THE ČMELÁK (BUMBLE-BEE) AGRICULTURAL AIRCRAFT Z-37

As a result of 20 years experience of agricultural aviation, Czechoslovak aircraft designers with the full co-operation of agricultural operators in Czechoslovakia as well as abroad, have built a new and efficient agricultural aeroplane, the Z-37 "Čmelák" or Bumble-bee. This machine is fast becoming known throughout the agricultural aviation for its efficiency and versatility. Not only can it be used for the distribution of fertilizers, pesticides, etc. over field and forest, and for seed sowing but, in addition, it can be quickly adapted for freight and passenger carrying. It also can be converted easily into a flying ambulance.

The short take-off and landing run, the sturdy undercarriage, the spacious cockpit, these are features appreciated by every pilot. The ease with which the aircraft can be converted from a „flying tractor" to a safe and unpretentious transport combining many of the advantages of a helicopter with those of the traditional fixed-wing aircraft certainly will be appreciated by every operator. In its concept and performance, this is the ideal addition to the present range of modern farm machinery.

Z-37


OK-UJF
Čmelák

Brief Description

Z·37

The aircraft is an all-metal, low-wing, cantilever monoplane. At the rear of the fuselage only and on the rudder the metal skin is replaced by a special tesil fabric. The entire aircraft is corrosion-proofed against the effects of chemical substances. The view from the comfortable cockpit is excellent. The cockpit also is equipped with a most efficient heating and ventilating system, and is sealed against the penetration of chemicals. Air admitted to the cabin is first passed through a filter so as to remove all chemicals.

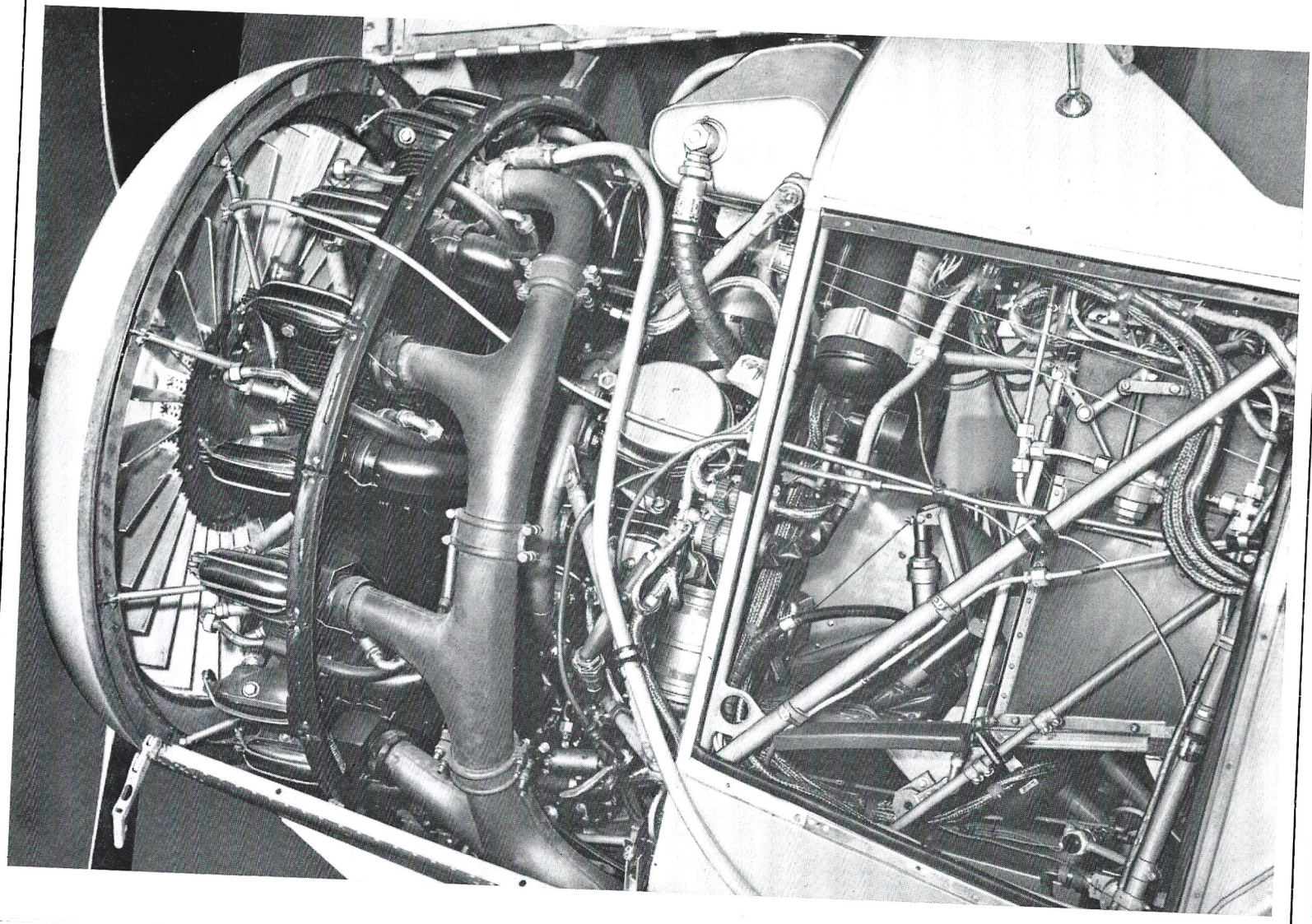
The chemical tank is located behind the pilot's seat. In the interest of safety, the tank attachments have been stressed to take 24 g. Behind the tank is a seat for a mechanic.

The instrument panel has a complete set of flight and engine instruments. An additional instrument not found in many other agricultural aircraft is an indicator to show the weight of chemical remaining in the tank. The stall warning indicator also is standard.

The layout of the standard instruments is such that, although fully comprehensive, there is still ample space for the installation of any extra instruments that may be required by the operator.

The wings have fixed slats which improve the efficiency of the ailerons and result in lateral control being retained down to and even below the stall. Provision is made in the wings for the installation of two fuel tanks, one in each wing, with a capacity of 125 l. (27.5 imp. gals.) each.

The M 462 RF radial engine:



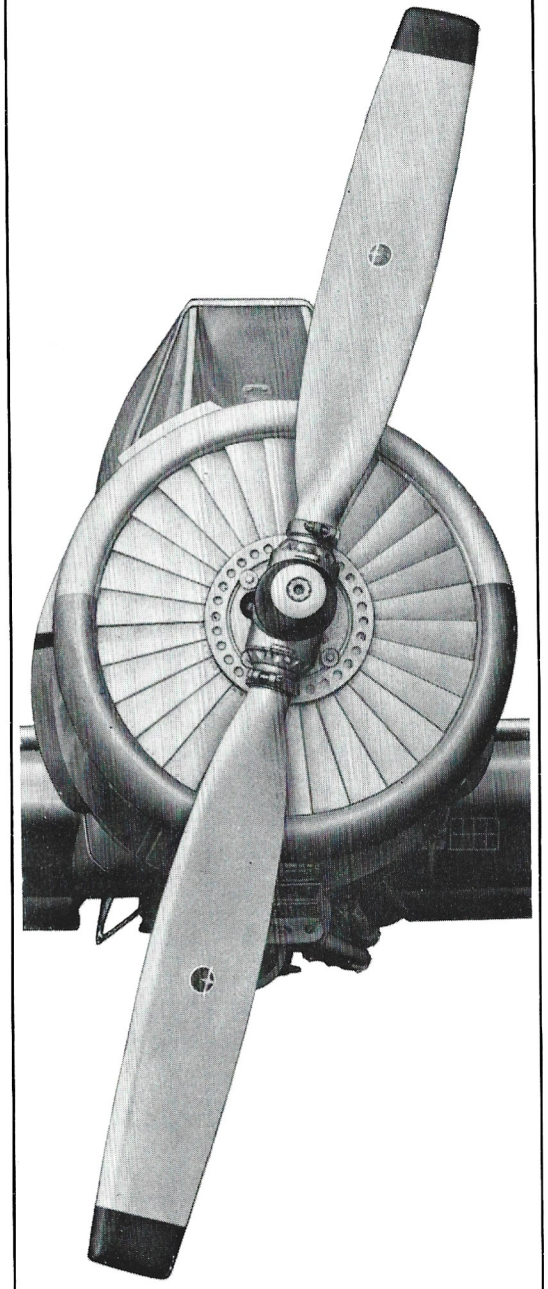
Take-off power (max. 5 mins.)
315 BHP at 2,450 RPM

Rated power
280 BHP at 2,200 RPM

Economic cruise power
195 BHP at 1,900/1,950 RPM

Normal operating power
195–245 BHP at 2,000 RPM

Z-37



The engine drives a two-bladed, variable pitch propeller.

The sturdy fixed undercarriage is of conventional oleo-pneumatic design and allows operation from practically any surface – sand, stones, mud, etc.

modern farm machinery.

