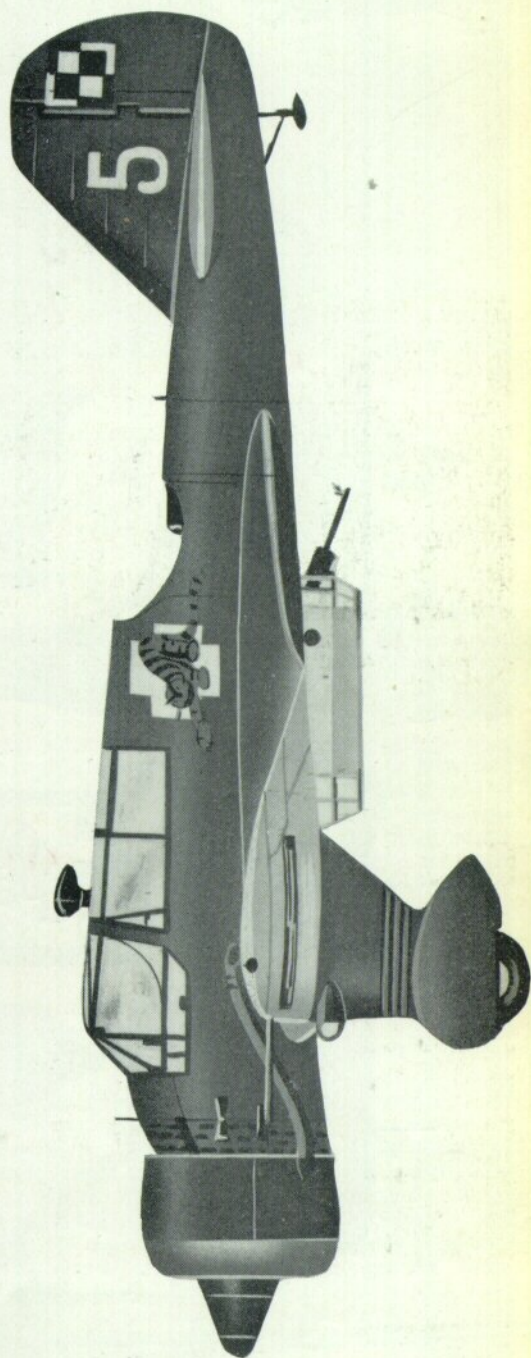
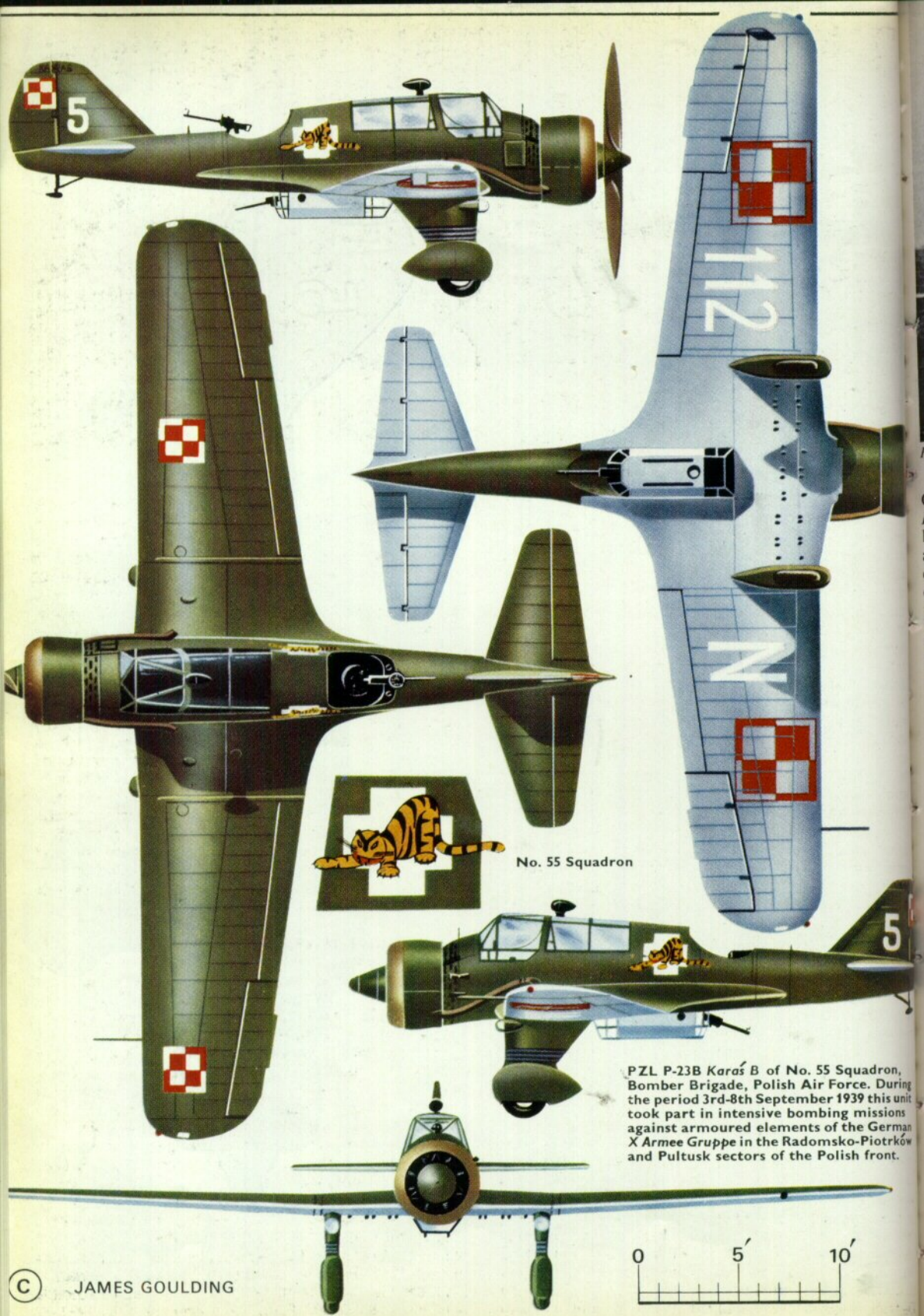


PROFILE PUBLICATIONS

The
P.Z.L.
P-23
Karas

NUMBER 104
TWO SHILLINGS





No. 55 Squadron

PZL P-23B Karol B of No. 55 Squadron, Bomber Brigade, Polish Air Force. During the period 3rd-8th September 1939 this unit took part in intensive bombing missions against armoured elements of the German X Armee Gruppe in the Radomsko-Piotrków and Pultusk sectors of the Polish front.

