

MICRONAIR

AU5000 ATOMISER

Operator's Handbook and Parts Catalogue

Micron Sprayers Limited

Bromyard Industrial Estate

Bromyard

Herefordshire HR7 4HS

United Kingdom

Telephone: +44 (0) 1885 482397

Fax: +44 (0) 1885 483043

E-mail: micron@micron.co.uk

Web site: www.micron.co.uk

Iss 12W
9/2006

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 SPECIFICATION	2
3.0 TEN KEY POINTS FOR OPERATORS	3
4.0 INSTALLATION	5
4.1 Securing and Wire Locking of Atomisers and Fittings	6
4.2 Alternative Mounting Clamps.....	8
5.0 OPERATION.....	10
5.1 General Comments	10
5.2 Daily Inspection	10
5.3 Calibration Procedure.....	10
5.4 Operating Technique.....	11
5.4.1 Low Volume (LV) Spraying	11
5.4.2 Ultra Low Volume (ULV) Spraying	11
5.5 Observation in Flight.....	11
6.0 HEALTH AND SAFETY	12
7.0 CALIBRATION AND ADJUSTMENT.....	13
7.1 General.....	13
7.2 Application Rate	13
7.2.1 Aircraft Calibration	13
7.2.2 Adjustment of Flow Rate Through Atomisers on Ground.....	14
7.3 Droplet Size.....	19
7.3.1 Determining Rotational Speed (RPM).....	19
7.3.2 Determining Fan Blade Angle	19
7.3.2 Setting of Fan Blade Angle	24
7.4 Fan Blades	25
7.4.1 Standard Fan Blades (90 - 150 MPH).....	25
7.4.2 Fan Blades for Slow Flying Aircraft (50 - 100 MPH).....	25
7.4.3 Fan Blades for High Speed Aircraft (150 - 200 MPH)	25
7.5 Alternative Gauzes	26
8.0 MAINTENANCE OF ATOMISER	26
8.1 General.....	26
8.2 Pre-flight Checks	27

8.3	Dismantling Procedure	27
8.3.1	Removal from Aircraft	27
8.3.2	Removal of Spindle.....	27
8.3.3	Removal of Gauze	28
8.3.4	Removal of V-ring	28
8.3.5	Removal of Bearings.....	28
8.3.6	Removal of Shock Bush from Clamp	28
8.4	Assembly Procedure	28
8.4.1	Installation of Bearings.....	28
8.4.2	V-ring	29
8.4.3	Gauze	29
8.4.4	Blades.....	29
8.4.5	Spindle.....	30
8.4.6	Shock Bush.....	30
8.5	Balance	30
8.6	Bearing Lubrication.....	31
9.0	VARIABLE RESTRICTOR UNIT	32
9.1	Principle of Operation.....	32
9.2	Instructions for Use	32
9.3	Maintenance.....	33
10.0	DIAPHRAGM CHECK VALVE	34
10.1	Principle of Operation.....	34
10.2	Maintenance.....	35
10.3	Chemical Resistance of Diaphragms.....	35
11.0	AIR DEFLECTOR KIT	35
11.1	Installation	36
11.2	Calibration	36
11.3	Gauze Types	36
11.4	Parts List	37
12.0	APPLICATION MONITOR	38
13.0	RPM INDICATOR (TACHOMETER).....	38
14.0	PARTS LISTS	39
14.1	AU5000 Atomiser	40
14.2	Variable Restrictor Unit.....	42
14.3	Diaphragm Check Valve.....	44
14.4	Special Tools Available from Micron Sprayers Ltd	45
15.0	CONVERSION FACTORS.....	46

1.0 INTRODUCTION

The AU5000 atomiser has been developed from over 40 years experience in the design and use of rotary atomisers for agricultural aircraft. The atomiser is precision engineered from proven chemical resistant materials. Micronair atomisers have been supplied to more than 75 countries and have been fitted to over 30 types of fixed wing aircraft and helicopters. This unique background, combined with continuous research and development, has enabled Micronair to produce a truly versatile and reliable atomiser for all agricultural spraying requirements.

The Micronair AU5000 atomiser uses a rotating wire gauze cylinder to produce spray droplets. This ensures a narrow, controlled spectrum of droplet sizes. The atomiser is driven by the airflow past the unit by means of three highly efficient fan blades. These are adjustable in pitch, enabling the rotational speed of the atomiser to be varied as required. As the size of the spray droplets is determined by the rotational speed, the atomiser can be set to produce the correct size for a particular application by a simple adjustment of blade angle.

The AU5000 atomiser has been designed to operate over a wide range of flow rates. The unit is ideally suited for all application techniques from conventional Low Volume (LV) spraying with water based formulations at 10 – 20 litres/hectare to specialised Ultra Low Volume (ULV) spraying at 1 L/ha or less. Chemical flow to each atomiser is regulated by means of a Variable Restrictor Unit (VRU). This provides quick and easy adjustment of output over the entire operating range of the atomiser.

The easy and independent adjustment of droplet size and flow rate enable an aircraft equipped with AU5000 atomisers to be calibrated for a wide variety of chemicals and application techniques with a minimum of delay. This contrasts with conventional boom and nozzle systems where it is normally necessary to change all nozzles when a different calibration is required.

As the AU5000 atomiser does not contain any small orifices and does not require a high pressure to operate, blockages are rare, even with viscous liquids or high concentrations of solids in suspension. Should field service be necessary, the simple design of the atomiser enables it to be dismantled and cleaned in minutes.

Because of its light weight and low drag, the AU5000 atomiser can be fitted directly onto the standard spray booms of most agricultural aircraft without any structural modification. Alternatively, quick-change replacement boom kits are available for popular models of aircraft and special installation kits can be supplied for some non-agricultural types (e.g. Cessna 170/180 series).

The AU5000 atomiser is the preferred replacement for the now obsolete AU3000 model for the majority of agricultural applications. Special mounting clamps are available to install AU5000 atomisers on Micronair streamline booms originally supplied for AU3000 atomisers.

The number of AU5000 atomisers installed on an aircraft depends upon the aircraft type, swath width and application rate (see Calibration section) but 6 – 12 units are normally recommended to ensure an even swath.

AU5000 installation kits are supplied complete with all accessories including attachment clamps, variable restrictors, diaphragm check valves for instant chemical shut-off and all necessary pipework, hardware etc.

For specialised pest control, public health spraying and similar work requiring continuous operation at high rotational speeds to produce very small droplets, Micronair recommend the AU4000 atomiser. This is a development of the AU3000 atomiser and uses the same bearings, brakes and installation kits.

2.0 SPECIFICATION

Weight:	1.8 Kg (4 lb) complete with mounting bracket
Flow rate:	0 – 23 litres/min (0 – 6 USG/min) per atomiser ^[1]
Flow control:	By Micronair variable restrictor unit.
Chemical shut-off:	By diaphragm check valve and secondary shut-off in atomiser
Spray droplet size:	Variable between 60 – 750 microns VMD ^[2]
Rotational speed:	Variable between 2,000 – 10,000 (max) RPM
Operating airspeed:	90 – 150 MPH (145 – 240 Km/hr) with EX1772/2 blades ^[3] 50 – 100 MPH (80 – 160 Km/hr) with EX2021 blades ^[4] 150 – 200 MPH (240 – 320 Km/hr) with EX6353 blades ^[5]
Mounting:	By lightweight mounting clamp – available for all popular boom sections
Chemical feed:	From 1/8" or 1/4" NPT tapped boom outlet holes ^[6]

NOTES:

1. Maximum flow rate for efficient atomisation will depend upon fluid properties. Data shown here is for water.
2. Droplet size at a given atomiser speed will depend upon the formulation used. The size will be reduced with ULV formulations.
3. EX1772/2 blades supplied as standard.
4. EX2021 blades supplied only when specified for slow aircraft.
5. EX6353 blades supplied only when specified for fast aircraft.
6. Alternative fittings may be supplied with some installation kits if necessary.

3.0 TEN KEY POINTS FOR OPERATORS

The following list of ten key points is intended to assist operators in the efficient use of Micronair atomisers. We hope that this section will encourage pilots and engineers to read the entire Handbook and follow its recommendations.

1. Thoroughly check all parts of the spray system daily. Check the condition of all atomisers before each flight.
2. Ensure that all atomisers run smoothly. The only friction should be a small amount of drag from the V-ring seal. Do not continue to operate an atomiser which does not run smoothly. Remove the unit, dismantle the bearing assembly and check the bearings and fits and clearances; particularly the two matched bearing spacers which should be identical lengths. Return the unit to the factory if the problem cannot be found.
3. Check that the spindle retaining nut is tight and wire locked. Under no circumstances should the atomiser be operated if the nut is slack. If the atomiser has been used with a loose nut, it is almost certain that the bearings or spacers have been damaged.
4. If greased bearings are installed, ensure that they are greased regularly but not excessively. Over-greasing can cause heating and destroy the bearings.
5. Inspect all gauzes for chemical deposit, damage or any condition which may cause it to run out of balance. Gauzes should never be repaired in the field as they must be dynamically balanced after repair.
6. Check that all fan blades are in good condition and are set to the correct angle for the work being undertaken. Replace any damaged blades and ensure that the clamp ring securing bolts are not over-tightened. If the bolts are correctly tightened, it should be just possible to move the blades by hand. The gap between the clamp ring and hub must NOT be completely closed.
7. Inspect the diaphragm check valve for chemical leakage. This indicates a damaged or wrongly installed diaphragm.
8. Ensure that all VRUs are correctly secured, set to the appropriate number and that there is no evidence of chemical leakage
9. Check that the Application Monitor (if fitted) is functioning correctly. Verify the accuracy of the readings by checking the volume of chemical sprayed against the actual area sprayed and the spray time.
10. Should any vibration be noticed from the boom or atomisers, do not continue to operate. Reduce airspeed, land as soon as possible and check for loose attachments, correct blade settings, worn bearings or out of balance gauzes. Ensure that the hub, clamp ring and gauze are correctly assembled and aligned.

