the rear of a central nacelle. This unorthodox design possessed several advantages, such as the ability to concentrate most of the guns in the aircraft's nose, good pilot visibility, and ease of service.[1] While this promising design study was completed, it remained dormant until 1941, when defence considerations heightened the imminent need for it.[1] At the start of Second World War, the Swedes became concerned about maintaining their neutrality and independence as they would soon be threatened by one or more European nations. As an emergency measure, the Swedish Air Force embarked upon a major rearmament and expansion of their military during the 1939–1941 period, which included the procurement of foreign-sourced aircraft as well as the local development of new, modern designs.[2] However, as a consequence of the war, few nations at war were willing to supply fighters to a neutral country, while Sweden's own production capability would be insufficient until at least 1943. As a consequence, Sweden was forced to purchase already obsolete Fiat CR.42 biplanes from Italy as an interim measure, and which were of little value against modern monoplane fighters.[3][2] Accordingly, SAAB began looking at solutions to various anticipated production problems for their proposed fighter.[1]

Design

SAAB A21A-3 on display at Söderhamn /F15 Aviation Museum, Söderhamn, Sweden

The SAAB J 21 needed a top speed of at least 480 km/h (300 mph), which required a powerful engine. It was decided to substitute the Taurus engine for the American Pratt & Whitney R-1830 Twin Wasp radial engine.[1] However Svenska Flygmotor was also asked to provide an alternative to the Twin Wasp. Options were limited by the urgency involved, leaving a license-produced engine as the only option. Accordingly, a locally built version of Germany's new 1,100 kW (1,500 hp) Daimler-Benz DB 605B inline engine was selected, however, due to the DB 605B's lack of maturity, a great deal of refinement and modification by Swedish engineers was required to ready it for operational use.[4]

Artist's depiction of a J 21 inflight

The SAAB 21 was an unorthodox twin-boom low wing pusher configuration fighter aircraft with a tricycle landing gear, and a heavy forward-firing armament.[5] Several recent innovations were incorporated into its design, including an ejection seat for the pilot while the pusher layout later allowed the type to be readily re-engined with a turbojet. The advantages of a pusher design include an unobstructed forward view for the pilot, and the armament can be concentrated in the nose, however, a major drawback is difficulty in making an emergency exit as the pilot could get drawn into the propeller blades. Many solutions were examined, such as jettisoning either the propeller or the engine via explosive charges prior to bailing out, before it was decided to adopt an ejection seat developed by Swedish defense firm Bofors, in parallel with the fighter.[6][7] The J 21 was one of the first operational aircraft in the world with an ejection seat.[1] The wing of the 21 was built around a SAAB-designed laminar airfoil. As the wings could not readily accommodate the main landing gear when retracted, wells were provided in the tail booms, aft of the rear wing spar.[5] To reduce drag, coolers and ducts for the engine were located in the wing section between the fuselage and tail booms, and integral fuel tanks were fitted.[5] The armament initially consisted of one nose mounted 20 mm (0.79 in) Hispano-Suiza Akan m/41A and four 13.2 mm (0.52 in) Akan m/39AA autocannons, two in the wings, and two in the nose. On the A-2 the 20 mm (0.79 in) guns were replaced with belt fed 20 mm (0.79 in) Bofors Akan m/45. The J 21A-3 (later designated A 21A) could carry rockets and bombs. Later in the Saab 21's service life the 13.2 mm (0.52 in) autocannons were rebarreled to fire American 12.7 mm (0.50 in) ammunition due to economics. These improved firing performance but the Saab 21 was now only viable as a ground attack aircraft due to the rate of change in fighter design.

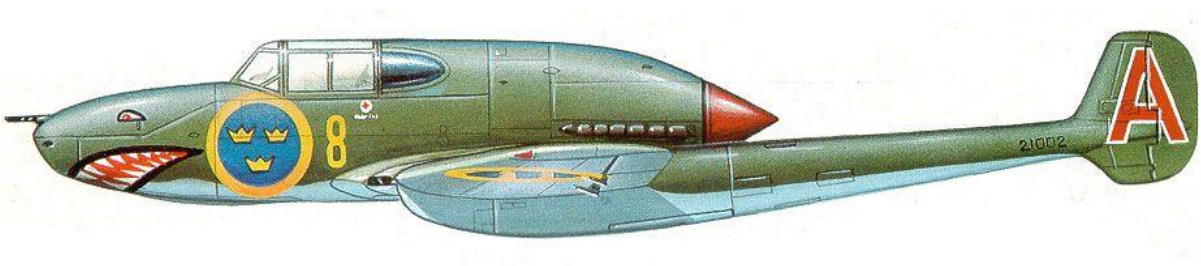
Three prototypes were completed of which only two were to be flyable, while the third was a static airframe for stress testing purposes.[5] On 30 July 1943, the first J 21 prototype conducted its maiden flight, flown by SAAB test pilot Claes Smith. During takeoff, he used too much flap, impairing acceleration and climb. This resulted in it hitting a fence and damaging the undercarriage, although he was able to land successfully afterwards.[8][5]