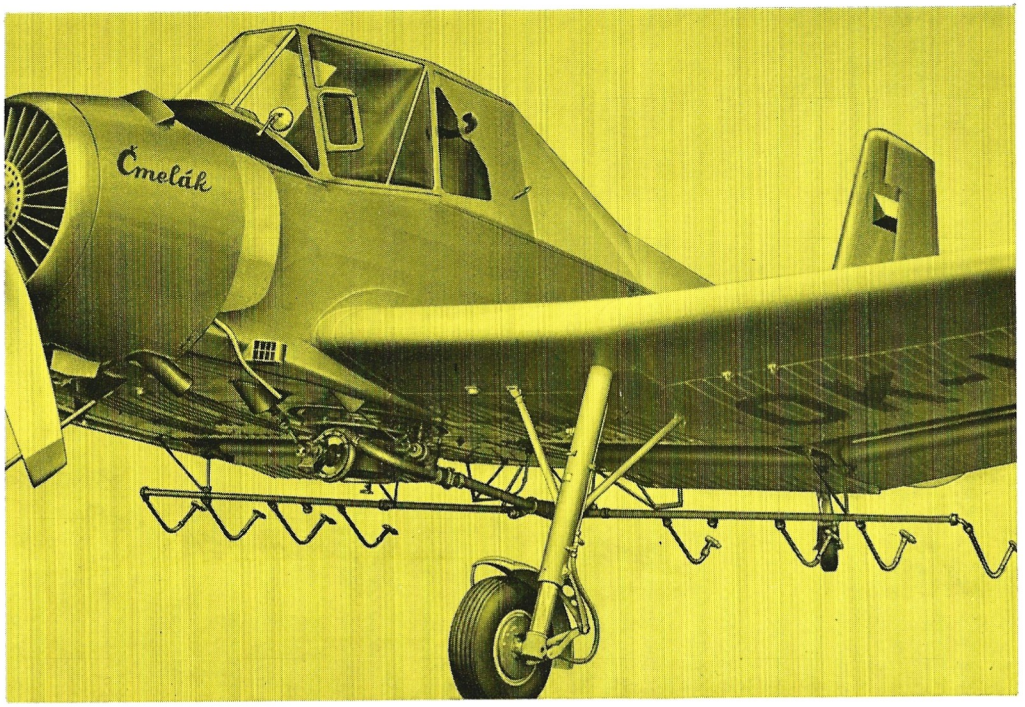
◀ Dusting and instantaneous full discharge of chemicals.

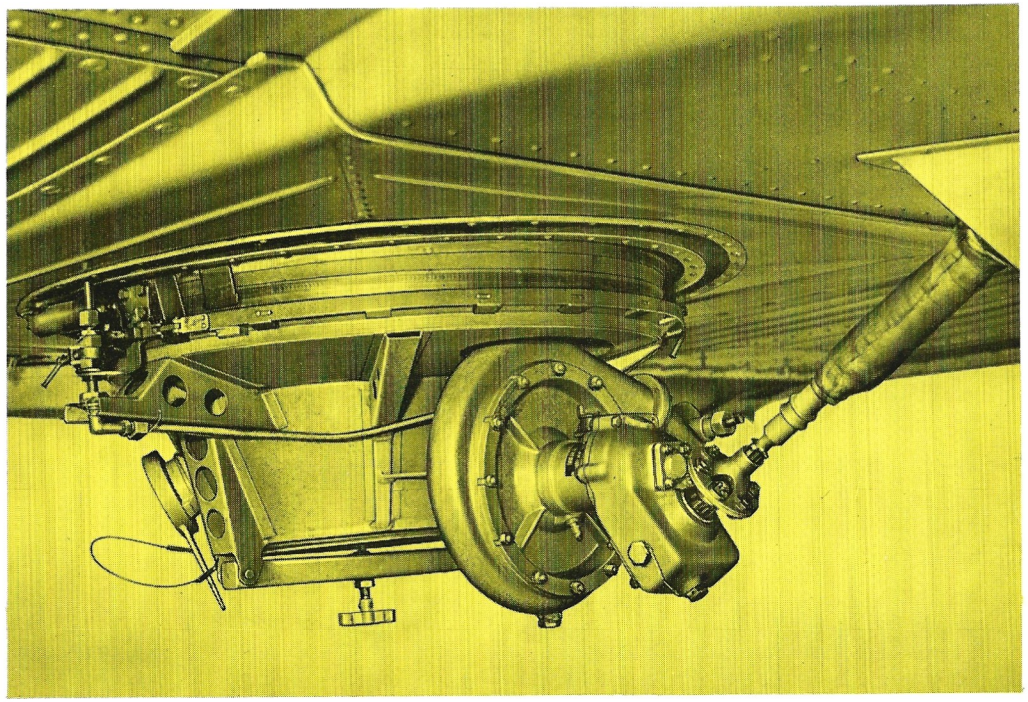
The agricultural equipment

consists of:

1. Chemical tank with a capacity of 650 l. (143 imp. gals.)
2. Mechanical drive
3. Dusting equipment
4. Spraying equipment
5. Spreader.

This equipment is controlled by push-buttons on the control column and the throttle which allows the pilot to concentrate fully on the safe flying of the aircraft while at the same time carrying out the job for which the aircraft is intended.