If a problem cannot be resolved with reference to this Handbook, please telephone, fax, e-mail or write to your distributor or to Micron Sprayers in England. Our staff will usually be able to give immediate advice.

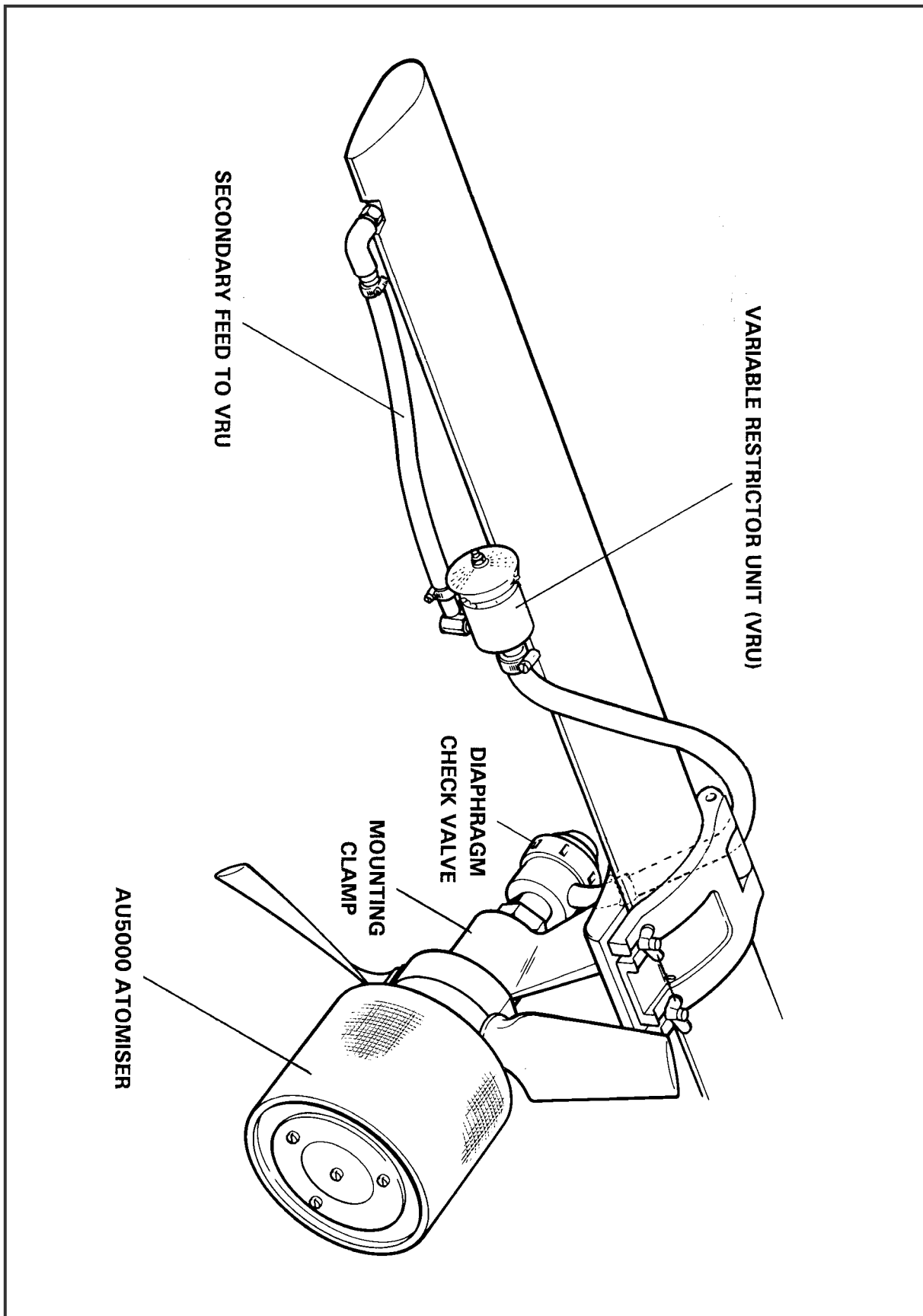


Fig. 1 – Typical Installation of AU5000 Atomiser

4.0 INSTALLATION

Micronair AU5000 atomisers are suitable for use on a wide range of aircraft types and additional instructions are supplied with installation kits where applicable.

The atomisers are either installed on the existing spray booms or are mounted on special Micronair booms that are then fitted in place of the original booms. In either case, the procedure for fitting the atomisers is as follows:

1. Inspect the spray booms, support brackets and attachments to the aircraft. These must all be in good condition and free of any cracks, leaks or corrosion. Replace any defective parts before installing the atomisers.

IMPORTANT: It is the operator's responsibility to ensure that spray booms and attachments to the aircraft are in good condition and of adequate strength to support the required number of AU5000 atomisers.

2. Remove all existing spray nozzles (where applicable).
3. From the appropriate installation drawing, mark the centreline of each atomiser on the boom. As a general rule, the outer atomisers should not be further outboard than 66% of the wing or rotor span and the remaining units should be equi-spaced.
4. In the case of round section booms with 1/8" NPT outlets only: identify the nozzle hole nearest to each atomiser position and screw in a locating peg (EX1517). Use PTFE or similar thread sealant to ensure a leakproof fit. This peg will prevent the atomiser clamp from rotating on the boom.
5. Install an atomiser mounting clamp at each position marked in (3) above. Secure each clamp, using the wing nuts provided. Wire lock the two wing nuts. In the case of round booms: the clamps should be fitted over the locating pegs installed in (4) above, ensuring that each peg is correctly aligned in the hole of the clamp and that the atomiser mount protrudes to the rear of the aircraft. For round booms of less than 1.25" (32 mm) diameter, clamps are supplied with reducing bushes to suit the boom diameter. These must be fitted between the boom and clamp according to the instructions on the installation drawing.
6. Fit a Variable Restrictor Unit - VRU - (EX2080) in a tapped nozzle hole adjacent to each atomiser. Each VRU has two inlet pipes. One is threaded 1/8" NPT male and the other 1/4" NPT male. Either of these may be screwed into the boom, depending upon the hole size. Use PTFE tape to seal these and all other screwed connections.

IMPORTANT: The VRUs feeding the outboard atomisers must be positioned at the extreme ends of the booms. This eliminates the possibility of air being trapped in the booms and causing a pulsating output of chemical or a slow shut-off at the end of the spray run.

7. Either close the unused VRU inlet pipe with the appropriate cap nut (EX1670 for the 1/8" thread or EX1671 for the 1/4" thread) or use this inlet as a second feed from the boom. The second feed should be used if the flow rate through each atomiser is likely to exceed 7 litres/min (1.8 USG/min). See Fig. 1 for details of the installation of this additional feed.

8. Fit an atomiser into each mounting clamp, ensuring that the flat on the spindle is correctly located against the flat inside the shock bush in the bracket. The front and rear rubber shields (EX1974 and EX1973) must be fitted at each end of the shock bush prior to installing the atomiser. Ensure that the shields are correctly identified as they have different inside diameters and can easily be interchanged in error. Secure each atomiser with its retaining nut, making sure that the locking washer (EX1975) is fitted between the nut and the inner sleeve of the shock bush with its securing lug located in the slot of the bush.

Note that the locking washer has flats to allow it to be held with a 1¼" A/F spanner when the atomiser retaining nut is being tightened or undone. This avoids unnecessary strain on the rubber shock bush.
9. Attach a diaphragm check valve (EX1525) to the spindle of each atomiser. The inlet pipe of the valve must face towards the boom.
10. Connect the outlet of each VRU to the inlet of the check valve, using the 1/2" hose and pipe clips supplied. Ensure that the hose cannot come into contact with the atomiser or any sharp edges and is not kinked. If the hose runs parallel to the boom for more than about 30 cm (12") or could move in flight it must be secured to the boom. Heavy duty nylon cable ties are suitable for this.
11. Blank off any unused holes in the boom, using the appropriate plugs supplied with the kit (EX1549 for 1/8" NPT holes or EX1566 for 1/4" NPT holes).
12. Wire (safety) lock all nuts and fittings as described in section 4.1.
13. Adjust all atomiser fan blades as described in the Calibration section.

IMPORTANT: Under no circumstances must the aircraft be flown until the fan blades have been adjusted and checked.

4.1 Securing and Wire Locking of Atomisers and Fittings

It is vital that the securing nuts and fittings of each AU5000 atomiser are wire (safety) locked in accordance with standard aircraft practice. Failure to comply with this requirement could result in chemical leaks, damage to components or loss of equipment and possible serious damage to the airframe.

Components must be wire locked as follows:

1. The two wing nuts of the mounting clamp must be evenly tightened to a torque of approximately 0.7 nm (0.5 lb ft) and wire locked together using the holes provided as shown in Fig. 2.
2. Tighten the atomiser securing nut (EX1514) to a torque of approximately 14 nm (10 lb ft) and wire lock to one hole in the locking washer (EX1575) as shown in Fig. 2.

Note that this nut must never be allowed to become loose. Should an atomiser be run with a loose nut, the bearings and bearing spacers are likely to be damaged. If the atomiser is found not to run freely when the nut is tightened as described above, the bearing assembly must be dismantled, checked and parts replaced as necessary. Under no circumstances must the securing nut be wire locked until it has been correctly tightened.