Further development

During 1945, several options were explored to improve the 21's performance.[9] During the first half of the year, the company was working on a variant that would be powered by a 1,500 kW (2,000 hp) Rolls-Royce Griffon engine to give the 21 a projected top speed of 669 km/h (416 mph). Other projects, such as the **Saab 27** were also designed for the Griffon, however all work on piston-engine upgrades was abandoned by the end of the year.[9] In parallel with these studies, SAAB and other Swedish companies had been evaluating the adoption of jet propulsion. Two early studies, designated as **RX 1** and **RX 2**, were twin-boom aircraft similar to the 21.[10] Swedish Air Force enthusiasm for a jet fighter in late 1945 pushed SAAB to produce a version of the J 21 using jet propulsion.[11] At Swedish Air Force request, existing J 21 aircraft were converted to jet propulsion in 1947 and redesignated **J 21R**.[12] This required modifications to over 50 per cent of the airframe, including the tailplane and wing. The aircraft was to be powered by a single British-sourced de Havilland Goblin turbojet engine, to replace the DB 605B. It entered Swedish Air Force service as their first jet aircraft.

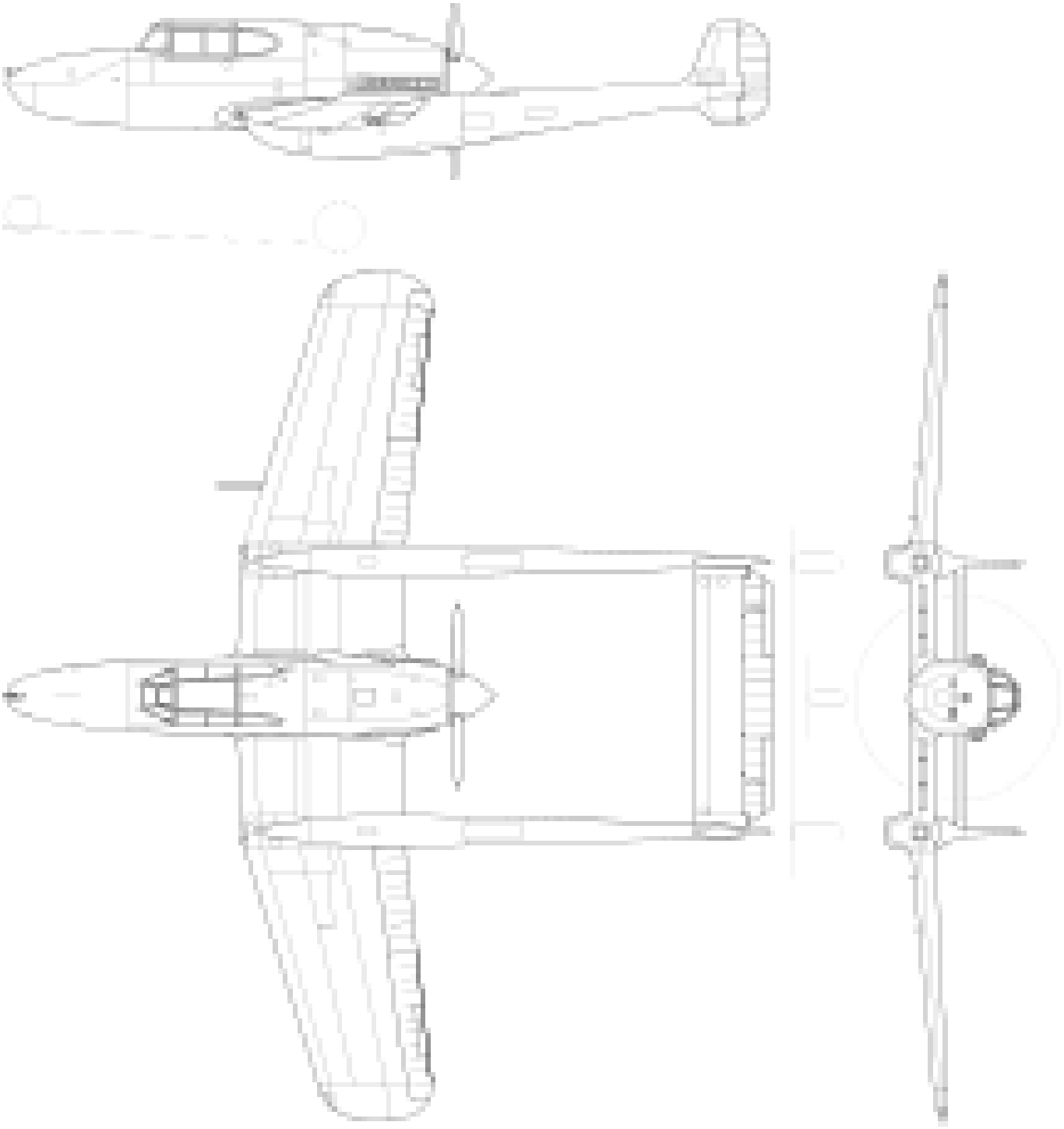
Operational history

The first example from the first batch of 54 of the first production variant, the **J 21A-1** was delivered to the Swedish Air Force on 1 December 1945.[5] Construction was at SAAB's main plant in Trollhättan and deliveries of this model ran until 5 December 1946, when deliveries of two batches totalling 124 of the **J 21A-2** began. A third order, in two batches totalling 119 of the **A21A-3** fighter-bomber completed production of the piston-engine variants.[13] A total of 298 J 21As were constructed prior to the production line ending in 1948.[13] During December 1945, the Svea Wing (F 8) became the first fighter unit to receive the J 21.[13] During the following year, other units of the Swedish Air Force, such as Göta Wing (F 9), also began to receive the type. However, within less than four years, some squadrons were already being re-equipped with a new generation of jet fighters capable of far greater speed, such as the de Havilland Vampire.