The P.Z.L. P-23 Karas



by J. B. Cynk

First production batch of P-23A's, with centre-section slots and two searchlights.

(Photo: the author)

One of the most peculiar aspects of the Polish *Lotnictwo Wojskowe* (or Military Aviation) during the between-the-wars era was the importance attached to aircraft for armed reconnaissance duties, working in close support of armies in the field. These machines, called the *liniowe* or "front-line"—type aircraft, formed a class of their own and were recognized by the Polish High Command as the most vital element of the air force besides the fighters. This misguided belief was largely the outcome of experiences gained during the Russo-Polish war of 1919-20, when due to the small number of aircraft involved both sides enjoyed a complete freedom of the air and aeroplanes were most usefully employed in the close support and reconnaissance rôle. At the turn of the 1920's-1930's these army co-operation squadrons were equipped mainly with Polish-built Potez XXV and XXVII biplanes, and some of them with Breguet XIXs. It was obvious that a much more advanced and potent aircraft would soon be needed as a replacement, and the Aviation Department of the Ministry of War indicated broad terms of the requirements to the industry.

At that time Dipl. Ing. Stanislaw Prauss, young designer at the P.Z.L. Project Office in Warsaw, conducted preliminary studies for a fast single-engined passenger transport intended for the P.L.L. *Lot*. The aircraft, designated P.Z.L.13, was a low-wing cantilever monoplane of all-metal structure based upon the 400-450 h.p. Pratt & Whitney Wasp radial engine. In spite of the very advanced nature of the project the P.L.L. *Lot* lost all interest in the design, and in the spring of 1931 the Ministry of Transport, which was sponsoring the work, cancelled the aircraft.

As the outcome of consultations between the Aviation Department and Prauss it was decided to use the P.Z.L.13 project as the basis for a new three-seat army co-operation aircraft, and work on initial studies for such a machine went ahead. Other contenders were the two-seat 500 h.p. Pratt & Whitney Hornet-powered P.W.S.19 high-wing monoplane designed by Ciolkosz, and the Rudlicki's Lublin R.XVII, which, powered by a 450 h.p. Lorraine Dietrich, was a clean-looking two-seat biplane with

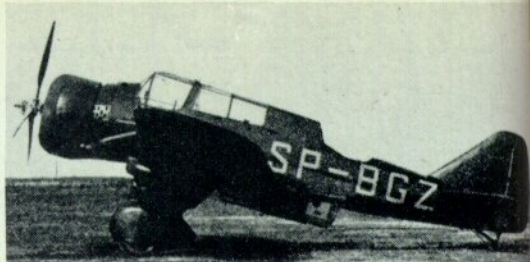
retractable undercarriage, utilising some parts of the Potez XXV built under licence by the Plage & Laśkiewicz Lublin factory. As 1931 drew to its close the Aviation Department made up its mind in favour of the P.Z.L. project and at the beginning of the next year instructed Prauss to proceed with the preliminary design, which received the designation P.23. The Bristol Pegasus was selected as the intended power plant, and the Polish Skoda Works in Warsaw were to undertake licence-manufacture of the engine. The P.23 was approved in principle in the spring of 1932, but to comply with the Department's wishes, the proposed simple cut-out in the fuselage bottom for a ventral gun was replaced by a more sophisticated ventral gondola, offering improved facilities for bomb-aiming gear and increased field of fire for the gun. By the autumn of the same year P.Z.L. were authorised to carry on with construction of a static-test specimen and three flying prototypes. (In the event the R.XVII did not progress beyond the paper study and the P.W.S.19 reached the prototype stage only, built as a P.W.S. private venture).

KARAS DEVELOPMENT

The development of the P.23 posed many tough problems. The aircraft was comparatively fast and heavy and yet it had to be able to operate from small, unprepared fields in forward combat areas, and the achievement of a satisfactory compromise was not an easy matter. In an effort to combine lightness with strength Prauss decided to use a wing of a completely new structure. The invention of Dipl. Ing. Franciszek Misztal (Polish patent No. 16,585, granted 20th June 1932) the wing outer sections were built as a torsion box of corrugated heavy-gauge duralumin sheet, with corrugations running spanwise, covered with partly stress-bearing smooth duralumin sheet. To this central box a duralumin D leading-edge and "multi-cellular" trailing-edge were attached. The revolutionary construction method employed on the central box can be regarded as one of the earliest examples of the metal sandwich structure in aviation engineering. The wing built on Misztal's principle was first used on the P.Z.L.19 tourer, built in 1931-32



P-23/II Karaś, with the engine mounted in the intermediate position. (Photo: the author)



Karaś B experimentally fitted with 925 h.p. Pegasus XX driving a three-bladed Hamilton airscrew. (Photo: via W. B. Klepack)



One of the first P-23A's delivered. (Photo: the author).



Karaś A operational trainer, with spats removed from under carriage photographed in 1938. (Photo: the author)

for the 1932 Challenge, but its approval for the P.23 attracted even more attention.

The pioneering nature of the venture contributed to the difficulties experienced during the building of the prototypes. Protracted static tests at the I.T.B.L. (Institute of Aviation Technical Research) revealed the insufficient strength of some of the components. Modifications were introduced to the structure and the tests were eventually completed towards the end of 1933, the airframe achieving a safety factor of 10.5 for a simulated lightly-loaded condition and of 8, for a maximum take-off weight of 3,450 k.g. (7,605 lb.). The necessary changes delayed completion of the prototypes.