3. Tighten the diaphragm check valve outlet nut and wire lock to the second hole in the locking washer (EX1575) as shown in Fig. 2.

IMPORTANT: Under no circumstances should the atomiser securing nut or diaphragm check valve outlet be wire locked to the vertical portion of the mounting clamp. Movement of the shock bush could cause the wire to wear a groove in the clamp and weaken it.

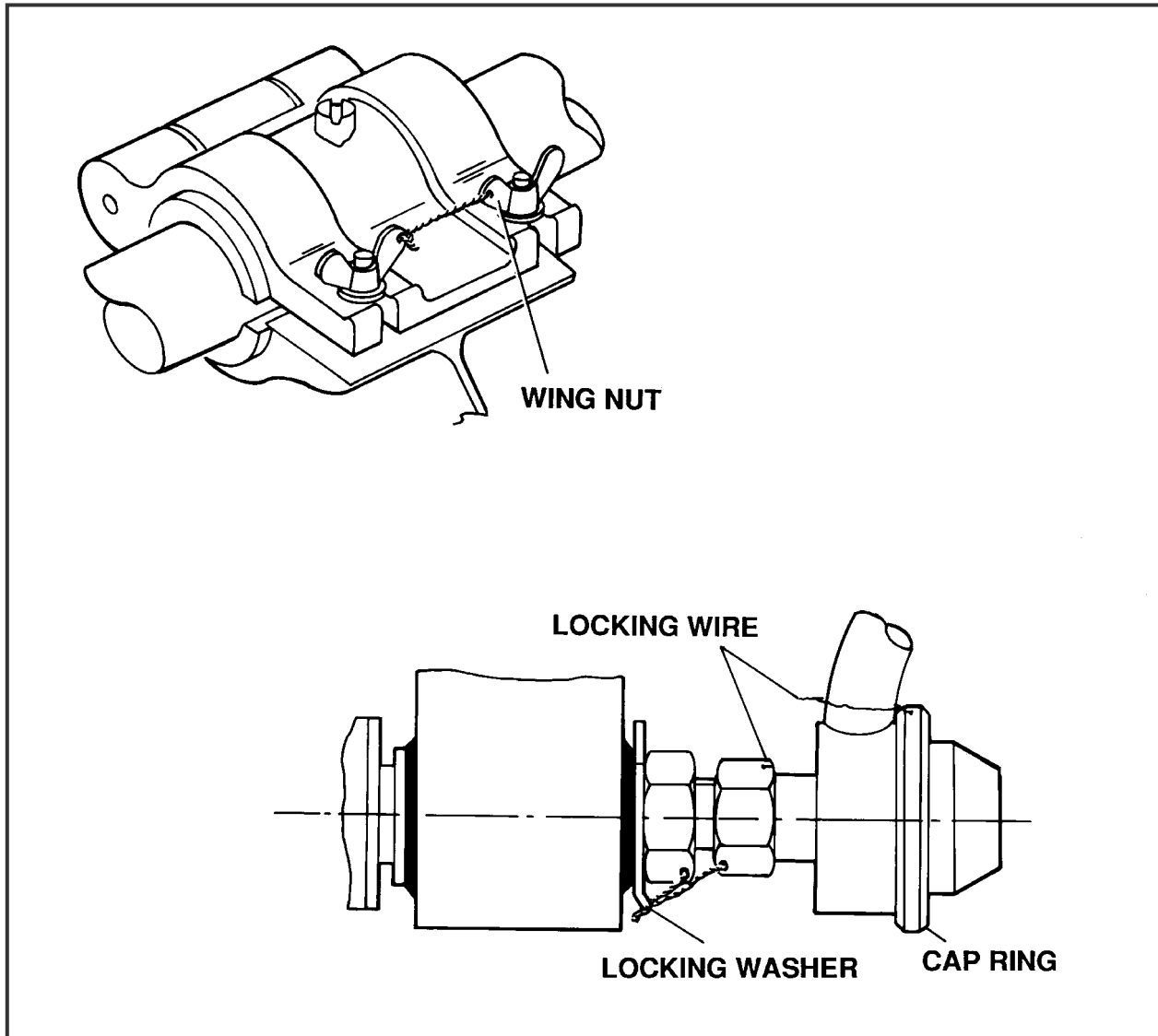


Fig. 2 – Wire Locking of Atomiser and Components

4.2 Alternative Mounting Clamps

Mounting clamps are available to install AU5000 atomisers on many different sections of round and streamline boom. Some of these are shown in the drawings below, together with their part numbers and dimensions. Operators must establish the correct clamp for their requirements and order by type, dimensions and part number. Special clamps can also be supplied to order for non-standard boom profiles.