Spraying equipment and details of the pump. ▶

◀ Dusting Equipment

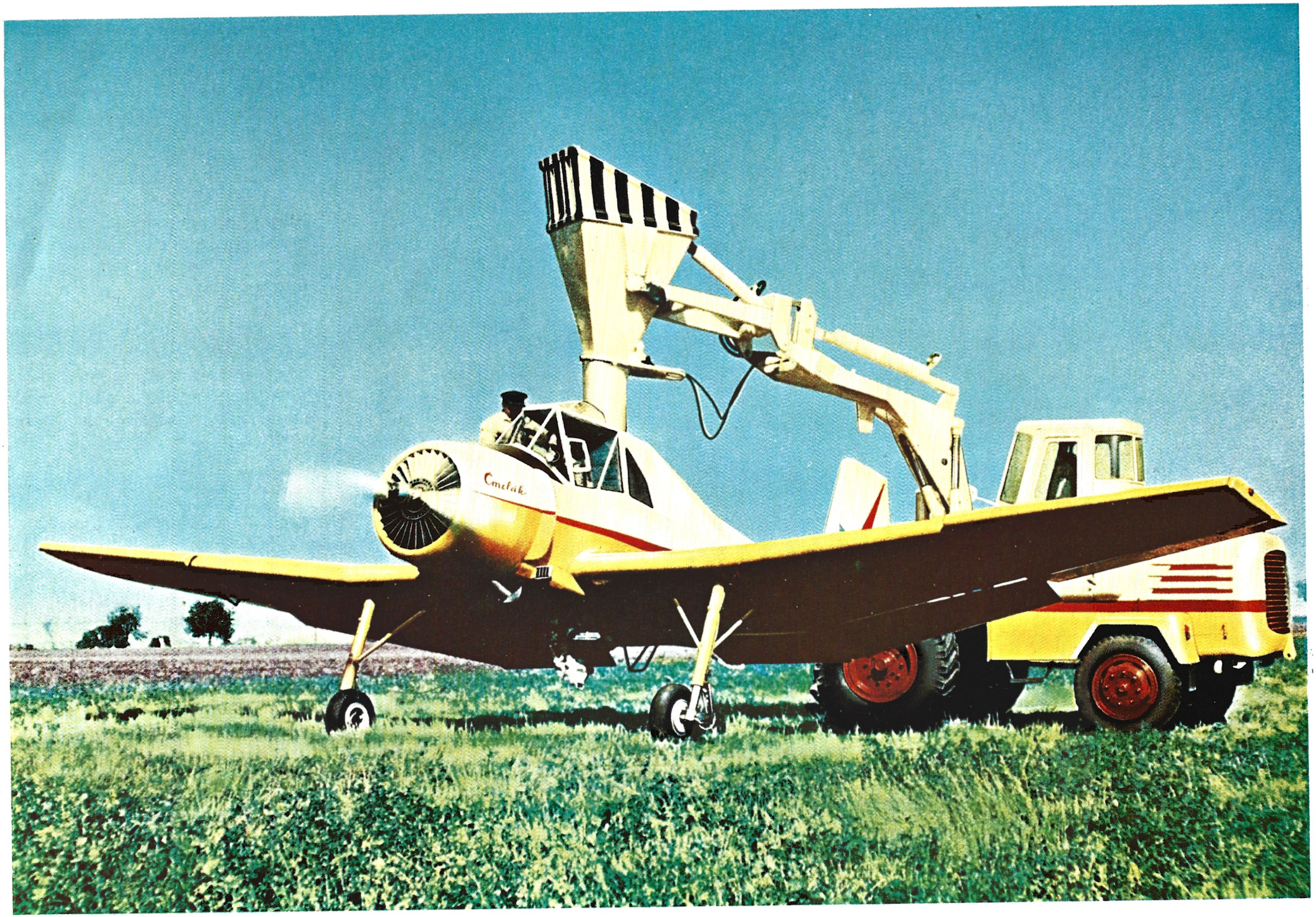
◀ Spreader

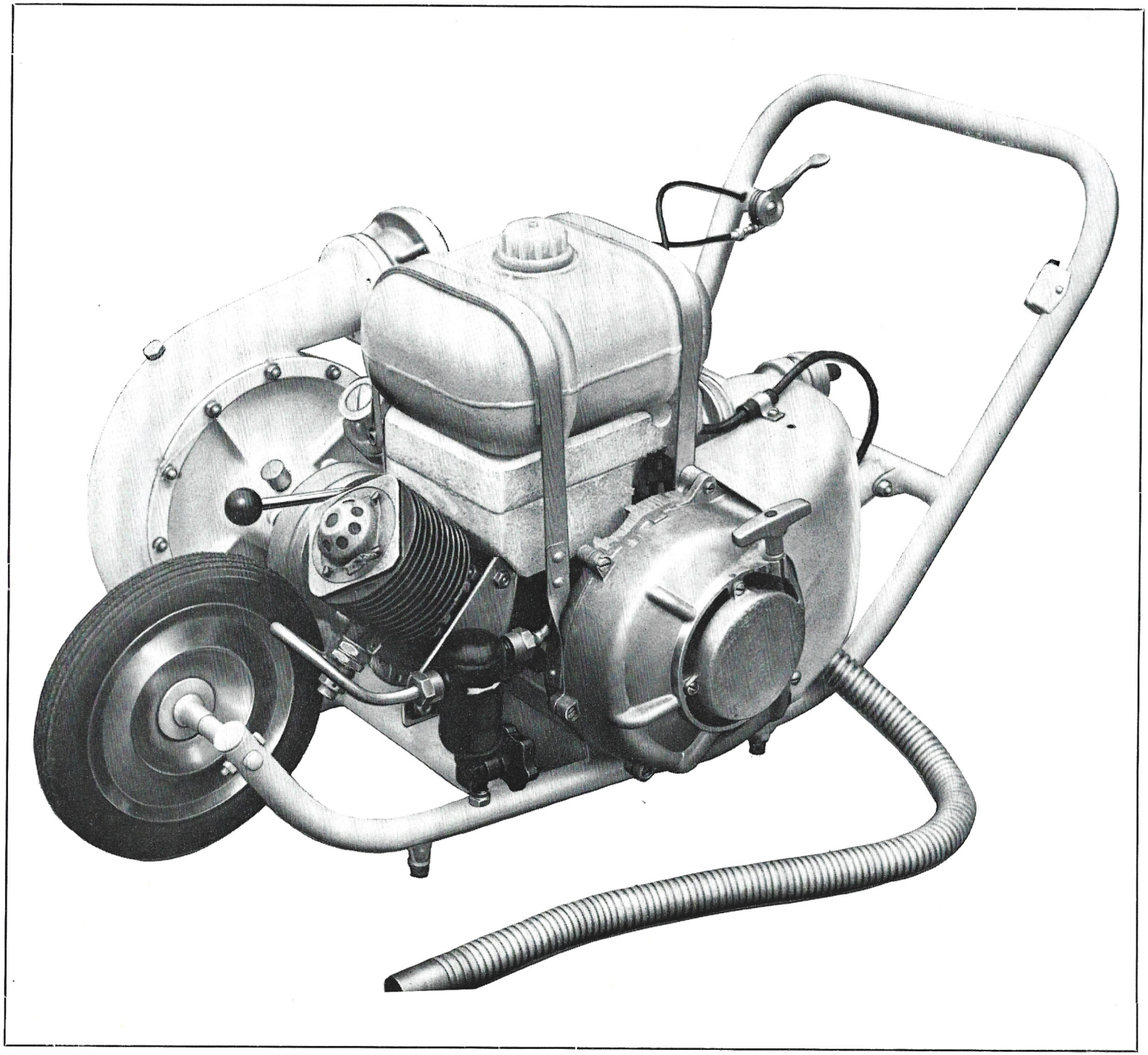
The HON 050 hydraulic loader with the LN 2.00 loading hopper is intended primarily to cater for those occasions when several aircraft are being operated at the same time. When used for loading loose chemicals, it is an easy matter to check the size of each load as the hopper is fitted with a weighing device. A driver's cab and a crusher for use in breaking up solidified chemicals also are available. The loader is highly manoeuvreable, even with the hopper fully loaded and operating on soft ground. With a little organization, one loader can supply the needs of three aircraft, operating at the same time.

The HON 050 loader is a truly versatile machine. It can be used for other purposes simply by changing the hopper for another implement as a shovel, hook, scraper, etc.

Technical Data:

Engine power output – 50 BHP
Max. speed – 20 KPH (12½ m.p.h.)
Jib traverse – 180°
Control system – hydraulic
Max. hopper load – 600 kg (1,320 lb.)
Aircraft tank filling time – max. 60 secs.


Čmelák



The PA 100 Filling Set is designed for loading the aircraft with liquid chemicals. It also can be used for refuelling the aircraft, recharging the air-pressure cylinder and washing down the aircraft with water.

A low weight – less than 40 kg (88 lb.) – and small size enable the Set to be carried in the aircraft behind the chemical tank or on a special bracket which can be attached under the fuselage.

The Set is driven by a two-stroke engine and can carry out any two functions simultaneously. For instance, while refuelling the aircraft, the air-pressure cylinder also can be re-charged.

Engine type: Manet

Water and chemical pump: centrifugal type OC with an output of 600 l. per min. (7,920 imp. g. p. h.) at 0.5 atm. (7.3 lb./sq in.) pressure

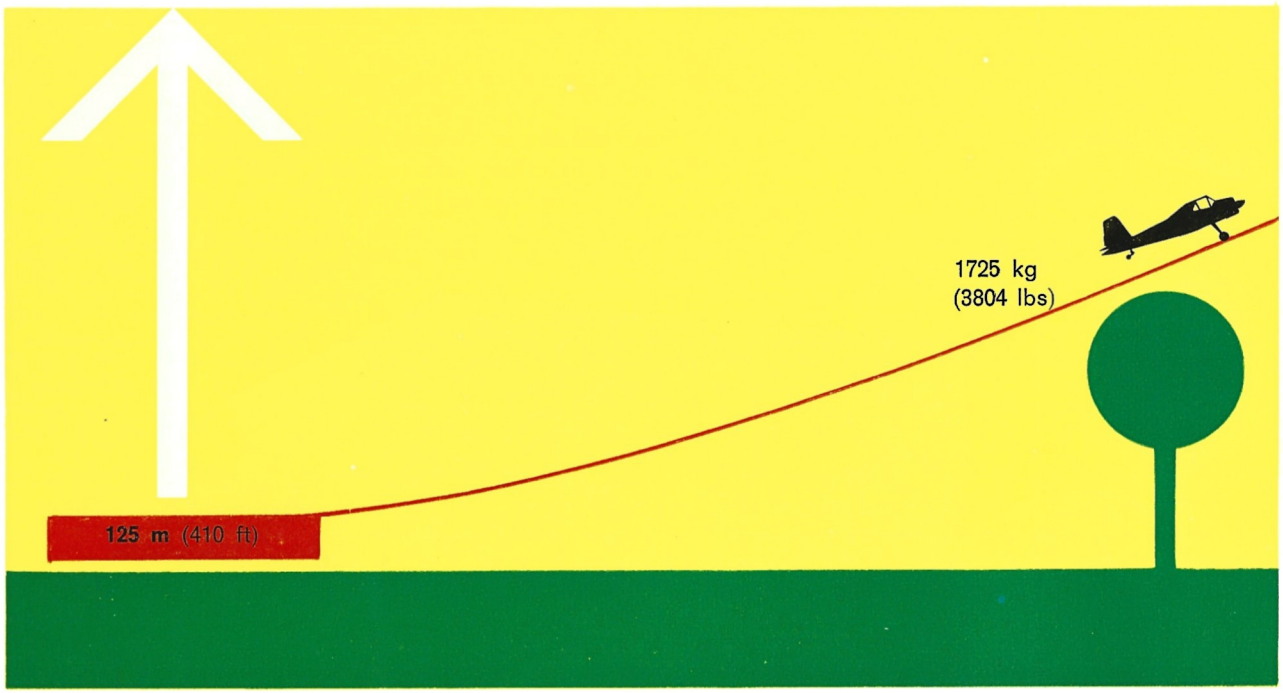
Power output: 5 BHP

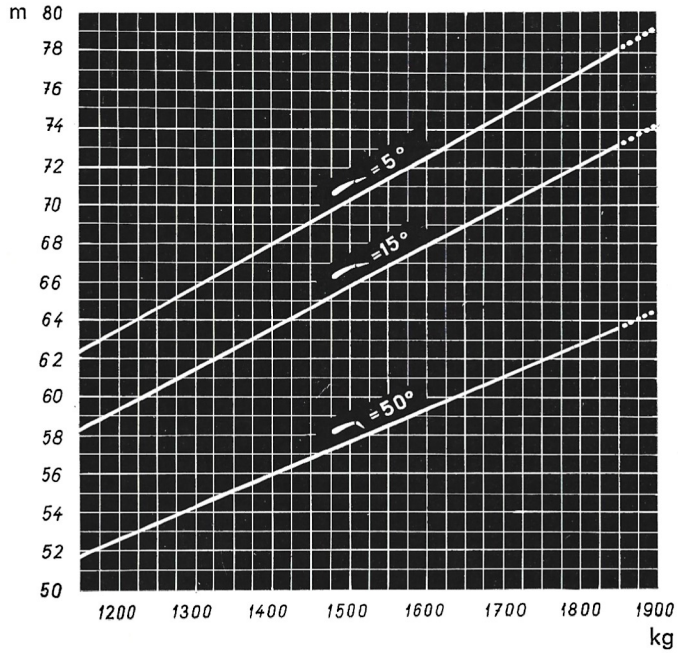
Fuel Tank capacity: 3.1 l. (0.68 imp. gal.) – vane type fuel pump of 60 l. per min. (792 imp. g. p. h.) capacity at 0.3 atm. (4.4 lb./sq. in.) pressure