The Warsaw Technical University had shown a great interest in the P.23's torsion-box wing, and at the request of Prof. Huber P.Z.L. built a wing of the same configuration, but of conventional two-spar

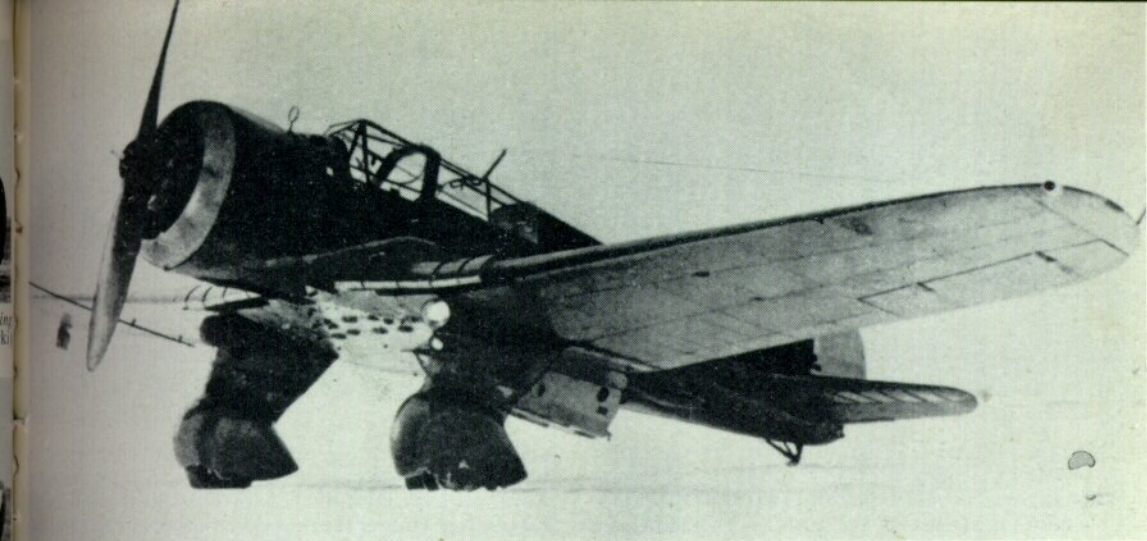
structure, for comparison static trials. These were conducted in the context of the University's scientific research programme and were not directly related to the development of the aircraft itself.

The name of *Karaś* (Crucian-carp) was officially approved for the type and the first prototype, the P.23/I *Karaś I* made its maiden flight in the third week of August, 1934, powered by a 570-590 h.p. Bristol Pegasus IIM₂, driving a two-blade wooden Szomański airscrew. Early trials indicated real fuselage vibration and tail flutter. Even before the prototype flew it was realized that the visibility from the pilot's and observer's cockpit was totally inadequate and the cramped interior made it difficult for crew members to get to their seats, restriction of space arising mainly from the fact that a large proportion of the P.23/I's bombload was carried internally in the fuselage bomb-bay. In the light of these short-

The Pegasus powered P-23/I Karaś during the later stages of tests in 1935.

(Photo: the author)





P-23/III Karaś with engine in final position.

(Photo: the author)

comings the P.23/II and P.23/III, second and third prototypes, were extensively reworked. To improve visibility the engine of the P.23/II, enclosed in a new low-drag cowl, was dropped below the fuselage longitudinal axis, giving the Karaś its characteristic hump nose. The bomb-bay was deleted from the fuselage and the entire bombload was carried externally on racks under the wing centre-section, between the undercarriage legs. The pilot's and observer's compartments, enclosed by new, extensively glazed canopies, were completely re-arranged and made roomier and more comfortable. Substantial changes were also introduced to the wings, which received more effective slotted ailerons, improved flaps with the maximum deflection of 45 deg., and incorporated centre-section slots, smoothing the flow over the tail at high angles of incidence. However, the Swiatecki bomb-release gear*, used on the P.23/I, was not fitted to the second prototype, nor to subsequent P.23's, mainly because of disagreements between the inventor and the Aviation Department regarding manufacture of the gear.

The P.23/II, powered by a Pegasus, flew in the spring of 1935. The machine proved much superior to the first prototype, but as the visibility from the front cockpit still left much to be desired, the third prototype which followed it into the air some two

months later, featured additional improvements. Its Pegasus II was lowered still further below the fuselage axis and pilot's cockpit was re-arranged once more, receiving a raised pilot's seat, higher canopy and redesigned windscreen.

In the early summer of 1935, during the I.T.L. airworthiness trials, the P.23/II crashed soon after take-off at the maximum loaded weight, killing the crew. These tests and service acceptance trials were successfully completed with the P.23/III. Various refinements were progressively introduced to this aircraft until it reached the standards of the production Karaś A model. The machine was subsequently re-engined with a 680 h.p. Pegasus VIII, and served as the development aircraft for the major production variant, the Karaś B. The P.23/III made its public debut in May, 1936 at the *Internationella Luftfarsutställningen* in Stockholm, Sweden, and towards the end of the year one of the first production Karaś A's, carrying the temporary registration SP-BMF, was shown at the Paris Salon.

PRODUCTION AND EXPORT

A total of 40 Pegasus II-powered Karaś A's and 210 Pegasus VIII-powered Karaś B's were ordered for the Polish Air Force, and the machine went into production at the new P.Z.L. Airframe Plant No. 1 at Warsaw-Okecie in the second half of 1935. By the end of the year first production P.23A airframes were ready and the remaining Karaś A's were well advanced, but due to lack of engines deliveries could not commence until the middle of 1936. By then the first

* Swiatecki's bomb-release gear was built under licence in several major European countries, and Vickers Armstrong produced a gear based upon the Swiatecki principal for British bombers during the W.W.2.