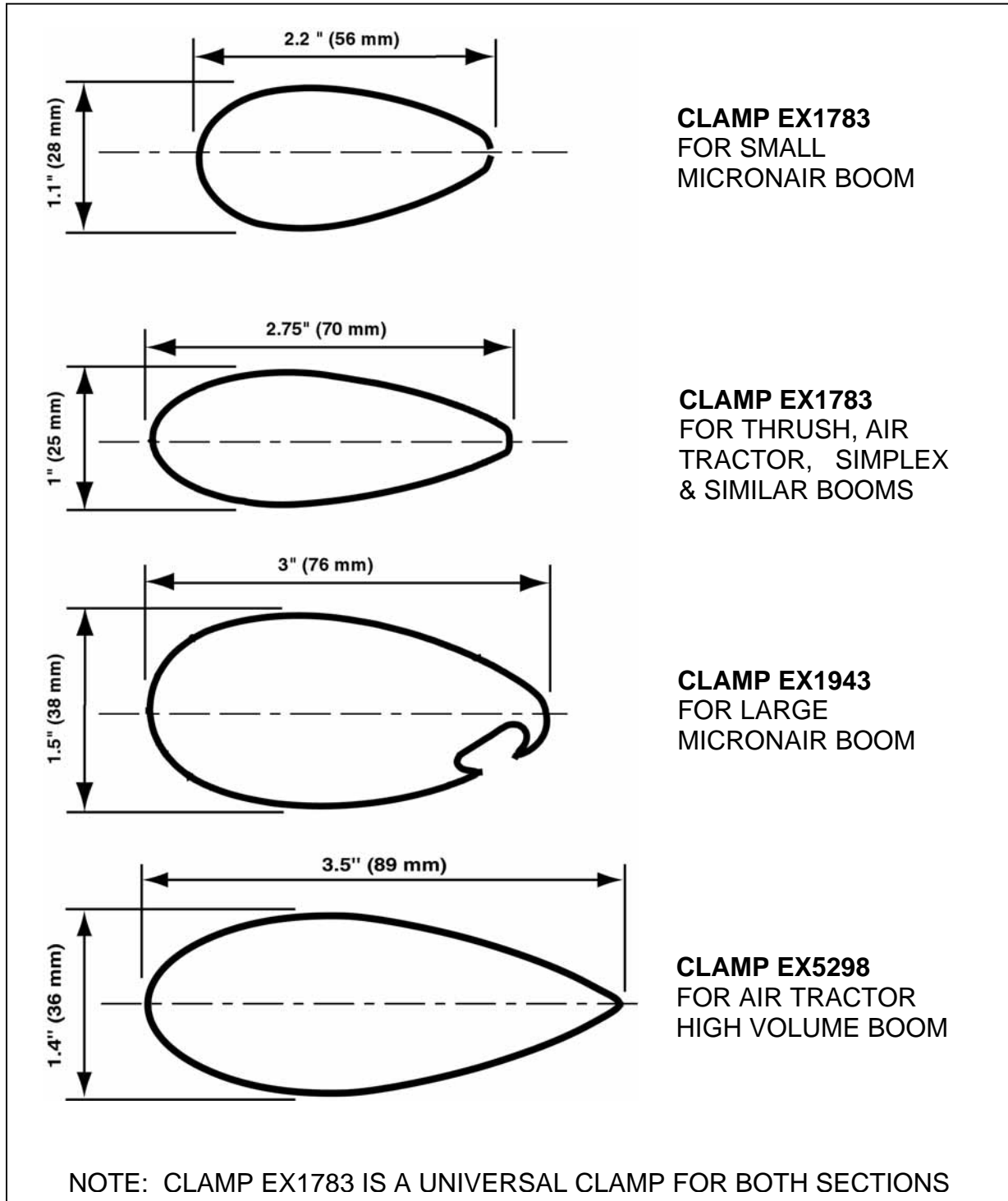


Fig. 3 – Dimensions of Clamps for Streamline Booms

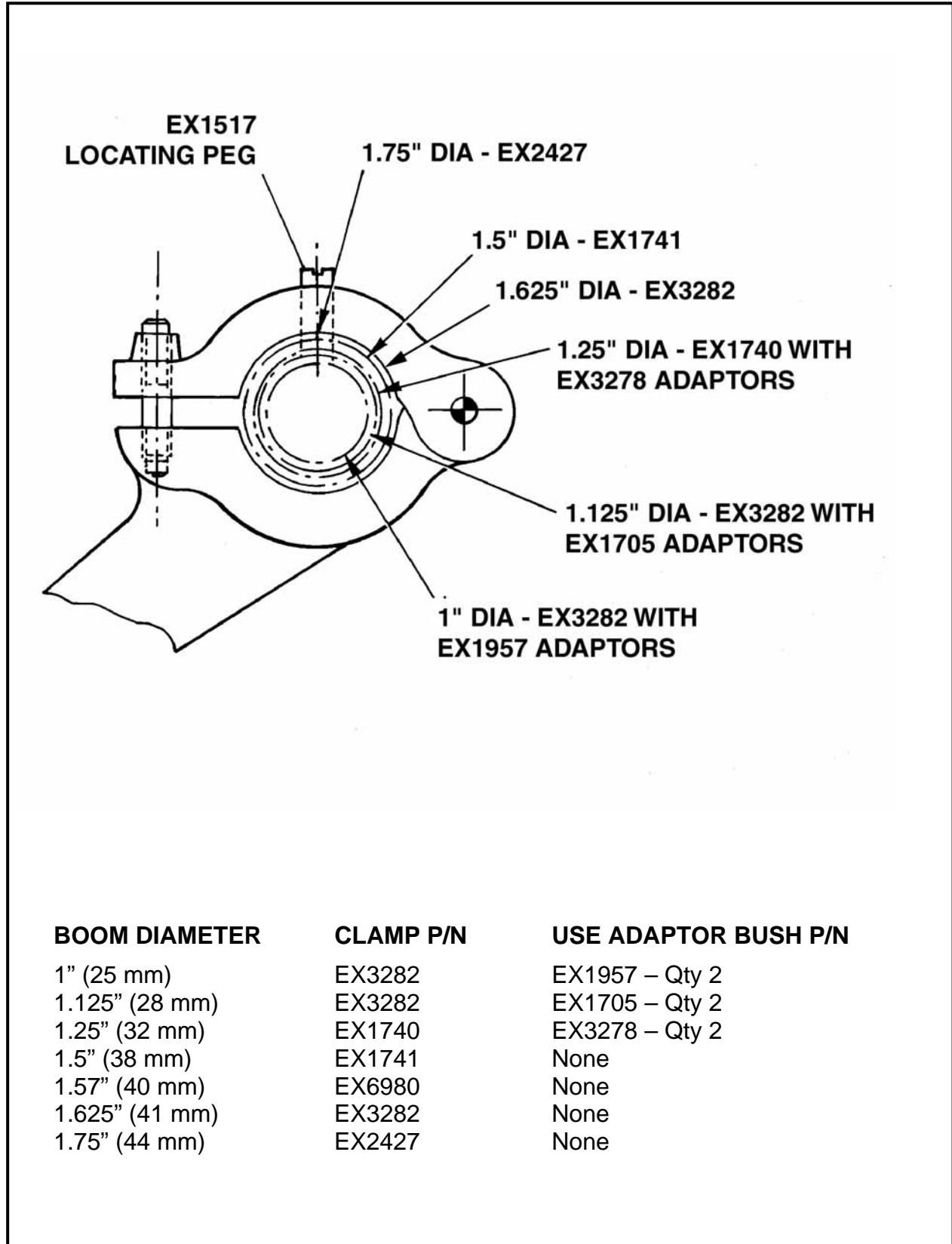


Fig. 4 – Clamps for Round Booms

5.0 OPERATION

As with all spraying equipment, optimum results will only be obtained with AU5000 Atomisers if they are correctly calibrated, operated and maintained. The role of the pilot in this is vital. Not only is he in the best position to monitor the performance of the equipment but the effectiveness and safety of the operation are in his hands.

It is important that every pilot who uses the equipment is completely familiar with its operation, calibration and use. It is therefore recommended that all pilots read this Handbook thoroughly before commencing operations. The following sections emphasise points of particular importance.

5.1 General Comments

Many pilots and operators who are not familiar with Micronair equipment believe incorrectly that it is only intended to produce very fine droplets at very low application rates.

In fact, an important advantage of Micronair atomisers is that they can be adjusted to give either a very small droplet or a large droplet depending upon the requirement of a particular treatment.

A small droplet is essential for ULV agricultural spraying and an even smaller droplet is necessary for aerosol or drift spraying as used for public health, tsetse, locust or mosquito control.

A placement spraying technique is used for LV insecticide or fungicide application and a larger droplet size is necessary to ensure that the droplets do not evaporate significantly or drift away from the target area.

Where herbicide application is envisaged, a much coarser droplet can be selected to keep the risk of drift to a minimum.

The operator or pilot must always be aware of the requirements for the treatment being undertaken and make certain that the equipment is set accordingly. Full details will be found in the Calibration section.

5.2 Daily Inspection

The pilot and engineer should check all parts of the spray system thoroughly at least once a day. A complete check list is included in the Maintenance section of this Handbook. However, particular attention must be paid to the condition of the atomisers and all clamps, pipes and fittings. All atomisers must run smoothly and the gauzes must be free of any dents or blockage due to dried chemical.

5.3 Calibration Procedure

Before use, the aircraft spray system must be accurately calibrated for both application rate and droplet size. Full details are given in the Calibration section of this Handbook. It is important to note that the graphs and tables are based on performance with water and are intended only as a guide. Actual performance will vary according to the type

and formulation of chemical being used. It is therefore vital that the calibration of the system is checked whenever a new chemical is used.

5.4 Operating Technique

5.4.1 Low Volume (LV) Spraying

An aircraft fitted with AU5000 atomisers should be operated using a similar technique to one fitted with a conventional boom and nozzle system.

The swath width will be a function of aircraft type, flying height, droplet size and climatic conditions. Generally, the swath width with AU5000 atomisers will be the same as with conventional spray equipment. See the Calibration section for details of methods of establishing swath width.

Flying height will depend upon the terrain, crop, obstructions and climatic conditions. However, the optimum height of the atomisers above the crop is 2 - 3 m (6 - 10 feet), provided that this can be achieved safely.

5.4.2 Ultra Low Volume (ULV) Spraying

The low volatility of most ULV formulations allows them to be sprayed from a greater height without loss due to evaporation. In order to achieve adequate coverage at ULV rates the droplet size must be reduced compared with that used with water-based LV formulations.

The combination of smaller droplet size and greater flying height result in a wider swath width than could be achieved at LV rates with the same aircraft. Any cross-wind should be utilised to increase the effective swath width. However, it is vital that the pilot should be aware of the downwind swath displacement so as to avoid accidental off-target application.

The choice of flying height and consequent swath width for ULV spraying must be made in the context of local conditions. As a guide, the height of the atomisers above the crop should be about 3 – 5 m (10 – 15 feet) and the swath width can be expected to be about 20 – 35% greater than for LV application with the same aircraft. Under some circumstances (e.g. drift spraying against locusts and migrant pests) the aircraft should be flown at a much greater height and the cross-wind allowed to carry the spray droplets over an effective swath of 100 m or more.

5.5 Observation in Flight

Once an aircraft has been calibrated, the pilot must monitor the system in flight. Output rate must be checked with the Application Monitor (if installed) or by noting the amount of chemical used from the aircraft hopper in a given time.

The spray output from each atomiser should be checked visually. A reduced or uneven plume of spray from one unit indicates either blockage, incorrect adjustment of the VRU or a slow turning atomiser. Any discrepancies must be noted and reported to maintenance personnel for immediate attention.

If an RPM indicator is installed, the pilot should occasionally check the speed of each atomiser whilst spraying. The speeds of all atomisers should be approximately equal and should not normally differ by more than 200 – 400 RPM.

The pilot must check regularly for any signs of excessive vibration. This can be due to a damaged atomiser, a build-up of chemical in one or more of the atomiser gauzes, a worn bearing assembly, loose attachments or a damaged blade. Vibration will either be felt through the airframe or will be visible at the atomiser or the adjoining boom.

If excessive vibration is detected, the pilot must reduce airspeed as much as possible and land at the nearest airstrip. Full details on the importance of atomiser balance will be found in the Balance section of this Handbook and the necessary corrective action is described in the Maintenance section.

6.0 HEALTH AND SAFETY

Legislation regarding the application of chemicals which are potentially harmful to individuals or the environment varies considerably between countries. Operators using chemicals and equipment must ensure they are working within the regulations applicable to their area.

Irrespective of legislation, Micronair advise the users of their equipment that all possible care must be taken to ensure the health and safety of the user and personnel in the vicinity of the spraying operation.

The following recommendations are for guidance only and do not exclude any statutory requirement:

1. The application of each chemical should follow the recommendations of the manufacturer. Extreme care should be taken to prevent chemical reaching the operator or any other people, animals or neighbouring crops where contamination could have an adverse effect.
2. Ensure that the equipment is correctly calibrated for the chemical being used.
3. Suitable clothing, gloves, eye protection and masks must be worn when working with or near toxic chemicals and operators must adhere to all relevant handling precautions and regulations.
4. The entire spray system and all ancillary equipment must be thoroughly washed out after use or before maintenance.
5. All chemical residues must be safely stored or disposed of.
6. All used chemical containers must be safely disposed of in accordance with local regulations and requirements.
7. First aid and washing facilities must always be available and personnel must be trained in their use.

7.0 CALIBRATION AND ADJUSTMENT

7.1 General

The calibration procedure for an aircraft fitted with Micronair atomisers is in two stages: adjusting the application rate (see 7.2) and setting the droplet size (see 7.3). Unlike conventional pressure nozzles, these two variables are largely independent and one can be changed without significantly affecting the other.

7.2 Application Rate

The flow rate of chemical from the aircraft must be adjusted to give the correct application rate on the crop or target.

The output from each atomiser is controlled by its Variable Restrictor Unit (VRU). Each VRU contains a restrictor plate which has a series of holes of different sizes (see section 9.1). A selector plate attached to the adjustment knob exposes any one of these holes, providing a flow to the atomiser which depends upon the size of the orifice. The holes in the standard restrictor plate are numbered 1 – 13, odd numbers only. Higher numbers correspond to higher flow rates, with 13 being the highest and 0 a shut-off position. In addition to this standard plate, other special plates are available on request. See section 9.2 for full details.