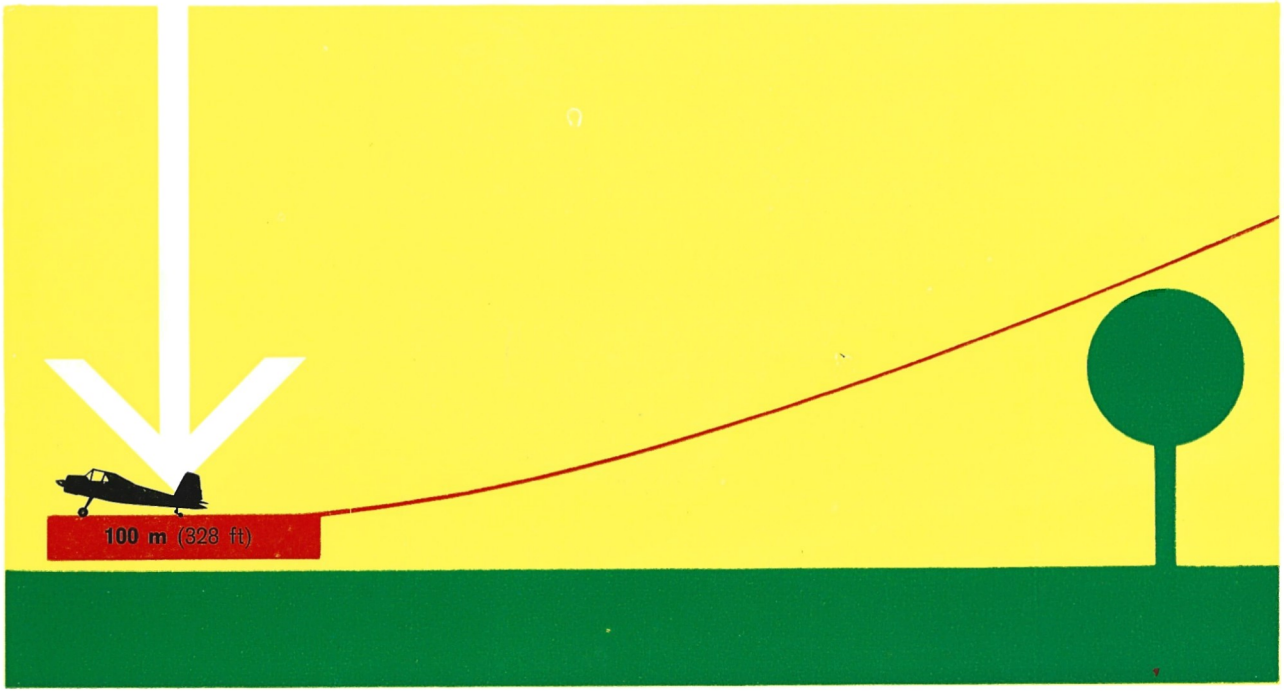
Compressor: piston type, model AK 50 M

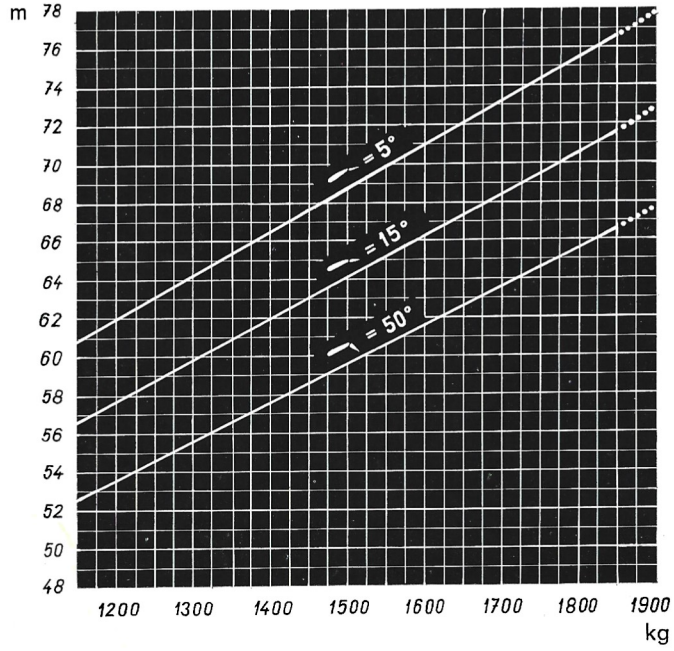
Z-37

Tool Box:
Available on special order. Contains all tools necessary to carry out running and routine repairs. The tools are packed in the box in such a way that, while they are always readily accessible, the size of the box has been kept small enough for it to be carried in the aircraft to the operating site.


1725 kg
(3804 lbs)
125 m (410 ft)


m
80
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
=5°
=15°
=50°
1200
1300
1400
1500
1600
1700
1800
1900
kg


100 m (328 ft)


m
78
76
74
72
70
68
66
64
62
60
58
56
54
52
50
48
=5°
=15°
=50°
1200
1300
1400
1500
1600
1700
1800
1900
kg

Stalling speeds
of the freight, spreading and spraying versions with idling engine.

Stalling speeds
of the dusting version with idling engine.

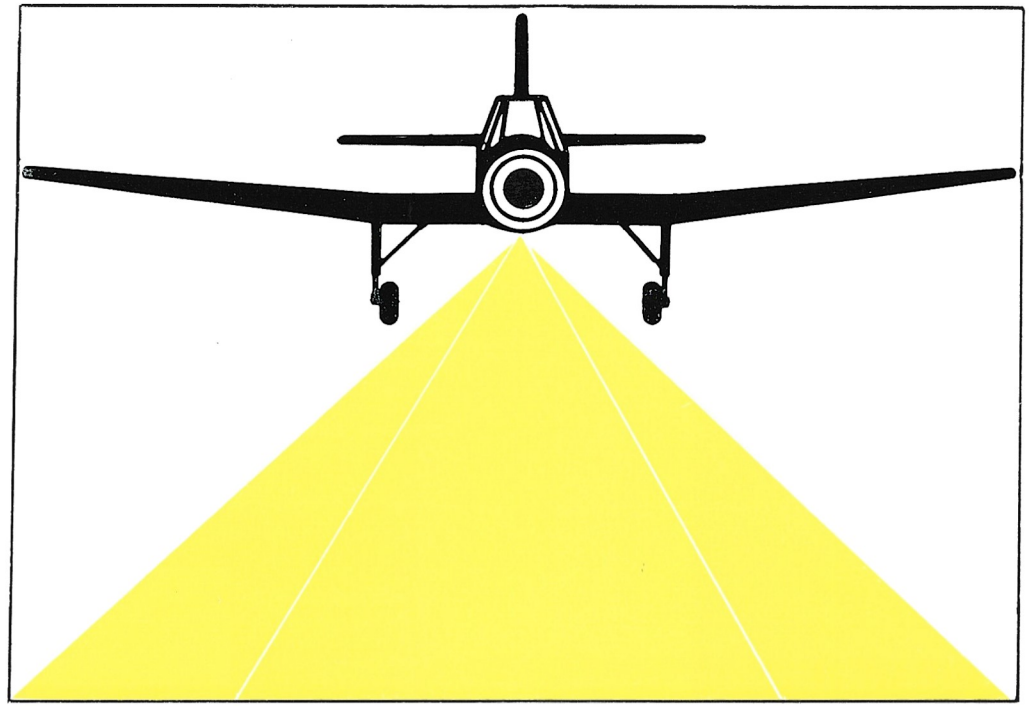
AGRICULTURAL OPERATING DATA

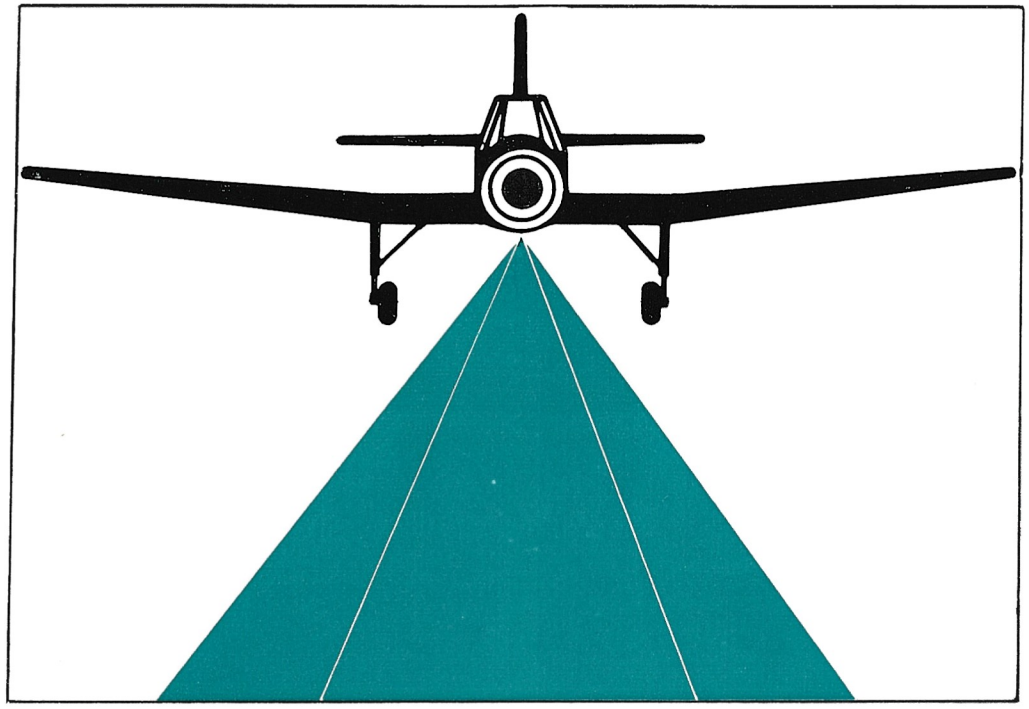
Characteristics Nature of the operation	Dusting	Spreading	Spraying Oil	Spraying Water
Best flying speed km/hr	120	120	120	120
Operating height, m	5	5–20	5	5
ft	16.4	16.4–65.6	16.4	16.4
Maximum distribution width, m	60	35–40	60	55
ft	197	115–131	197	180.5
Effective width, m	40	20–25	35	20
ft	131.2	65.6–82	115	65.6
Range of application rate per 1 sec. kg	0.7–6	2.0–20	0.3–2 l	2.0–12 l
lbs	1.54–13.2	4.4–44	0.31–2.1 quarts	2.1–12.7 quarts
Adjustment of application rate within the range given in the previous line	Continuous adjustment	Continuous adjustment	Accurate to within 0.1 l per sec. (6 imp. g.p.min.) in the range 0.3 to 1.0 l per sec. (3.96 to 13.2 imp. g.p.min.) and to within 0.3 l per sec. (3.96 imp. g.p. min.) in the range 0.0 to 2.0 l per sec. (0 to 26.4 imp. g.p.min.)	Continious adjustment
Accuracy of application rate	± 10 %	± 10 %	± 10 %	± 10 %
Uniformity of dose across distribution width	± 30 %	± 40 %	± 25 %	± 25 %
Characteristics of distributed particles	Powder chemicals of DDT type with filling substance (pulverised talc, chalk)	Granules and crystals of 0.5 to 5 mm (0.02 to 0.2 in.) and occasionally up to 20 mm (0.8 in.)	Oil solutions, emulsions and suspensions	Aqueous solutions, emulsions and suspensions
Size of minimum 2/3 particles	–	–	40 to 120 µ	100 to 500 µ