Operational trainers in service with the SPL Deblin. Starboard searchlight has been removed. In the background, Jupiter-powered Potez XXV biplanes. (Photo: R. Lopacki)

Karaś machines of the 1st Air Regiment based at Warsaw, sporting light blue triangles on which the squadron badges were superimposed. (Photo: the author)





The P-42 development aircraft was first flown in early April 1936.

(Photo: the author)

machines of B series began to leave the assembly lines. Delay in the programme resulted from great difficulties experienced with the Pegasus II. Bristol-built engines installed in the prototypes manifested some shortcomings and these were to be rectified on the Polish-manufactured examples. However, when the first engines from the P.Z.L. Engine Plant No. 1 (former Polish Skoda Works) began running trials they developed worse troubles. Jamming of reduction gears and crankshaft fractures became a common occurrence. Correspondence with Bristol eventually revealed that Bristol subcontractors, who had encountered similar difficulties during components tests, had made several modifications and changes which were not introduced to the drawings and specifications supplied to Poland. Engine documentation was not amended because the Pegasus II was not in quantity production in Britain. The P.Z.L. Pegasus II's, although eventually improved, were never quite satisfactory and their deliveries were several months behind schedule. As a result the first production *Karaś A*'s were not ready for service until June, 1936, and the operational ceiling of all A series aircraft was restricted to 3,000 m. (9,842 ft.). The initial production P.23A's were provided with automatic centre-section slots like those fitted to the P.23/II and /III prototypes, but as the slots proved of little practical use, they were deleted from all subsequent *Karaś* aircraft. Production of the *Karaś B* reached its peak in the spring and summer of 1937 with a monthly output of 15-20 machines, and continued on diminishing scale well into 1938.

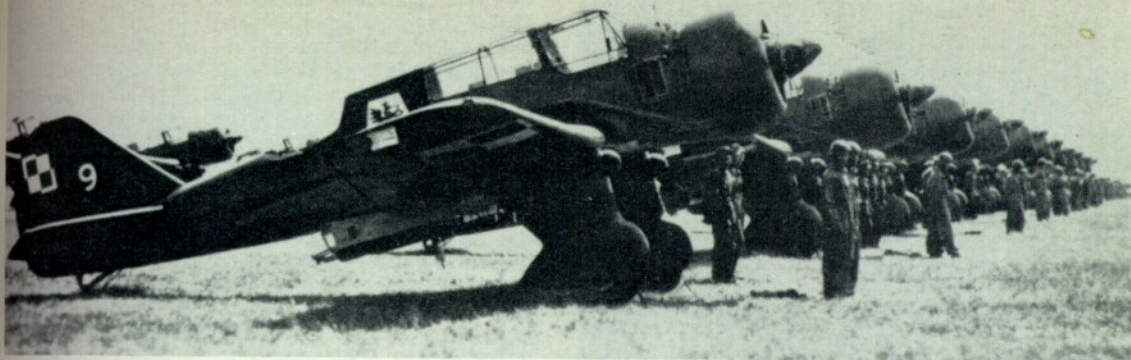
With the *Karaś* established in production several experimental programmes were conducted with the aircraft. A large variety of airscrews were fitted to the machine for comparison trials, and in one P.23B the prone bomb aimer's/gunner's position in the ventral gondola was replaced by a revolving seat, and a periscopic bomb

sight installed. In 1936 Prauss's team began work on progressive developments of the basic design; the more powerful edition of the P.23 evolved to the Bulgarian requirement under the new designation of P.43, and the substantially revised successor of the P.23, the P.46 *Sum*. The story of the *Sum* is outside the scope of this work, but the *Karaś* assisted in the development of this aircraft. The *Sum* was to be provided with a retractable ventral gondola, extending under the weight of a bomb aimer's/gunner's body, and twin fin and rudder assembly; the first production *Karaś B* was modified on the assembly line to incorporate these features for trial purposes. This development aircraft, powered by the P.Z.L. Pegasus VIIIA, was designated P.42, and flew for the first time in April, 1936. After the tests it was decided to drop the idea of the gravity extension system for the gondola and instead use a hydraulically operated mechanism on the *Sum*; and the P.42 was converted to the full standards of the *Karaś B* and delivered to the Polish Air Force. In 1937 another P.23B was temporarily fitted with the 925 h.p. P.Z.L. Pegasus XX, driving a three-bladed controllable pitch metal Hamilton airscrew as specified for the *Sum A*. This aircraft carried the civil registration SP-BGZ and after completion of tests was brought back to the full B series standard.

The initial Bulgarian order negotiated with P.Z.L. called for twelve aircraft. Despite the change of the factory designation number to P.43 the new variant retained the name of *Karaś*. To comply with the Bulgarian requirement the P.43 was to be provided



Flying view of a P-23B *Karaś* from the 6th Air Regiment's No. 64 Sqn., based at Lwów.
(Photo: the author)



P-23B's of No. 42 Sqdn., 4th Air Regiment at Torun, attached in 1939 to the Army Pomorze.

(Photo: the author)

with a more powerful Gnome-Rhone engine and armed with two, instead of one, forward-firing synchronised guns. The machine was generally similar to the P.23, but to offset the C.G. movement resulting from the use of a heavier engine, changes in the airframe were necessary. The pilot's and observer's cockpits were modified and the fuselage length increased. All other dimensions and the maximum loaded weight remained the same as for the P.23B. No true prototype of the P.43 was built and the first production aircraft served as the development machine for the series.

Deliveries of the twelve P.43A's, powered by the 930 h.p. Gnome-Rhone 14 Kfs radial engine bought by the Bulgarians in France, were delayed until the end of 1937 because of difficulties experienced with the power plant. Over-heating and frequent fires were the main source of the troubles. Once these were resolved and the P.43A entered service with the Bulgarian squadrons, the machine gained an excellent reputation and a repeat order for 36 aircraft later increased by a further six to 42, was placed with P.Z.L. These aeroplanes, designated P.43B, differed from the first export version in having the improved 980 h.p. Gnome-Rhone 14 Nol radial engine in place of the earlier 14 Kfs. Deliveries were scheduled for the two middle quarters of 1939 and some 30 P.43B's were despatched to Bulgaria by September 1, 1939.