The VRU can also be set to a full-flow position in which the restrictor plates are pulled apart and do not impede the flow. See section 9.2 for full details.

At a given VRU setting, fine adjustment of the total output from the aircraft is made by varying the boom pressure. The VRU settings must always be selected so as to allow a reasonable opening of the control valve (and hence boom pressure). This will ensure easy regulation of application rate.

Unlike conventional nozzles, a high pressure is not needed for the efficient operation of Micronair atomisers. A pressure of about 20 – 40 PSI (1.5 – 3 Bar) is recommended.

If it should be found that the swath from the aircraft is uneven, individual VRUs can be adjusted to regulate the flow through the appropriate atomisers and to compensate for any under or over-application across the swath.

7.2.1 Aircraft Calibration

In order to establish the correct adjustment of each atomiser, it is first necessary to determine the total output from the aircraft. The procedure is as follows:

1. Refer to Table 1 or 2 to determine the coverage of the aircraft in hectares or acres per minute at the operating airspeed and swath width.
2. Multiply this figure by the required application rate in litres/hectare or gallons/acre to give the output from the aircraft in litres or gallons per minute.
3. Divide this by the number of atomisers to determine the output from each atomiser.
4. Refer to Table 3 or Graph 1 to establish the appropriate setting for the Variable Restrictor Units (VRUs). Note that standard VRUs are supplied with odd (/O)

numbered restrictor plates (see section 9.2). If even (/E) numbered plates are being used for a specialised application, flow rates will be found in Table 4 and Graph 2. The VRU setting should be chosen to give the required flow rate at a boom pressure of between 20 – 40 PSI (1.5 – 3 Bar). The use of a lower pressure may not give a consistent output from all atomisers and higher pressures can result in unnecessary wear and tear on the system.

Note that the figures in this Handbook are based on tests with water. Actual flow rates will depend upon the properties (especially viscosity) of the liquid being sprayed. Actual flow rates must always be checked.

7.2.2 Adjustment of Flow Rate Through Atomisers on Ground

1. Fill the aircraft hopper with the chemical to be used (or a liquid of similar viscosity).
2. Set each variable restrictor unit to the setting established in section 7.2.1 by aligning the appropriate number on the knob with the line on the VRU body. Note that two sets of numbers are shown on the knob. Standard VRUs use only the odd numbers shown on the side of the knob, so the even numbers at the end of the knob should be ignored.
3. Run the aircraft engine so as to produce an adequate airflow from the propeller over the pump fan (or to operate an hydraulic pump, if fitted).
4. Purge the system fully so as to eliminate all air from the pump and booms. Place a suitable container (e.g. a plastic bag or bucket) under each atomiser.
5. Open the boom valve for 1 minute or part of a minute depending on the rate of flow and size of container.
6. Measure the contents of each container and calculate the rate of flow from each atomiser. If this is insufficient, increase the boom pressure or select the next larger VRU orifice (higher number). If the output is excessive, reduce the boom pressure or select a smaller orifice.
7. Having established the appropriate VRU orifice and approximate boom pressure, the final adjustment of boom pressure must be made in flight.

SPEED Km/hr	SWATH WIDTH – METRES									
	12	14	16	18	20	30	40	50	75	100
85	1.7	1.9	2.2	2.5	2.8	4.2	5.6	7.0	10.6	14.1
90	1.8	2.1	2.4	2.7	3.0	4.5	6.0	7.5	11.3	15.0
95	1.9	2.2	2.5	2.8	3.1	4.8	6.3	7.9	11.8	15.8
100	2.0	2.3	2.6	3.0	3.3	5.0	6.6	8.3	12.5	16.6
110	2.2	2.5	2.9	3.3	3.6	5.5	7.3	9.1	13.8	18.3
120	2.4	2.8	3.2	3.6	4.0	6.0	8.0	10.0	15.0	20.0
130	2.6	3.0	3.4	3.9	4.3	6.5	8.6	10.8	16.3	21.6
140	2.8	3.2	3.7	4.2	4.6	7.0	9.3	11.6	17.5	23.3
150	3.0	3.5	4.0	4.5	5.0	7.5	9.3	12.5	18.8	25.0
160	3.2	3.7	4.2	4.8	5.3	8.0	10.6	13.3	20.0	26.6
170	3.4	3.9	4.5	5.1	5.6	8.5	11.3	14.1	21.3	28.3

FORMULA: Hectares/min = $\frac{\text{Speed (Km/hr)} \times \text{Swath (m)}}{600}$

Table 1 – Hectares Sprayed per Minute

SPEED MPH	SWATH WIDTH – FEET									
	30	35	40	45	50	75	100	200	300	500
75	4.5	5.2	6.0	6.7	7.5	11.2	15.0	30.0	45.0	75.0
80	4.8	5.6	6.4	7.2	8.0	12.0	16.0	32.0	48.0	80.0
85	5.1	5.9	6.8	7.6	8.5	12.7	17.0	34.0	51.0	85.0
90	5.4	6.3	7.2	8.1	9.0	13.5	18.0	36.0	54.0	90.0
95	5.7	6.6	7.6	8.5	9.5	14.2	19.0	38.0	57.0	95.0
100	6.0	7.0	8.0	9.0	10.0	15.0	20.0	40.0	60.0	100.0
110	6.6	7.7	8.8	9.9	11.0	16.5	22.0	44.0	66.0	110.0
120	7.2	8.4	9.6	10.8	12.0	18.0	24.0	48.0	72.0	120.0
130	7.8	9.1	10.4	11.7	13.0	19.5	26.0	52.0	78.0	130.0
140	8.4	9.8	11.2	12.6	14.0	21.0	28.0	56.0	84.0	140.0
150	9.0	10.5	12.0	13.5	15.0	22.5	30.0	60.0	90.0	150.0

FORMULA: Acres/min (approx) = $\frac{\text{Speed (MPH)} \times \text{Swath (feet)}}{500}$

Table 2 – Acres Sprayed per Minute

FLOW THROUGH VRU WITH AU5000 ATOMISER WITH SECONDARY SHUT-OFF AND DIAPHRAGM CHECK VALVE

SETTING NUMBER	PRESSURE PSI	FLOW PER MINUTE PER ATOMISER		
		Imp pints	US pints	Litres
1	20	0.51	0.61	0.29
	30	0.98	1.18	0.56
	40	2.19	1.45	0.68
3	20	1.35	1.63	0.77
	30	1.66	2.01	0.95
	40	2.06	2.49	1.18
5	20	3.29	3.97	1.88
	30	4.46	5.39	2.55
	40	5.42	6.55	3.10
7	20	4.48	5.41	2.56
	30	6.79	8.20	3.88
	40	8.35	10.08	4.77
9	20	6.82	8.24	3.90
	30	9.62	11.62	5.50
	40	12.00	14.49	6.86
11	20	11.30	13.65	6.46
	30	14.44	17.43	8.25
	40	18.29	22.08	10.45
13	20	15.22	18.38	8.70
	30	19.53	23.58	11.16
	40	25.90	31.27	14.80

The above figures are based on tests with water. Actual flow rates will vary according to the installation and chemical used. Operators should always check flow rates under field conditions.

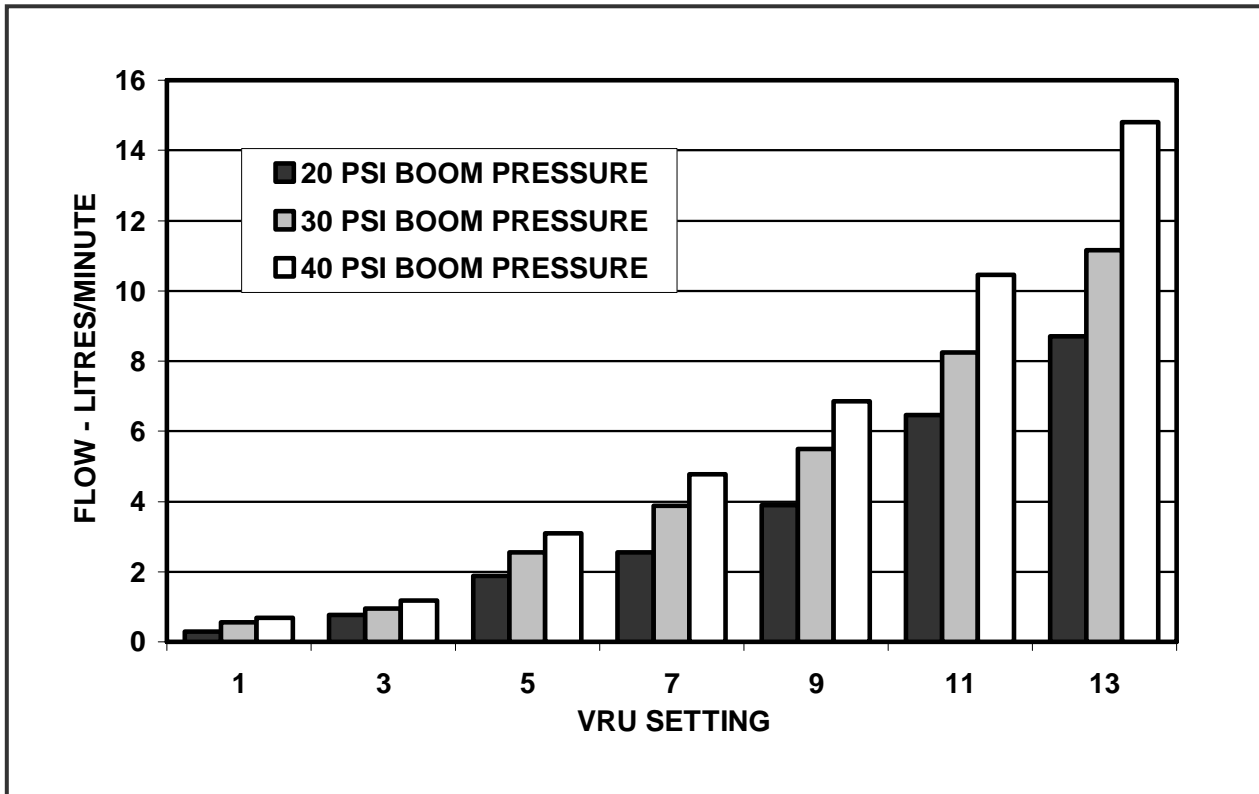
Table 3 – Flow from VRU Fitted with Standard Odd Numbered Plate