[14] Despite the original intention for the type to be principally used in air defence roles, in service, the J 21 was utilized mainly in the light bomber role. The type was used only by the Swedish Air Force. Officials doubted its effectiveness due to its unconventional design.[9] In response, the Swedish Air Board requested that SAAB study a development with the engine in the nose as the **J 23**.[9] This aircraft used the J 21's DB 605B engine and had a more traditional appearance, similar to the North American P-51 Mustang, but its projected performance was reduced, which became a key factor in improving the J 21 instead. The Swedish Air Force became interested in jet propulsion and from 1945, SAAB began studying modifications of the airframe to accommodate a jet engine in place of its piston engine.[9] Production of the piston-engine version continued until 1948 while examples of the new jet engine version began being converted on the line. As a result of the conversions, the piston-engine powered J 21A began being retired in 1954.[6][15]



tounu J-21A-1 v podobě ze začátku roku 1945, kdy jej ke zkouškám v bojových podmínkách převzala stíhací jednotka F-8 švédského letectva. V té době byl již letoun opatřen kamuflází, která se stala standardní pro všechny stroje SAAB 21 – horní a boční plochy kryl nátěr tmavou hnědozelenou barvou, spodní světlou šedomodrou

Specifications (J 21A)



Saab J 21 3-view drawing

General characteristics

- **Crew:** 1
- **Length:** 10.45 m (34 ft 3 in)
- **Wingspan:** 11.6 m (38 ft 1 in)
- **Height:** 3.97 m (13 ft 0 in)
- **Wing area:** 22.2 m^2 (239 sq ft)
- **Airfoil:** Saab laminar airfoil[21]
- **Empty weight:** 3,250 kg (7,165 lb)
- **Gross weight:** 4,150 kg (9,149 lb)

- **Max takeoff weight:** 5,200 kg (11,464 lb)
- **Fuel capacity:** 510 L (130 US gal; 110 imp gal) internal

2x 160 L (42 US gal; 35 imp gal) drop tanks (J 21A-1 & J 21A-2) ;

2x 400 L (110 US gal; 88 imp gal) drop tanks (J(A) 21A-3)

- **Powerplant:** 1 × Daimler-Benz DB 605B V-12 inverted liquid-cooled piston engine, 1,085 kW (1,455 hp) built by SFA
- **Propellers:** 3-bladed constant-speed pusher propeller