CONSTRUCTION AND EQUIPMENT

The Karaš was a three-seat low-wing cantilever

monoplane of all-metal structure. The wing, set at a slight dihedral angle, was built in three sections, and consisted of a two-spar centre-section built integral with the fuselage and two outer sections built on the previously described Miszta principle. The centre-section carried the undercarriage and was specially reinforced to serve as the framework for bomb racks. The wing was provided with slotted ailerons with an area of 1.93 m² (20.77 sq. ft.) and hand-operated split flaps with the maximum deflection of 45 deg. and area of 1.65 m² (16.68 sq. ft.). Total wing area was 26.8 m² (287.9 sq. ft.).

The main fuselage was an oval-section structure built up of a series of frames assembled by stringers, with the middle portion stiffened by struts. The frames were built of duralumin sheet and open sections. The rear fuselage was a duralumin semi-monocoque. The fuselage was covered with smooth duralumin sheet stiffened by "Z" sections. The stress-bearing portions of the skin were reinforced internally by corrugated sheeting. The pilot was seated in a fully enclosed heated and air conditioned cockpit, with the observer's seat, provided with detachable dual controls, behind. The observer, who was also bomb-aimer and gunner, could, after folding his seat, descend into the ventral gondola. The permanently-open dorsal gun position manned by a gunner was partly screened by a continuation of the cockpit covering.

The tail unit was a cantilever structure built up of spars and ribs. The fin and tailplane were covered with stress-bearing smooth duralumin sheet, while rudder and elevators had a cover of finely corrugated sheet with eight corrugations to an inch. The tail-plane was fixed and elevators were provided with trimming-tabs.



Operational Karaš A's of the Rumanian Air Force.
(Photo: via W. B. Klepacki)



Rare photograph of No. 41 Sqdn.'s P-23B's during the September Campaign. The aircraft are seen here at Zduńowo airfield; note white wing tips. (Photo: the author)

The landing gear of fixed tail-skid type consisted of two cantilever units incorporating the Avia 85200XB or XC oleo-pneumatic shock-absorbers and 775 x 240 mm. Dunlop DRG-AH423 medium-pressure wheels or corresponding indigenous *Stomil* tyres. The P.23B aircraft numbers 44 to 151 inclusive were provided with PZL 10681 pneumatic brakes, while the rest had Dunlop brakes. The legs and wheels were normally enclosed in streamlined fairings, but for operations from unprepared fields the wheel spats were usually removed. The tail-skid was fitted with Avia 30100PB oleo-pneumatic shock-absorber. The wheel track was 3.1 m. (10 ft. 2 in.).

The power plant consisted of the 570-590 h.p. PZL Pegasus IIM₂ (P.23A) or 660-680 h.p. PZL Pegasus VIII (P.23B) nine-cylinder radial air-cooled engine, driving a two-bladed fixed-pitch wooden Szomański B-17 II/b airscrew. Bulgarian machines were provided with the 930 h.p. Gnome-Rhone 14 Kfs (P.43a) or 980 h.p. Gnome-Rhone 14 Nol fourteen-cylinder radial air-cooled engine, driving a ground-adjustable three-bladed metal Gnome-Rhone airscrew. A Viet-type 250 starter was fitted as standard. The P.23's engine was enclosed in a P.Z.L. cowling with leading-edge exhaust collector ring, while the P.43 had an N.A.C.A. engine cowling. The fuel was

carried in six tanks with a total capacity of 740 litre (162.7 Imp. gallons) situated in the wing centre section and in the central box of the outer sections. A small 30 litre (6.59 Imp. gallons)-capacity gravity tank was fitted in the fuselage. The oil tank, with a capacity of 70 litres (15.39 Imp. gallons), was in the forward fuselage in front of the pilot's cockpit.

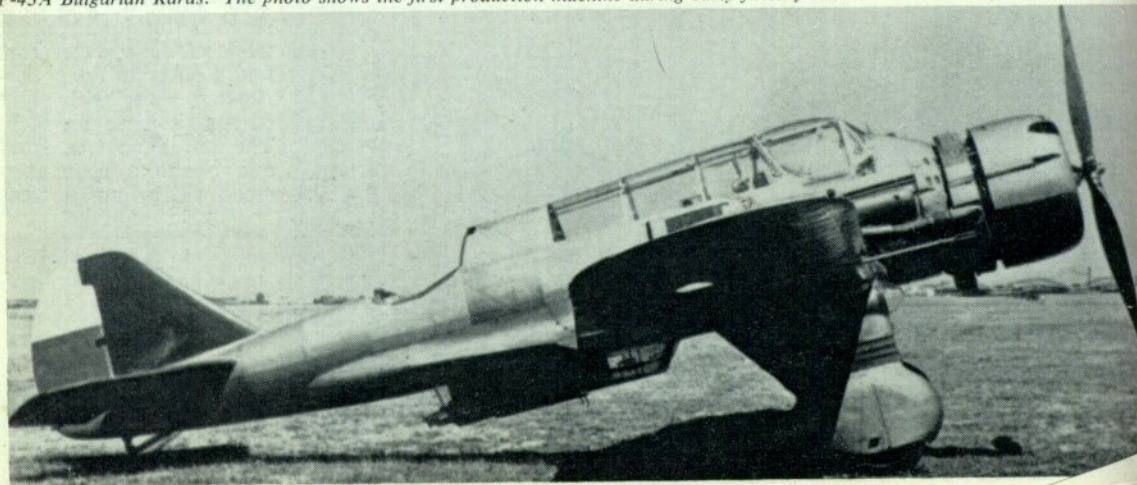
The armament comprised one 7.7 mm. Wz.33 fixed gun (P.23), or two 7.7 mm. Wz.36 fixed guns, one in each fuselage side (P.43), firing forward through the airscrew, and two single 7.7 mm. Vickers moveable guns with 600 rounds each in after position. Originally the installation of a twin-gun was envisaged in the upper position, but this was never fitted and both the P.23 and P.43 were provided with a single dorsal gun. This gun on a PZL-type hydraulic mounting, was retractable in the fuselage. The ventral gun, with angle of fire 60 deg. sideways and downwards, was fitted at the aft end of the gondola on a PZL-type hinge hydraulic mounting. A camera and bomb-release gear were mounted at the forward end of the gondola.