**FLOW THROUGH VRU WITH AU5000 ATOMISER WITH SECONDARY
SHUT-OFF AND DIAPHRAGM CHECK VALVE**

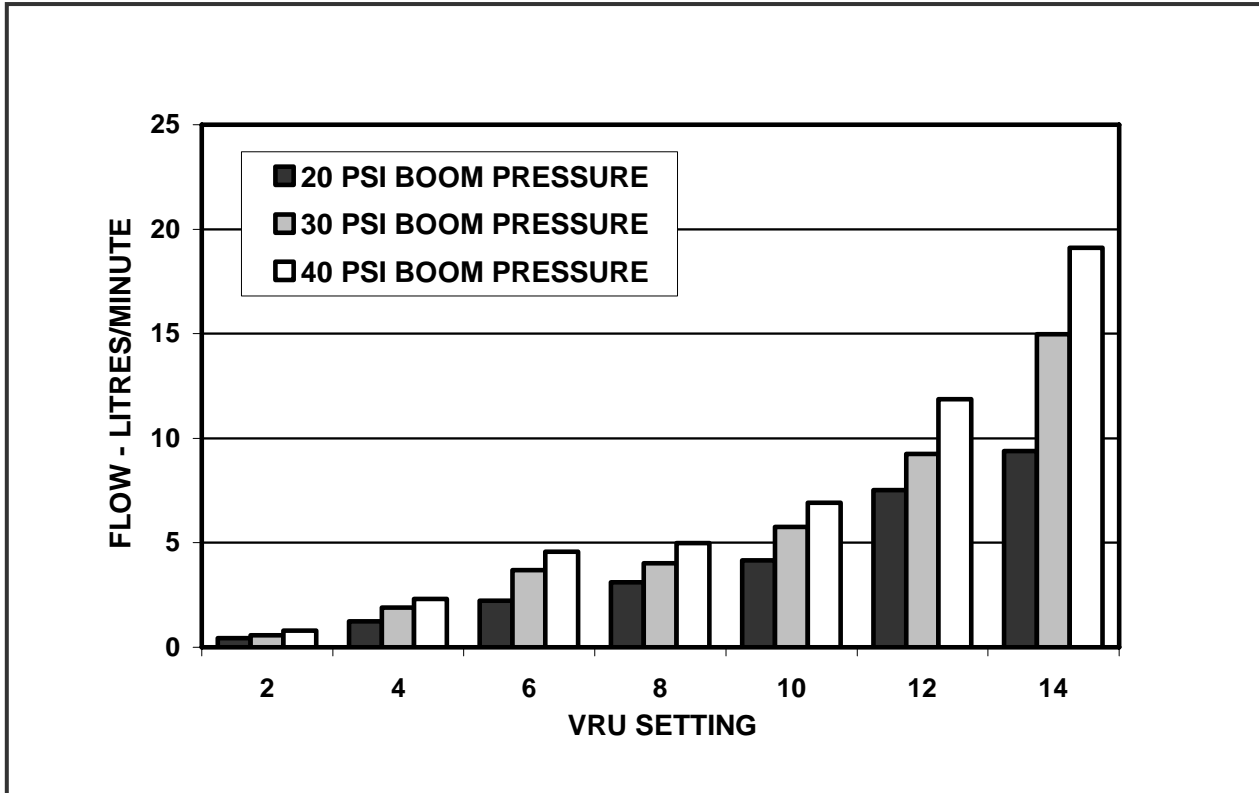
SETTING NUMBER	PRESSURE PSI	FLOW PER MINUTE PER ATOMISER		
		Imp pints	US pints	Litres
2	20	0.79	0.95	0.45
	30	1.03	1.25	0.59
	40	1.40	1.69	0.80
4	20	2.19	2.64	1.25
	30	3.32	4.01	1.90
	40	4.04	4.88	2.31
6	20	3.90	4.71	2.23
	30	6.44	7.78	3.68
	40	7.98	9.63	4.56
8	20	5.44	6.57	3.11
	30	7.05	8.51	4.03
	40	8.71	10.51	4.97
10	20	7.30	8.81	4.17
	30	10.08	12.17	5.76
	40	12.12	14.63	6.92
12	20	13.18	15.91	7.53
	30	16.20	19.57	9.26
	40	20.75	25.06	11.86
14	20	16.45	19.86	9.40
	30	26.20	31.63	14.97
	40	33.46	40.40	19.12

The above figures are based on tests with water. Actual flow rates will vary according to the installation and chemical used. Operators should always check flow rates under field conditions.

Table 4 – Flow from VRU Fitted with Optional Even Numbered Plate



Graph 1 – Flow from VRU Fitted with Standard Odd Numbered Plate



Graph 2 – Flow from VRU Fitted with Optional Even Numbered Plate

7.3 Droplet Size

The mean size of the spray droplets produced by an atomiser is determined by the rotational speed of the gauze. The gauze is turned by the fan blades in the airstream, the speed of rotation is controlled by both airspeed and blade angle. The airspeed is determined by the type of aircraft and spraying operation, hence the droplet size is controlled by the setting of the fan blades.

7.3.1 Determining Rotational Speed (RPM)

The approximate relationship between droplet size and rotational speed is shown in Graph 3. To determine the correct rotational speed (RPM), find the desired droplet size on the vertical scale and draw a line across to meet the curve. Next, draw a vertical line down from this point and read the RPM on the horizontal scale at the bottom. For example, droplets with a VMD of 150 microns require a rotational speed of 6000 RPM.

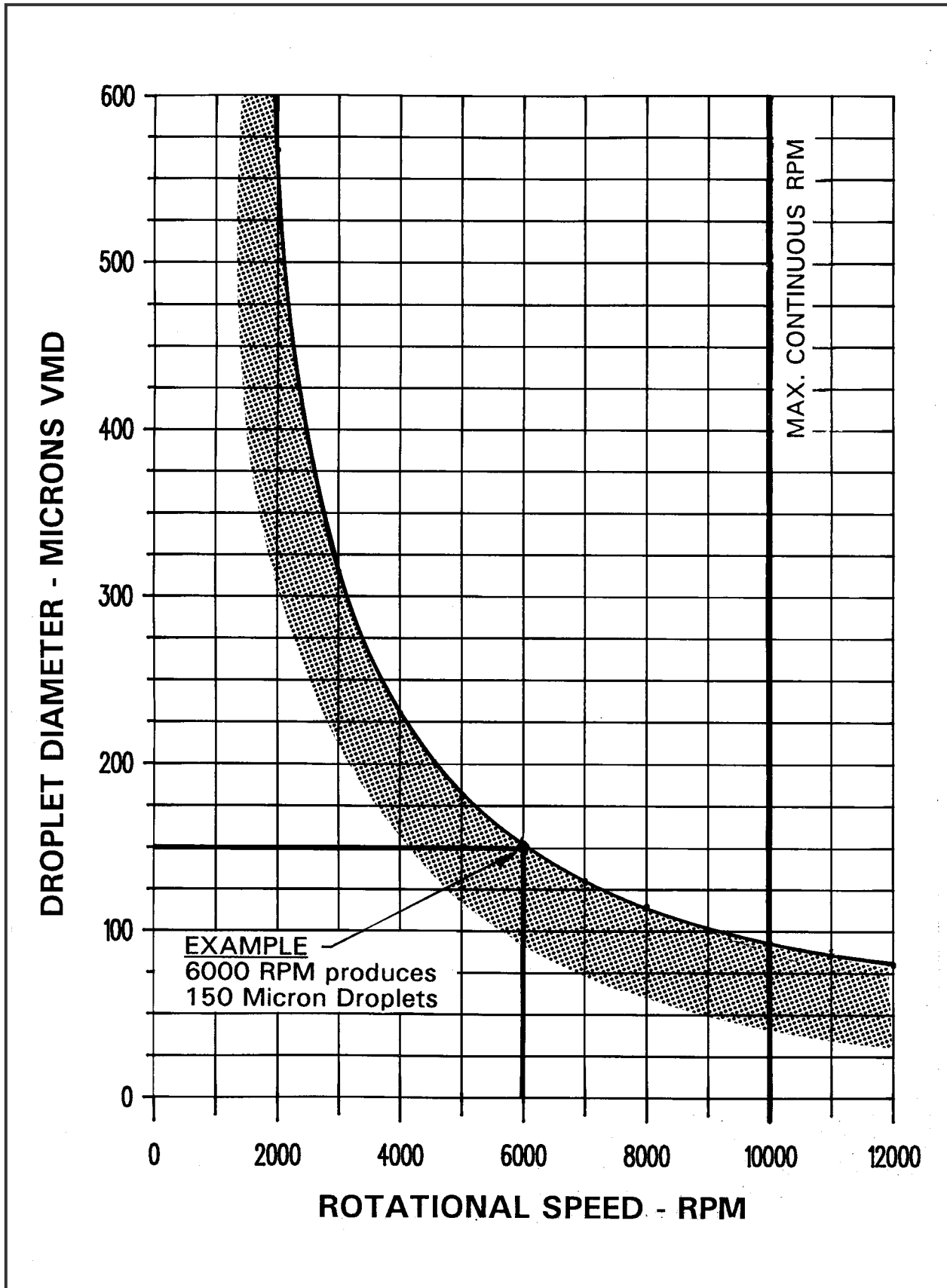
Note that the droplet size produced by an AU5000 atomiser is influenced by the properties of the chemical being sprayed. In general, ULV formulations will tend to form smaller droplets than water-based LV formulations at the same rotational speed. This is indicated by the shaded band below the curve in Graph 3. The example shown in Graph 3 applies to water.