Economic Agricultural Operation

Due to variations in currency exchange rates and different national economic conditions, it is not really a very practical exercise to try to evaluate this aircraft in absolute economic terms. However a useful indication of its economy of operation can be obtained by making a comparison with doing the same job by traditional methods. The following are the results of such a comparison:

- Spraying with aerosols at a dose rate of 5 l per ha (0.44 imp. gals per acre) the Z 37 aircraft will do the job up to 30 times faster when compared with ordinary ground methods, and the direct operating costs for the treatment of 1 hectare (2.471 acres) are 75 % less.
- For spreading granulated fertilizers at a dose rate of 60 kg per hectare (53.42 lb. per acre), the Z 37 aircraft will do it 25 times faster, and the direct operating costs are 50 % less than when done by traditional methods.
- When spraying with aqueous solutions at a dose rate of 100 to 200 l per hectare (40–80 imp. gals per acre), the Z 37 aircraft will do it 10 times faster, and the direct operating costs will be 30 % less.
- Even at application rates of 300 to 500 kg per hectare (approx. 250 to 450 lb. per acre) the Z 37 aircraft will do it at least 5 times faster, and the direct operating costs do not exceed those of the more traditional methods.



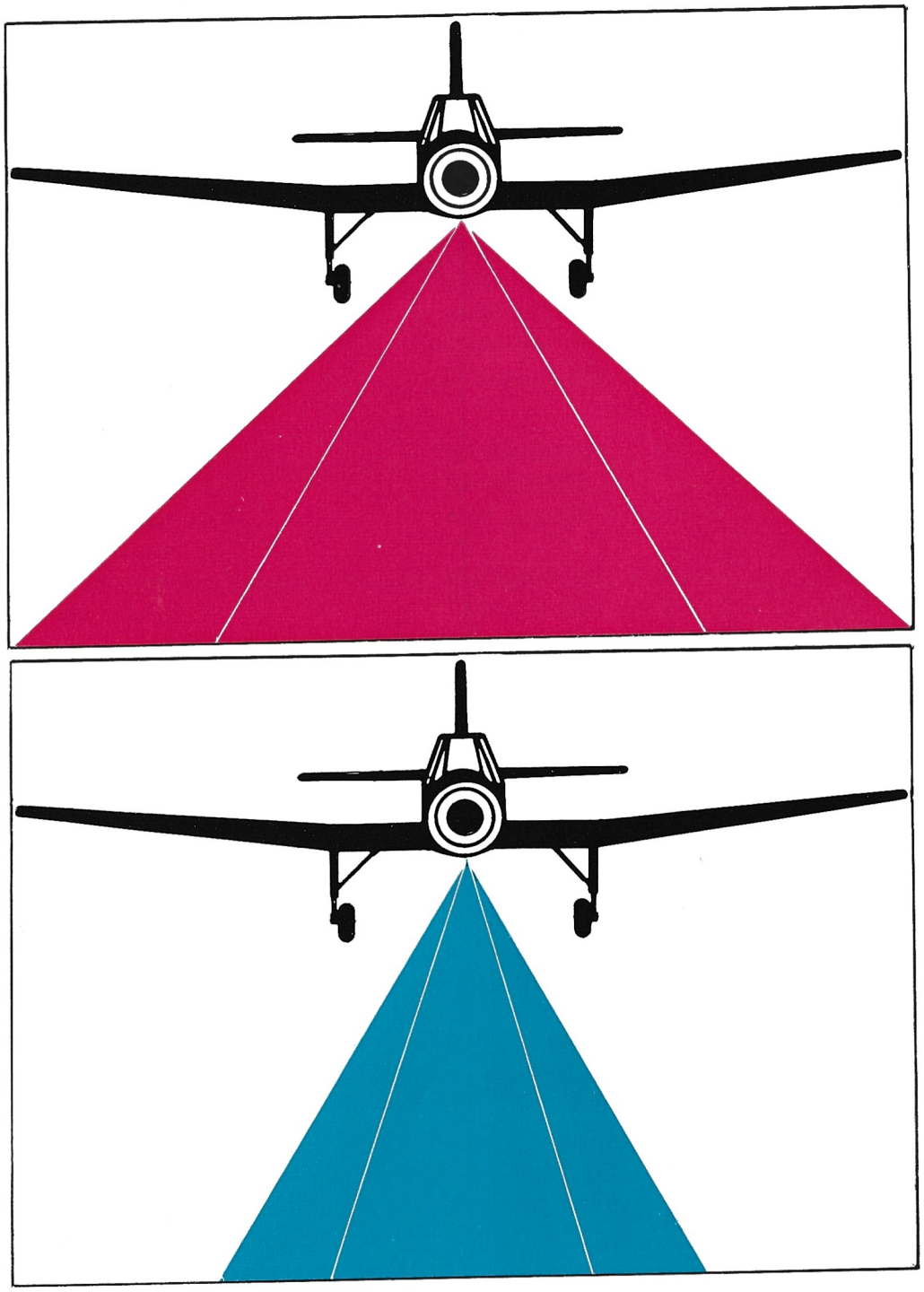


Dusting:
Effective width of application:
40 m
131 ft.
Range of application rate:
0.7–6 kg/sec.
1.54–13.2 lb./sec.

Spreading:
Effective width of application:
20–25 m
65.6–82 ft.
Range of application rate:
2–20 kg/sec.
4.4–44 lb./sec.
Size of particles:
0.5–5 mm

Oil spray:
Effective width of application:
35 m
115 ft.
Range of application rate:
0.3–2 l
0.31–2.1 quarts.
Size of particles:
40–120 μ

Water spray:
Effective width of application:
20 m
65.6 ft.
Range of application rate:
2–12 l
2.1–12.7 quarts.
Size of particles:
100–500 μ



Specification

Diagram a:

Take-off distance required

Wing flaps 15° – Freight version

The take-off distance required from rest to the 15 metres height point with wing flaps extented to 15° for varying air temperatures, aerodrome altitudes, take-off weights, reported wind components, and uniform runway slopes.

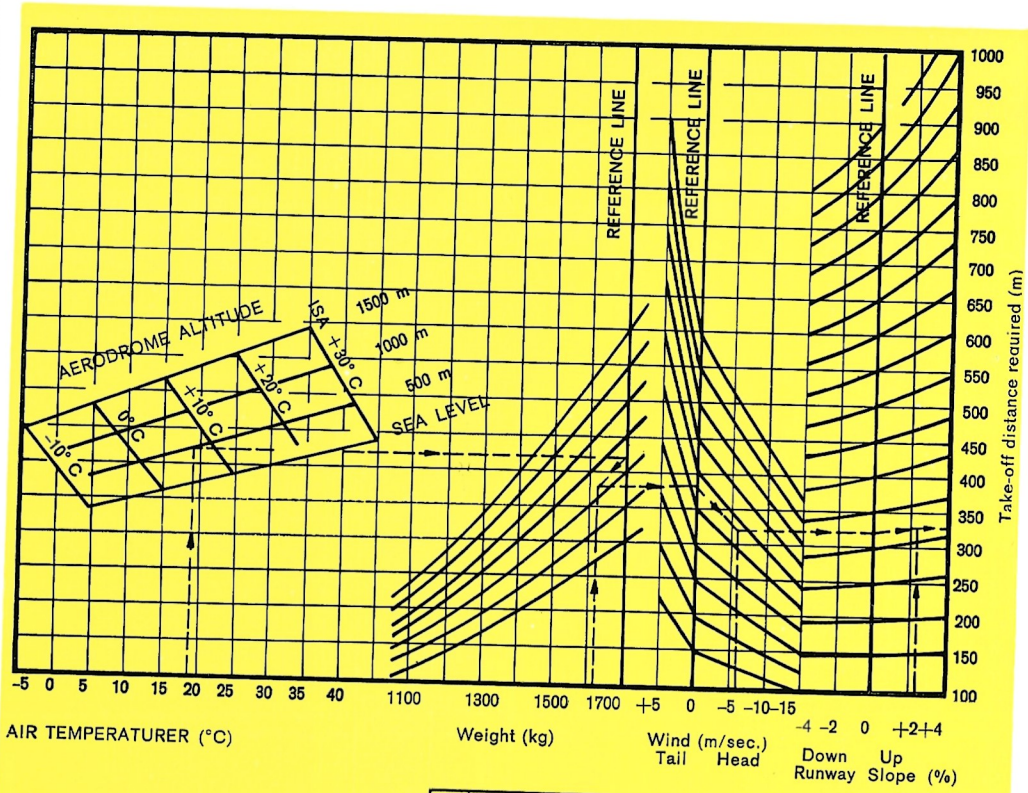
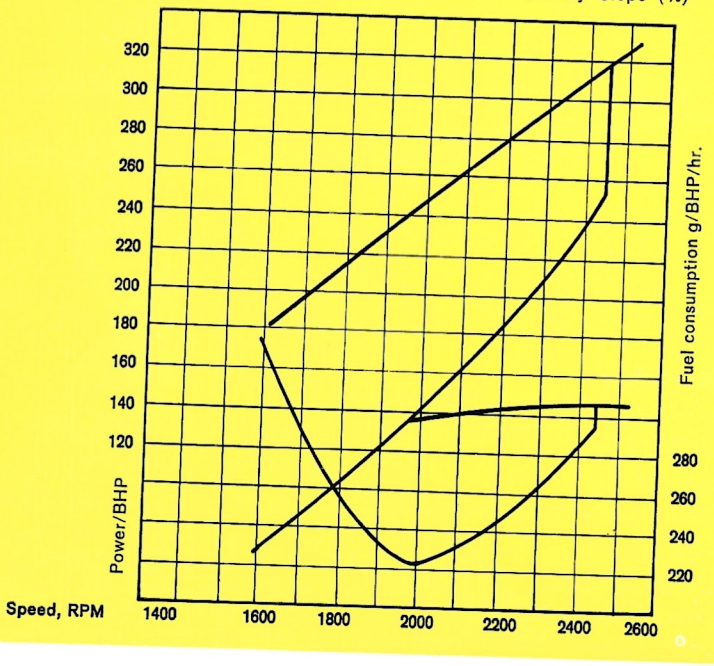