The bombload of up to 700 kg. (1,543 lb.) was carried externally on racks under the wing centre-section. Standard loads were six 100-kg. (220 lb.) bombs, eight 50-kg. (110 lb.) bombs, or twenty-four 12.5-kg. (27.5 lb.) fragmentation bombs, or combinations of these. Two flares were also carried. During operations in field conditions seldom more than 400 kg. (881 lb.) of bombs were lifted. Bomb-aiming gear of the RH-32 type was fitted, and on the P.23 Avia-manufactured release gear was used, while on P.43, on specific Bulgarian request, Swiatecki gear was employed for 12.5 kg. bombs. Electrical or manual release could be used.

Full all-weather equipment, with engine-driven electric generator, included two powerful searchlights fitted one in each landing gear fairing, the starboard light being fixed and port one steerable by the pilot. Polish Philips Works type NIL/L R/T wireless was specified as standard, but due to short supply only about three quarters of the P.23B's were provided with it at the outbreak of the Second World War. Other items of equipment included full oxygen installation and three automatic Salwa-A and one manual Salwa-Ra fire extinguishers.

P-43A Bulgarian Karaš. The photo shows the first production machine during early factory tests.

(Photo: the author)

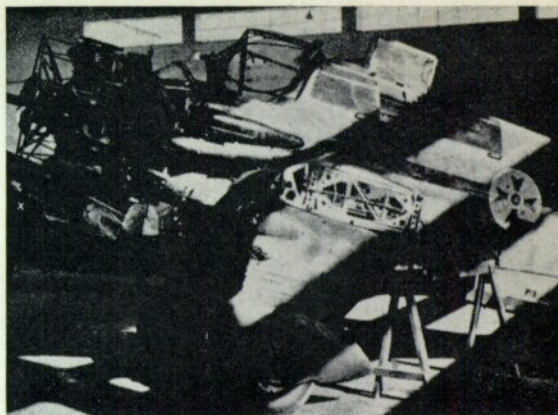


THE KARAŚ IN SERVICE

Because of the limitations imposed by shortcomings of the P.Z.L. Pegasus II engine all the P.23A's were equipped with fully duplicated controls and relegated to the operational training role. The machines were issued to squadrons in the third quarter of 1936 as conversion aircraft and the first of them were delivered to the 1st Air Regiment in Warsaw, where two *Karaś* army co-operation squadrons were being formed. Later, when re-equipment with the fully-operational *Karaś B* was well under way, all *Karaś A*'s were transferred to training establishments, most of them going to the Air Force Training Centre at Deblin.

First deliveries of the *Karaś B* commenced in the autumn of 1936, beginning again with the squadrons of the 1st Air Regiment. By the middle of the following year several *Karaś* squadrons, with a statutory strength of 10 aircraft each, reached full combat readiness and participated in various military exercises. On one such occasion P.23B's of the 1st Air Regiment flying in formation carried out live bombardment of a small railway station in the Brzesc region. By early 1938 seventeen *Karaś* squadrons were formed and deliveries of 200 P.23B's against the original order were approaching completion. Surplus in the Aviation Department's budget for the year ending in the winter of 1937-8 permitted purchase of an additional ten machines, bringing the total to 210. Even with this increase the reserve above the statutory strength of the combat units was only 40 aircraft. Due to wear and tear in extensive exercises conducted in realistic field conditions and withdrawal of some machines for routine maintenance, these slim reserves were quite insufficient to keep the units going at full operational strength and an average of only seven or eight P.23B's per squadron were serviceable at any given time.

To resolve this situation, during the re-organization of the air force in 1938 it was decided to disband five *Karaś* squadrons; two of the 1st (Warsaw), one of the 3rd (Poznań) and two of the 6th (Lwów) Air Regiments. The aircraft withdrawn from these units permitted the remaining twelve squadrons to operate at full strength and keep a marginal reserve of



Bulgarian P-43B, one of the last of the 42 produced, damaged during the German bombardment of the P.Z.L. plant in September 1939.
(Photo: via W. B. Klepacki)

equipment. It seems incredible that in spite of such an acute shortage of aircraft, which resulted in fully trained crews being completely idle, some 30 of the superior P.43B's were allowed to leave Poland for Bulgaria in the summer of 1939, in face of the imminent German attack.

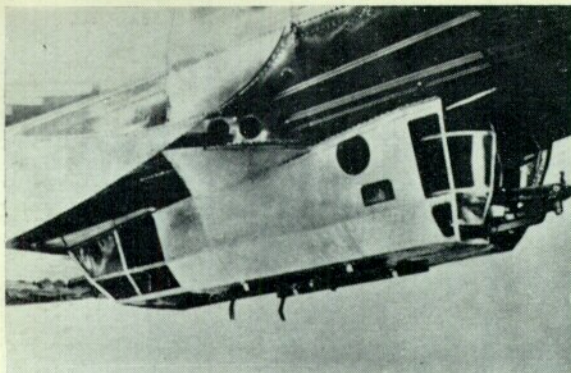
In 1938-39, for the first time since formation of the *Lotnictwo Wojskowe*, some attempts were made to work out a Polish air force doctrine and the usefulness of the *liniowe* ("front-line") squadrons was being re-examined. It was eventually decided to replace these units with separate light bombing and reconnaissance squadrons. Consequently the P.46 *Sum* aircraft, which were to succeed the *Karaś*, were to be specially equipped either for bombing or reconnaissance duties and in the expectation of deliveries of these to service early in 1940 *Karaś* squadrons were detailed to one or the other of the two tasks and began appropriate re-training.