7.3.2 Determining Fan Blade Angle

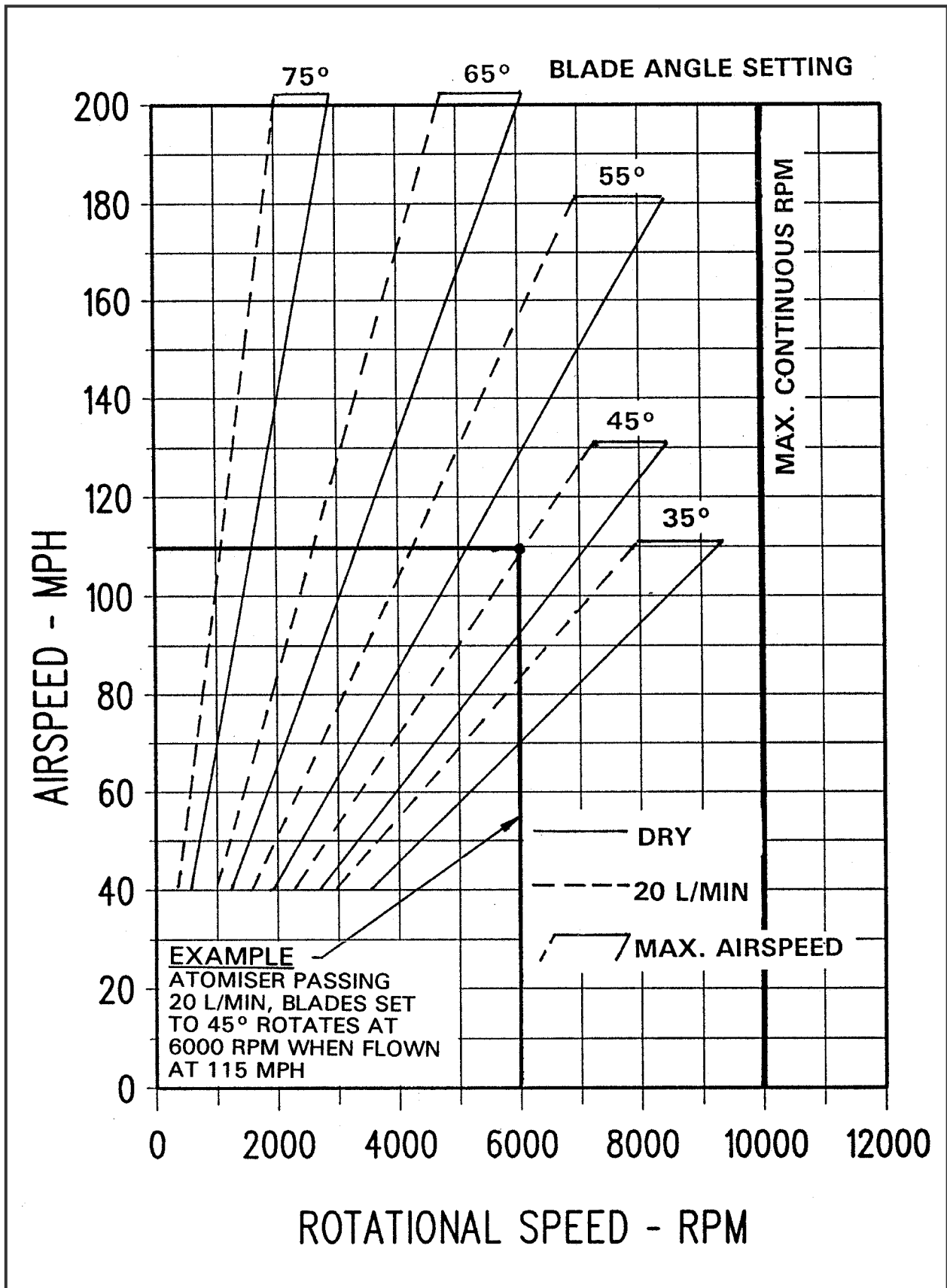
Having established the correct RPM it is necessary to find the appropriate blade angle setting to produce this RPM at that particular airspeed. The relationship between airspeed, RPM and blade angle is shown in Graphs 4, 5 or 6. Graph 4 is for standard EX1772/2 fan blades, Graph 5 is for the alternative longer EX2021 fan blades for use on slower aircraft and Graph 6 is for the alternative shorter fan blades for use on fast aircraft.

For example, if Graph 4 is to be used to determine the correct blade angle to give 6000 RPM at 110 MPH, follow the horizontal line corresponding to 110 MPH until it intersects with the vertical line corresponding to 6000 RPM. Find the appropriate blade angle setting for the flow rate to be used (in this case 20 L/min.). Blade angle is shown in the graphs over the range 35 – 75 degrees, which is the normal operating range of the atomiser. There are two lines on Graphs 4, 5 and 6 for each blade setting shown. These are marked Dry and 20 L/min corresponding to an atomiser spraying no (or very little) chemical, and 20 L/min (5 USG/min) respectively. As the volume of chemical flowing through the atomiser is increased, greater power is required to break it into droplets. This results in the atomiser slowing down. Consequently, it is necessary to set the fan blades to a finer angle to bring the speed back to the required level when spraying higher volumes.

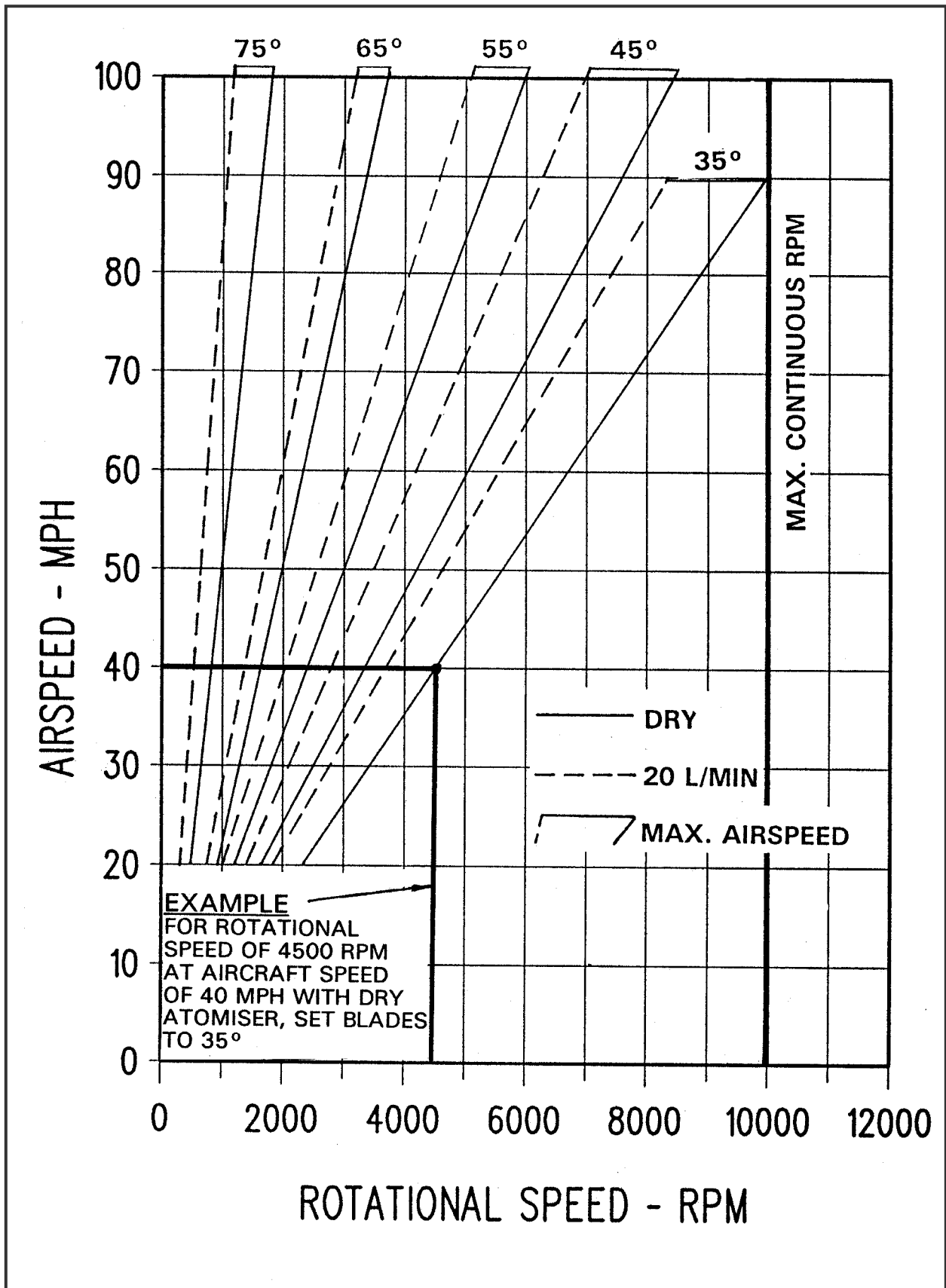
IMPORTANT: The AU5000 atomiser is designed for a maximum continuous rotational speed of 10,000 RPM. Note that the rotational speed of an atomiser increases when the flow of liquid is shut-off, therefore once fan blade angles have been set the 'Dry' line for that angle should be used to find the maximum permissible airspeed (corresponding to 10,000 RPM). This will ensure that the atomiser does not overspeed on ferry flights, or on descent to spray runs.