Diagram b:

Power curves for the type M 462 RF engine with V 520 propeller



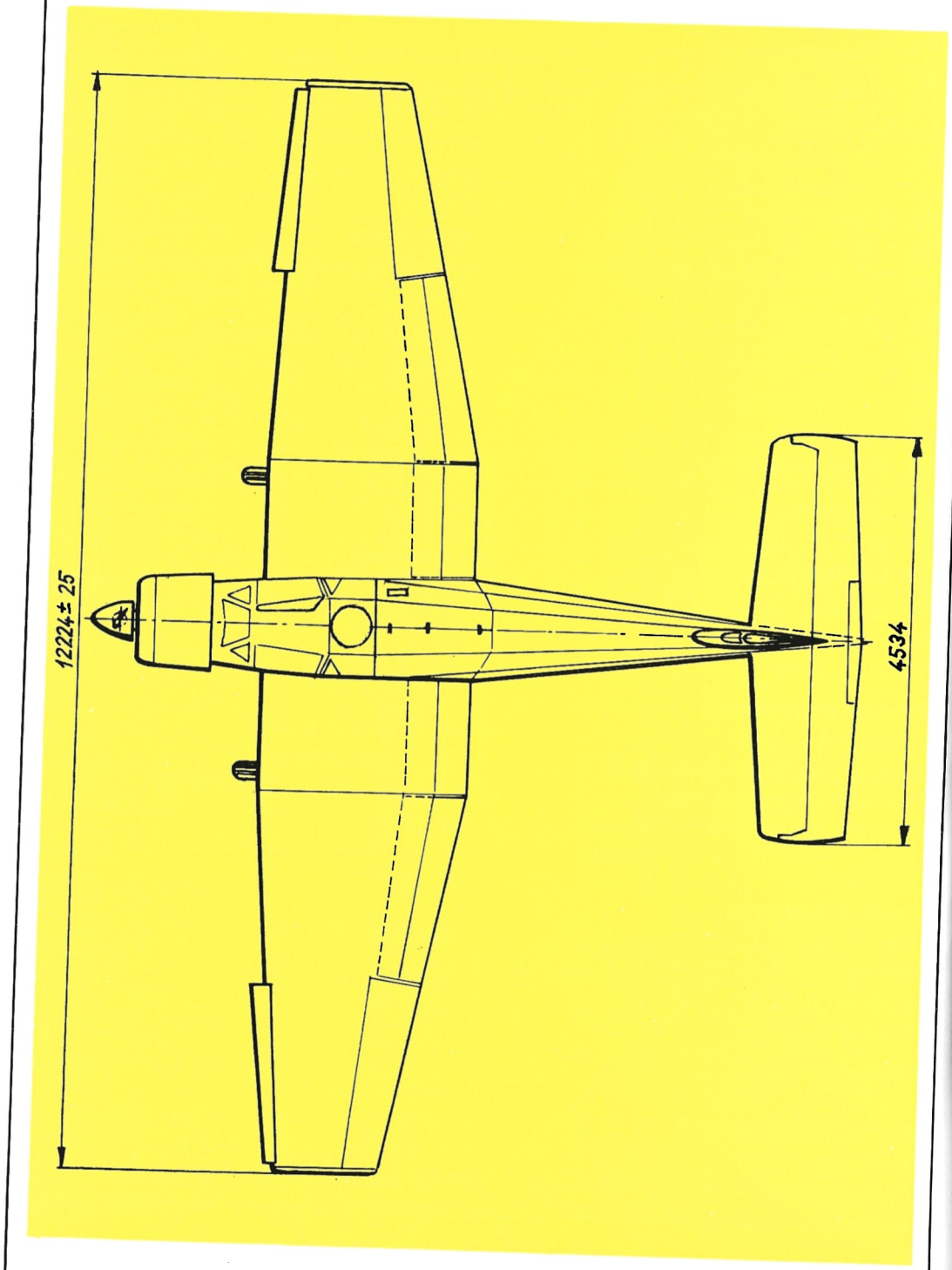
Engine:	
Type	M 462 RF radial piston engine fitted with a carburetter
Cooling system	air
Number of cylinders	9
Swept volume	10.16 cu. dm (620 cu.in.)
Reduction ratio	0.787
Take-off power	315 BHP – 2 %
Specific fuel consumption	220 g (0.48 lb.) per BHP per hr. at cruise power
Propeller:	
Type	V 520, all-metal, hydraulically operated constant-speed
Number of blades	2
Diameter	2,700 mm (8 ft. 10 in.)
Governing range	1,730 to 2,450 RPM
Fuel System:	
Number of tanks	1 or 2
Tank capacity	125 l (27.5 imp. gals.) each
Oil system:	
Number of tanks	1
Tank capacity	17.3 l (3.8 imp. gals.)
Pneumatic system:	
Compressor type	AK-50 M piston type
Pressure cylinder capacity	12 l (2,75 imp. gals.)
Pressure in main system	55–3 kg per sq. cm (782.3–42.67 lb./sq. in.)
Operating pressure in flap and agricultural equipment circuits	30+5 kg per sq. cm (426.7+71.1 lb./sq. in.)
Electrical system:	
Type	single conductor, d.c.
Voltage	28 V
Dynamo output	1,500 W
Battery capacity	10 Ah
Undercarriage:	
Type	non-retractable
Shock absorbers	oleo-pneumatic, two-chamber type
Tyre size	556×163 mm (21.9×6.5 in.)
Tyre pressure	2.25 kg per sq. cm (32.6 lb./sq. in.)
Brakes	hydraulically operated, internally expanding shoe-type

Tail Wheel:	
Type	non-retractable, directionally controllable
Shock absorber	oleo-pneumatic, two-chamber type
Tyre size	290×110 mm (11.4×4.3 in.)
Tyre pressure	2.85 kg per sq. cm (40.53 lb./sq. in.)
Dimensions:	
Wing span	12,224±25 mm (48 ft. 1¼ in.±1 in.)
Length	8,550±30 mm (28 ft. 0½ in.±1¼ in.)
Height	2,898±30 mm (9 ft. 6 in.±1¼ in.)
Tail plane span	4,534 mm (14 ft. 10½ in.)
Wing area	23.8 sq. m (256 sq. ft.)
Wing section:	
– root	NACA 33015
– tip	NACA 43012 A
Undercarriage width	3296 mm (10 ft. 9¾ in.)
Landing angle	13°
Minimum propeller ground clearance	350 mm (1 ft. 1¾ in.)
Freight volume	1.8 cu. m (63.6 cu. ft.)
Weight and C. of g.:	
Aircraft empty weight with standard equipment	985 kg (2,180 lb.)±1.5 %
Useful load	865 kg (1,910 lb.)
Agricultural equipment weight	95 to 165 kg (210 to 364 lb.) according to role
Maximum chemical load	600 kg (1,323 lb.)
Maximum take-off weight	1,850 kg (4,080 lb.)
Ratio of chemical weight to aircraft maximum weight	32.4 %
Ratio of useful load to aircraft maximum weight	46.8 %
Wing loading	77.7 kg per sq. m (15.93 lb./sq. ft.)
Maximum take-off weight in transport role	1,725 kg (3,804 lb.)
Payload in transport role	450 kg (992 lb.)
Empty weight centre of gravity	23.5 % MAC
Aft limit of centre of gravity	31 % MAC
Forward limit of centre of gravity	23 % MAC