Performance

- **Maximum speed:** 650 km/h (400 mph, 350 kn) **J 21A-1** / **J 21A-2**

560 km/h (350 mph; 300 kn) **J(A) 21A-3**

- **Cruise speed:** 495 km/h (308 mph, 267 kn) **J 21A-1** / **J 21A-2**

425 km/h (264 mph; 229 kn) J(A) 21A-3

- **Range:** 750 km (470 mi, 400 nmi)
- **Ferry range:** 1,190 km (740 mi, 640 nmi) **J 21A-1** / **J 21A-2**

1,650 km (1,030 mi; 890 nmi) **J(A) 21A-3**

- **Service ceiling:** 10,200 m (33,500 ft) **J 21A-1** / **J 21A-2**

7,500 m (24,606 ft) **J(A) 21A-3**

- **Rate of climb:** 15 m/s (3,000 ft/min)
- **Landing speed:** 145 km/h (90 mph; 78 kn)

Armament

- **Guns**

J 21A-1

- 1× 20 mm (0.79 in) akan m/41A with 60 rounds in the nose
- 2x 13.2 mm (0.52 in) akan m/39A with 350 rpg in the nose
- 2x 13.2 mm (0.52 in) akan m/39A with 325 rpg in the wings

J 21A-2 & A-3

- 1× 20 mm (0.79 in) akan m/45 with 140 rounds in the nose
- 2x 13.2 mm (0.52 in) akan m/39A with 350 rpg in the nose
- 2x 13.2 mm (0.52 in) akan m/39A with 325 rpg in the wings

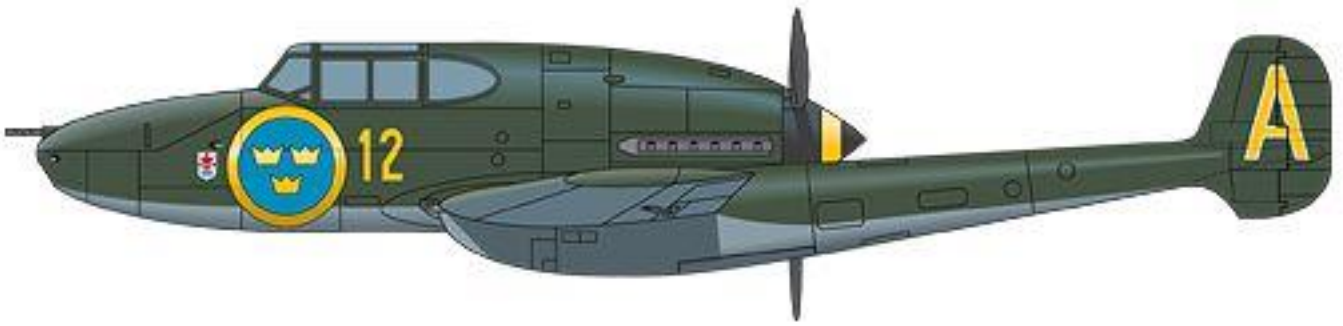
J(A) 21A-3 700 kg (1,543 lb) maximum

- **Inner wing mount**

(the inner wing mount was only used for rockets until the outer racks were developed)

- 4x 50 kg (110 lb) minbomb m/37 general-purpose bombs, or sprängbomb m/42 or m/47 fragmentation bombs or bombkapsel m/43 cluster bombs
- 4x 8 cm (3.1 in) pansarraket m/46 Armour-piercing RP-3 rocket
- 4x 15 cm (5.9 in) sprängraket m/46 High-explosive semi-armour-piercing (SAP) RP-3 rocket
- **Outer wing mount**
- 8x 8 cm (3.1 in) pansarraket m/46 Armour-piercing RP-3 rocket
- 8x 14.5 cm (5.7 in) Bofors pansarsprängraket m/49A & B High explosive anti-tank (HEAT) rocket

- 8x 15 cm (5.9 in) sprängraket m/46 High-explosive semi-armour-piercing RP-3 rocket or Bofors sprängraket m/51A & B high-explosive rocket
- 2x 18 cm (7.1 in) Bofors halvpansarraket m/49A & B Armour-piercing high-explosive anti-ship rocket (later used against general targets.)
- **Belly**
- 1x 250 kg (550 lb) minbomb m/37 general-purpose bomb
- 1x 250 kg (550 lb) minbomb m/40 general-purpose bomb
- 1x 250 kg (550 lb) minbomb m/50 general-purpose bomb
- 1x 500 kg (1,100 lb) minbomb m/41 general-purpose bomb
- 1x 600 kg (1,300 lb) minbomb m/50 general-purpose bomb
- **Wingtips**
- 2x vingspetstank drop tanks which could be armed in flight as incendiary bombs, and were tested with napalm.



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