In the spring of 1939 the first-line elements of the Military Aviation were regrouped to meet anticipated combat demands of the Polish High Command. Five *Karaś* squadrons (Nos. 21, 22, 55, 64 and 65) joined four *Los* squadrons to form the Bomber

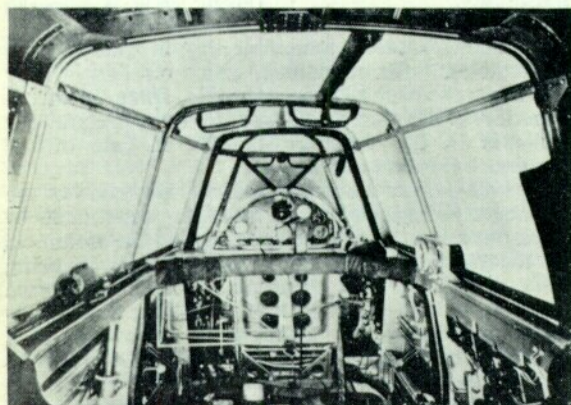
P-43A with modified air intake.



(Photo: via W. B. Klepacki)



Karaś ventral gondola. Wing fairings are removed on this photograph to show the control linkage which ran outside the cockpit and re-entered the fuselage aft of the rear gunner's position. (Photo: the author)



Karaś interior, looking forward toward control panel and the pilot's seat. (Photo: the author)

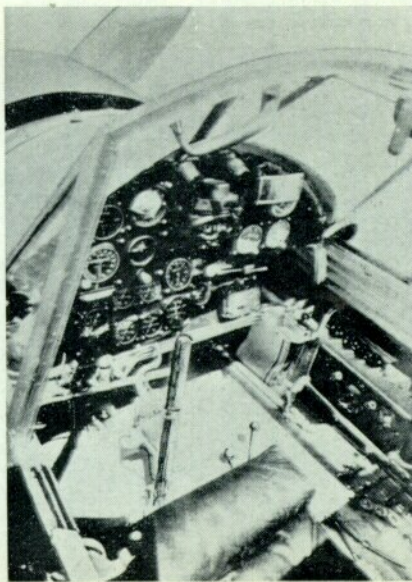
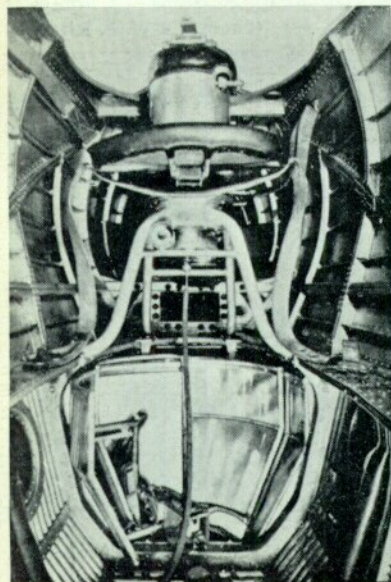
Brigade, an independent formation under direct orders of the C-in-C. of the Polish Armed Forces. The remaining *Karaś* squadrons were attached one each to seven land armies: No. 24 Sqdn. to Army Kraków, No. 31 Sqdn. to Army Karpaty, No. 32 Sqdn. to Army Łódź, No. 34 Sqdn. to Army Poznań,

No. 41 Sqdn. to Army Modlin, No. 42 Sqdn. to Army Pomorze and No. 51 Sqdn. to Independent Operational Group "Narew"; these units were completely subordinated to the armies' commands, their task being reconnaissance on the armies' behalf.

Between August 27th and 31st 1939, almost all squadrons were moved from their peace-time bases to secret combat airfields. All the units had ten P.23B aircraft each, except for No. 41 Sqdn., which had eight. Two supplementary *Karaś* B's were expected from the Warsaw base, but they did not arrive and on September 3rd No. 41 Sqdn. was asked to send crews to the P.Z.L.-W.P.I. at Warsaw Okecie, where eight Bulgarian P.43B's were ready for delivery, with the ninth (and last) leaving the assembly line. The following morning, just as the No. 41 Sqdn. crews reached Okecie to collect the aircraft, the *Luftwaffe* began a heavy air attack on the factory, severely damaging the plant and destroying three P.43B's prepared for take-off. In the event only the five remaining P.43B's, which had flown earlier to the well camouflaged Warsaw-Bielany airfield, went to No. 41 Sqdn., and operated alongside P.23B's throughout the rest of the September Campaign.

Despite their obsolescence, slow speed and limited lifting capabilities *Karaś* aircraft of the Bomber Brigade flew extensive bombing missions during the entire September Campaign, carrying out at least fifteen major bomber raids against the enemy's armour concentrations. On 2nd September eighteen *Karaś* aircraft of the Dyon VI/6 (Nos. 64 and 65 Sqdns.) made the first concentrated bombing attack on the Germans and inflicted heavy casualties, but only eleven aircraft returned and three of these were damaged on landing. The following day twenty-eight *Karaś* bombers from Nos. 21, 22 and 55 Sqdns. made three attacks on enemy armour in the Radomsko region, putting out of action some 30 per cent of the enemy's vehicles. Between 4th and 8th September some ten bombing raids were carried out, with the total of over 100 P.23B's taking part. These attacks alternating with heavy bombardments by *Luftwaffe* squadrons, were directed against German armour concentrations in the Radomsko-Piotrków sector of the central front and in the Pultusk region on the

northern front, and resulted in heavy losses to the German 10th Army Group's 4th Armoured Division and "Kempf" Armoured Division, but losses to the Polish bombers mounted quickly, and the pressure could not be kept up. Although operational sorties were still being flown in mid-September, these were of little significance as the number of airworthy machines was very small.