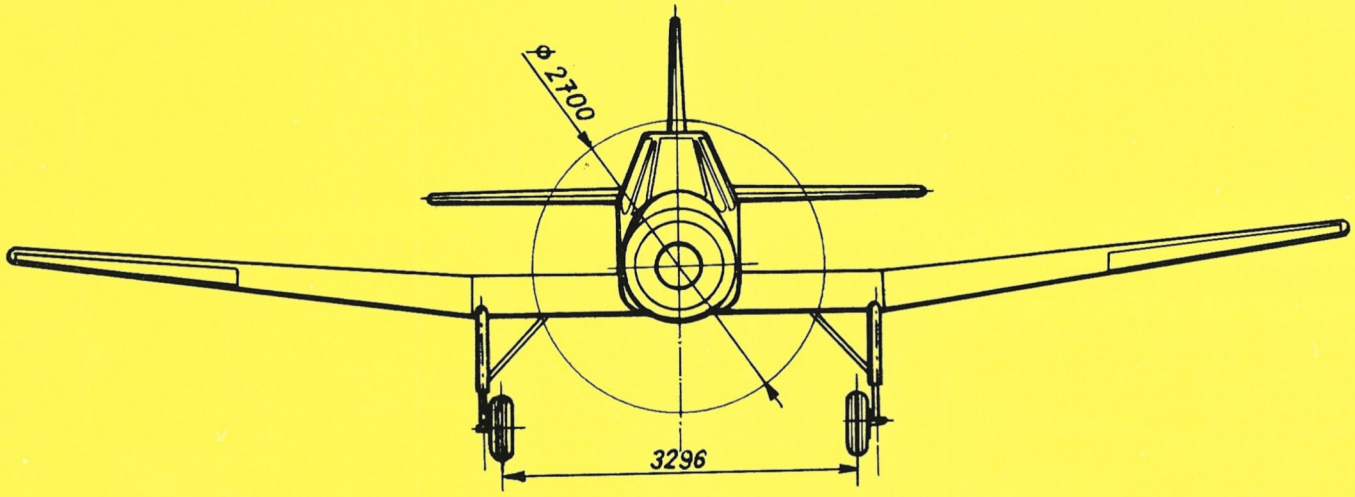
Performance:

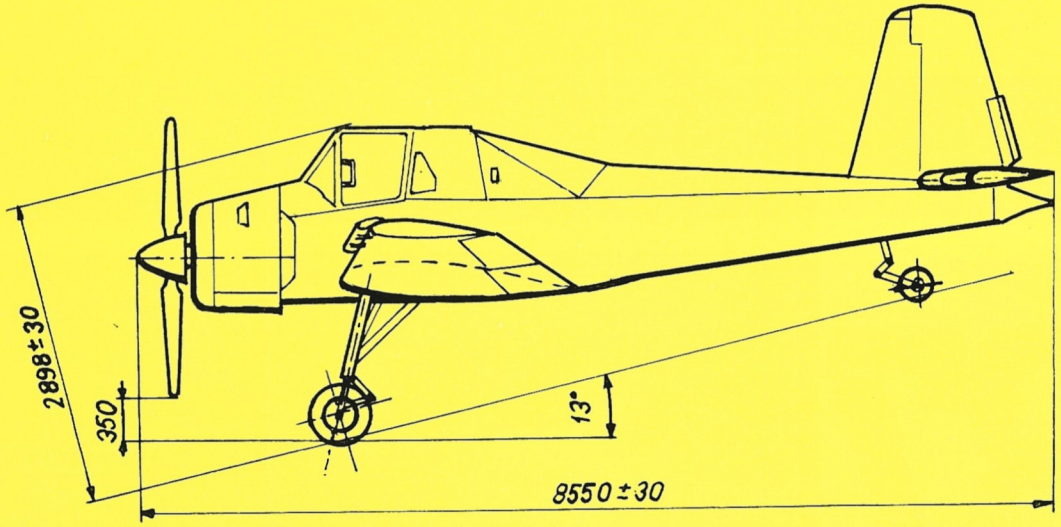
At maximum agricultural take-off weight of 1850 kg (4,080 lb.):	
Take-off run	155 m (509 ft.)
Landing run (using brakes)	125 m (410 ft.)
Max. rate of climb, sea level	3.7 m per sec. (726 ft. per min.)
Optimum climbing speed	120 km (74.5 miles) per hour
Crops spraying speed	120 km (74.5 miles) per hour
Stalling speed in level flight with power on and 50° flap	69 km (43 miles) per hour
Stalling speed, power off and 50° flap	77 km (48 miles) per hour
Cruising speed at 1,500 m (4,921 ft.)	170 km (106 miles) per hour

At maximum take-off weight (transport role) of 1,725 kg (3,804 lb.):	
Take-off run	125 m (410 ft.)
Landing run (using brakes)	100 m (328 ft.)
Max. rate of climb, sea level	4.7 m per sec. (924 ft. per min.)
Max. speed in level flight at sea level in ISA conditions	210 km (130.5 miles) per hour
Cruising speed at 1,500 m (4,921 ft.)	183 km (114 miles) per hour
Service ceiling	4,000 m (13,125 ft.)
Range with 1 hour reserve fuel	640 km (398 statute miles)
Stalling speed in level flight with power on and 50° flap	64 km (39.8 miles) per hour
Stalling speed, power off and 50° flap	71 km (44 miles) per hour



Z-37



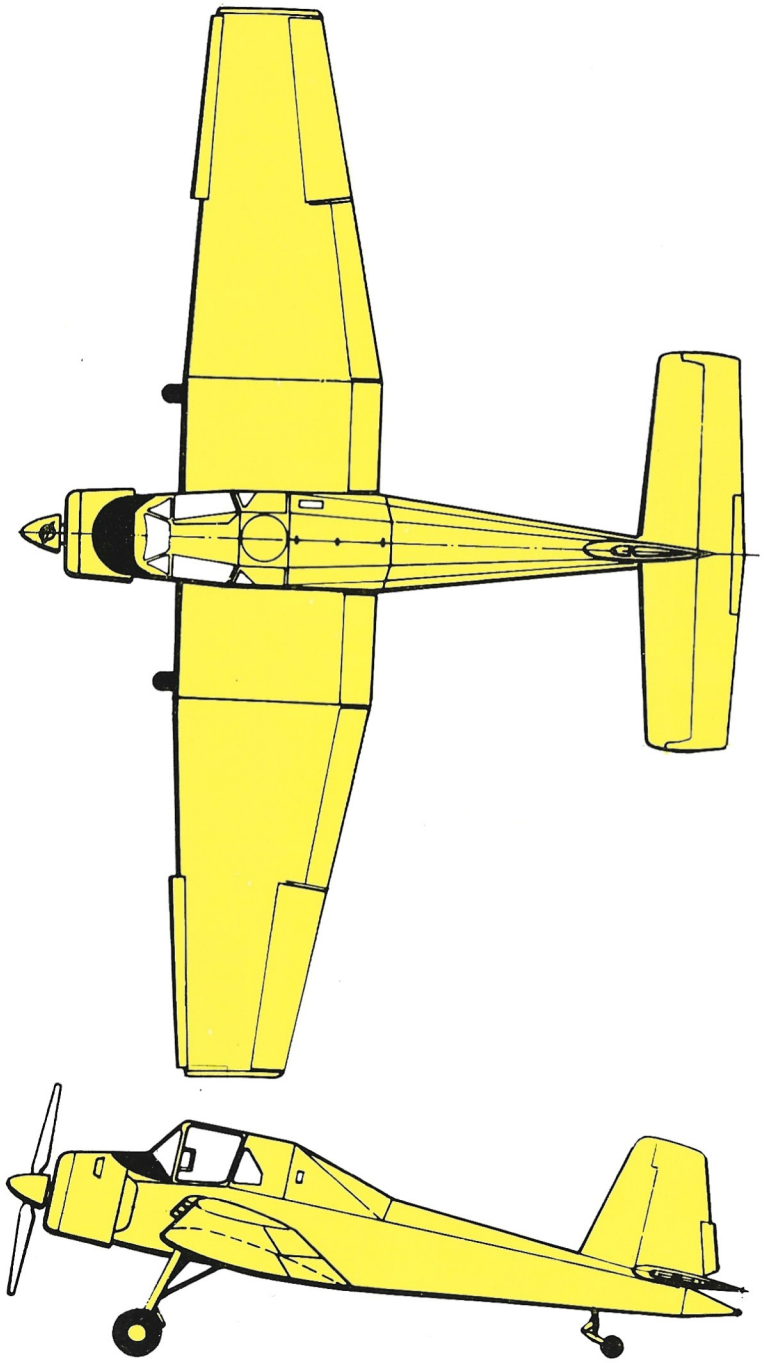


Paint pattern:

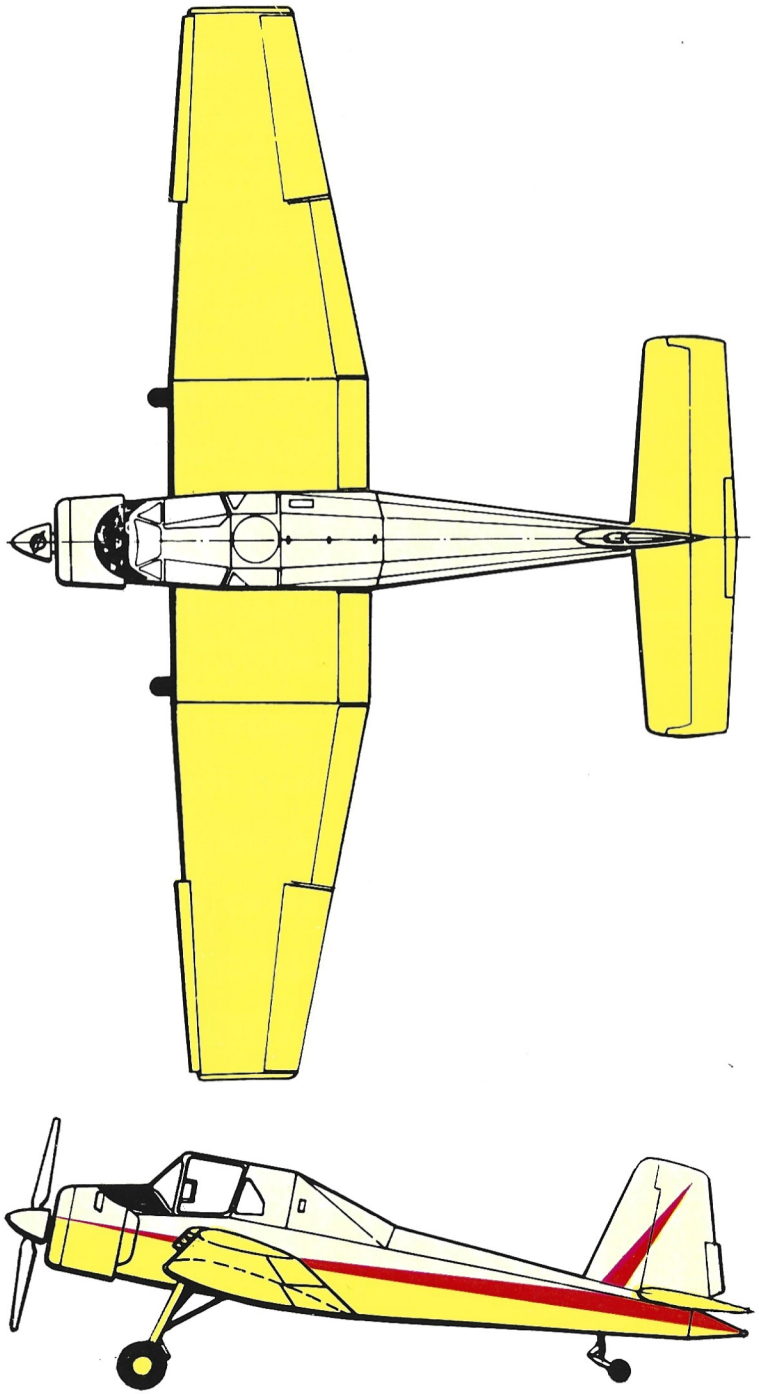
Fig. A. – Standard paint
Fig. B and C. – Paints at customer's option.

Z-37

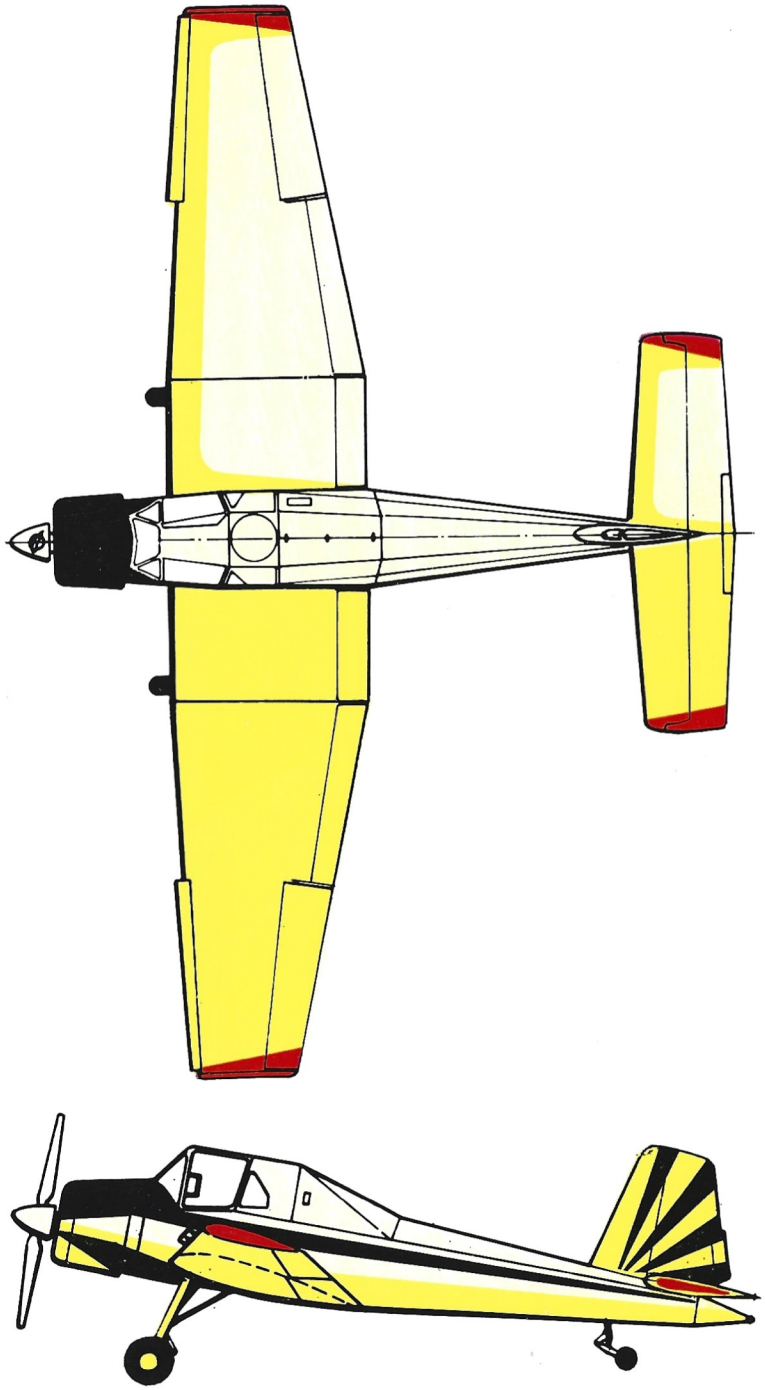
A



B



C



The Z-37 Čmelák /Bumble-bee/ agricultural aircraft has been awarded a golden medal at the Leipzig Fair 1965 and at the International Exhibition of Farming Machinery in Moscow in 1966.

The designers of this aircraft have aimed to provide an aircraft which, among other things, is part of a comprehensive, self-contained system capable of operation anywhere.

The aircraft complies with all BCAR regulations, both as regards design and performance.

The aircraft has been tested and awarded a certificate of airworthiness in the Czechoslovak Socialist Republic. In addition to the statutory tests, the aircraft and its equipment have been subjected to a number of exacting field tests in Czechoslovakia, the USSR, Cuba and India. These tests have proved that the aircraft is completely safe and reliable when operating under practically all climatic conditions.

The Z-37 Čmelák (Bumble-bee)

aircraft, complete with protective treatment and fitted with the M 462 engine and V 520 propeller, is delivered equipped as a basic agricultural aircraft with a standard Czechoslovak certificate of airworthiness.

Standard instrumentation includes:

- Airspeed indicator with stall warning device
- Altimeter
- Vertical speed indicator
- Turn indicator
- Magnetic compass
- Engine RPM indicator
- Quadruple engine temperature and pressure gauge
- Pneumatic system pressure gauge
- Fuel quantity indicator
- Flap position indicator
- Combined volt and ammeter
- Chemicals weight indicator
- Chemicals delivery pressure indicator

Optional extra equipment (available at customer's request):

- Aircraft clock
- Artificial horizon
- Direction indicator
- Radio
- Hand fire extinguisher
- Windscreen wiper and washer
- Engine oil dilution equipment
- Parking brake
- Skis
- Mudguards
- Starboard wing fuel tank complete with pump
- Field spares kit
- Airframe, propeller and engine tools
- Tool box and extra tools
- Mechanic's seat
- Modification kit for converting the aircraft from the agricultural to the transport role
- Equipment for suspending the filling set under the fuselage
- Fuel transport tanks
- Dusting spraying (oil and water) and spreading equipment
- Type PA 1.00 filling set complete with all necessary connecting hoses
- Type HON 050 hydraulic loader and hopper
- Packing crates

SENDER:

OMNIPOL

WASHINGTONOVA 11

PRAHA 1

CZECHOSLOVAKIA

Please send a detailed quotation (confirmation of order) for the Z-37 Čmelák (Bumble-bee) aircraft and equipment as listed overleaf.

The Z-37 Čmelák (Bumble-bee)

aircraft, complete with protective treatment and fitted with the M 462 engine and V 520 propeller, is delivered equipped as a basic agricultural aircraft with a standard Czechoslovak certificate of airworthiness.

Standard instrumentation includes:

- Airspeed indicator with stall warning device
- Altimeter
- Vertical speed indicator
- Turn indicator
- Magnetic compass
- Engine RPM indicator
- Quadruple engine temperature and pressure gauge
- Pneumatic system pressure gauge
- Fuel quantity indicator
- Flap position indicator
- Combined volt and ammeter
- Chemicals weight indicator
- Chemicals delivery pressure indicator

Optional extra equipment (available at customer's request):

- Aircraft clock
- Direction indicator
- Radio
- Hand fire extinguisher
- Windscreen wiper and washer
- Engine oil dilution equipment
- Parking brake
- Skis
- Mudguards
- Starboard wing fuel tank complete with pump
- Field spares kit
- Airframe, propeller and engine tools
- Tool box and extra tools
- Mechanic's seat
- Modification kit for converting the aircraft from the agricultural to the transport role
- Equipment for suspending the filling set under the fuselage
- Fuel transport tanks
- Dusting, spraying (oil and water) and spreading equipment
- Type PA 1.00 filling set complete with all necessary connecting hoses
- Type HON 050 hydraulic loader and hopper
- Packing crates

Note:
The producer reserves himself the right to modify the equipment under »standard«.

Dear Sir.

When considering the purchase of this aircraft, you can be quite sure that it is backed by an outstanding production organization as well as by a wide network of representatives.

A number of experienced and skilled specialists are at your service and ready to come to your aid and offer you all assistance you might require. Large stocks of spare parts both in Czechoslovakia and elsewhere abroad are available to you. So, if you require advice, servicing facilities, spares or supplies of any kind, please contact us or any of our many representatives.

Yours faithfully,

OMNIPOL
Washingtonova 11
Praha 1 - Czechoslovakia

MANUFACTURED BY:

N. C. KUNOVICE

TRUST: Aero CZECHOSLOVAK AERONAUTICAL WORKS, PRAHA

EXPORTED BY:

OMNIPOL - FOREIGN TRADE CORPORATION - WASHINGTONOVA 11 - PRAHA 1 - CZECHOSLOVAKIA

(1799/A)