Karaś interior, looking aft toward dorsal and ventral gun positions; note that floor of upper position is not in place. (Photo: the author)

Karaś pilot's position. (Photo: the author)

P-23B Karas, No. 21 Sqdn., Bomber Brigade, September campaign, 1939.



No. 22 Sqdn.

P-23B Karas, No. 42 Sqdn., attached to Army Pomorze, 1939.



No. 21 Sqdn.



P-23B Karas, No. 22 Sqdn., Bomber Brigade, September campaign, 1939.



No. 42 Sqdn.



No. 64 Sqdn.



P-23A Karas, Deblin Training Centre, 1938-39.

P-23B Karas, No. 64 Sqdn., 6th Air Regiment, Lwow, 1938.



Roumanian national insignia; note broken white outline.



Bulgarian national insignia.

P-23A Karas, Roumanian Air Force, 1941-42.



Deblin Training Centre.

P-43A Karas, Bulgarian Air Force.





Rumanian Air Force P-23A in flight. Full armament is carried, but starboard searchlight has been removed. (Photo: via Michel Cristescu)

P.23B's of the Armies' Air Force were not put to the best use. Senselessly split into insignificant detached units, they were engaged mostly on reconnaissance and only very occasionally on bombing attacks which were generally rather ineffective. The tasks given to these squadrons by various army commands were often unrealistic. The crews, operating under continuous fire from German and Polish ground defences alike, did an excellent job bringing back accurate information about all major movements of the enemy but these were of limited practical value as the shattered and ill-equipped Polish armies were not in a position to counter the developing German attacks. If these seven *Karaś* squadrons had been employed in force on well co-ordinated bombing, they could have inflicted heavy casualties and slowed down the advancing German armour.

Contrary to the German propaganda claims, Polish aircraft were not destroyed on the ground in the first days of the campaign. The *Karaś B*'s fought valiantly in the Polish skies against overwhelming odds until 90 per cent of them were lost in the hopeless battle. Of the outgoing strength of 118 P.23B's and five P.43B's delivered as replacement, 112 machines were lost in the first sixteen days of September. Excluding three aircraft lost in landing on bombed landing fields, none of the *Karaś* were destroyed on the ground by the Germans until 14th September. Only on that and the following day did the *Luftwaffe*

manage to smash 19 *Karaś* aircraft on detected landing fields.

With the Russian "stab in the back" attack on Poland, all airworthy combat aircraft of the *Lotnictwo Wojskowe*, including eleven *Karaś B*'s, were evacuated to Rumania on 17th September. Operational training machines, including over thirty *Karaś A*'s, reached Rumania a day or two earlier. All these aircraft were later taken over by the Rumanian Government and impressed into service with the German-controlled Rumanian Air Force. The *Karaś* served with the Rumanian reconnaissance and operational training elements between 1940 and 1945. At least one P.23 was still flying in Rumania in 1946.

In spite of its limitations, resulting mainly from the wrongly formulated requirement, the *Karaś* will be always remembered as the pioneering venture of the young Polish aircraft industry into the new field of metal sandwich structure. Its design exercised a lasting influence on several later P.Z.L. models. The Bulgarian DAR-10F two-seat dive-bomber of 1941, evolved by Lazarov, was largely inspired by the *Karaś*; and even the Polish post-war TS-8 two-seat basic trainer, designed by a former member of Pruss's team, Dipl. Ing. Tadeusz Soltyk, and built in large quantities for the Polish Air Force in the years 1957-62, owes some aspects of its structure to the *Karaś* of over twenty years before!

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THE P.Z.L. KARASZ DATA TABLE

Designation	Power Plant	Dimensions			Weights			Performance		
		Span	Length	Height	Empty, Equipped	Loaded for Recon.	Loaded for Bombing	Max. Speed	Service Ceiling	Range
P.Z.L. P.23A <i>Karaś A</i>	1 × 570-590 h.p. P.Z.L. Pegasus II	13.95 m. 45 ft. 9½ in.	9.682 m. 31 ft. 9½ in.	3.30 m. 10 ft. 10¼ in.	1,750 kg. 3,857 lb.	—	—	310 km.h. 192.6 m.p.h.	Restricted to 3,000 m. 9,842 ft.	1,300 km. 807 miles
P.Z.L. P.23B <i>Karaś B</i>	1 × 660-680 h.p. P.Z.L. Pegasus VIII	13.95 m. 45 ft. 9½ in.	9.682 m. 31 ft. 9½ in.	3.30 m. 10 ft. 10¼ in.	1,928 kg. 4,250 lb.	2,893-3,138 (max.) kg. 6,377-6,918 (max.) lb.	3,495-3,526 (max.) kg. 7,704-7,773 (max.) lb.	319 km.h. at 3,650 m. (at 2,893 kg. weight) 198.2 m.p.h. at 11,975 ft. (at 6,377 lb.)	7,300m. (at 2,893 kg. weight) 23,949 ft. (at 6,377 lb.)	1,260 km. (at 2,893 kg. weight) 782 miles (at 6,377 lb.)
P.Z.L. P.43B <i>Karaś</i>	1 × 980 h.p. Gnome-Rhone 14 Nol	13.95 m. 45 ft. 9½ in.	9.95 m. 32 ft. 7½ in.	3.30 m. 10 ft. 10¼ in.	2,200 kg. 4,850 lb.	3,100-3,300 (max.) kg. 6,834-7,275 (max.) lb.	3,525 (max.) kg. 7,771 (max.) lb.	365 km.h. at 4,000 m. (at 3,100 kg. weight) 226.7 m.p.h. at 13,123 ft. (at 6,834 lb.)	8,500 m. (at 3,100 kg. weight) 27,887 ft. (at 6,834 lb.)	1,400 km. (at 3,100 kg. weight) 869 miles (at 6,834 lb.)

P.23A and P.43B data quoted are the official factory data, guaranteed within 5%.
P.23B data from Service Handbook—factory data quoted the max. speed 340 km.h. (211.2 m.p.h.)