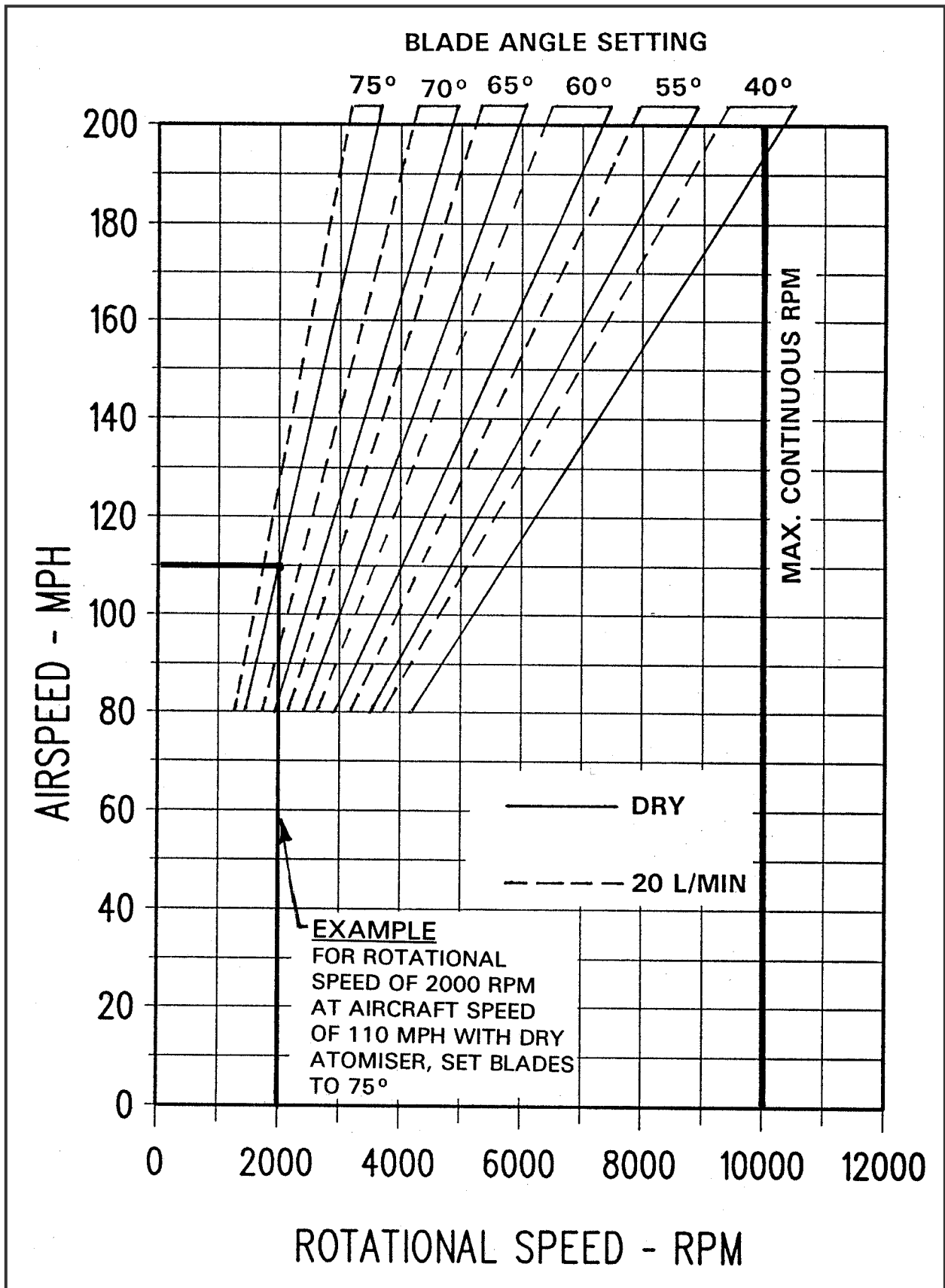
Graph 3 – Relationship Between Droplet Size and RPM



Graph 4 – Relationship Between Atomiser RPM and Airspeed for Standard EX1772/2 Fan Blades



Graph 5 – Relationship Between Atomiser RPM and Airspeed for Optional EX2021 Long Fan Blades



Graph 6 – Relationship Between Atomiser RPM and Airspeed for Optional Short EX6353 Fan Blades

7.3.2 Setting of Fan Blade Angle

To adjust the fan blade angle, first slacken the three bolts on the clamp ring and then twist the blades to the required angle by aligning the appropriate mark on the blade boss with the split line of the clamp ring as shown in Fig. 5.

When the three blades are correctly set, tighten the bolts evenly to a torque of 2.3 nm (1.7 lb ft). This will ensure that the blades are gripped sufficiently tightly to prevent them from moving in flight but are not over-tightened. Check that the blade angles have not altered after tightening.

The gap between the clamp ring and the hub must NOT be completely closed. Should this gap appear to be closed, it is likely that the clamp ring bolts have been over-tightened. The correct tightening of the clamp ring bolts can be checked by turning the blades by hand. It should be just possible to turn the blades by hand after all three bolts have been evenly tightened.

IMPORTANT: The clamp ring bolts must not be over-tightened. This could cause serious stresses in the roots of the blades and could lead to cracking and blade failure.

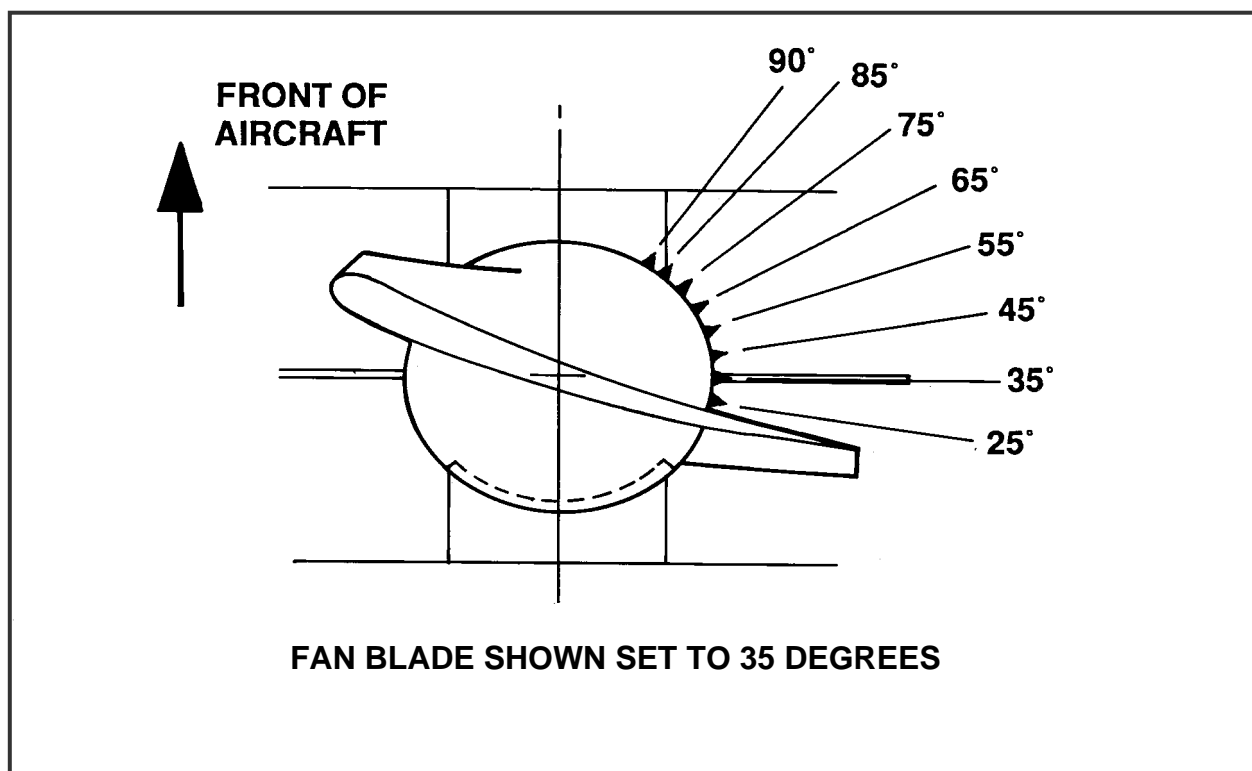


Fig. 5 – Adjustment of Fan Blade Angle

IMPORTANT: Under no circumstances should any blade be set to exceed its maximum continuous RPM (see graphs 4, 5 & 6).

7.4 Fan Blades

There are 3 alternative fan blades available for use with the AU5000 atomiser. Each type may be identified by its length, as shown in Fig. 6.

It is important to identify which type of blade is fitted, and that the appropriate graph is used to determine blade setting (see Graph 4, 5, and 6), as described in 7.3.2.

IMPORTANT: Under no circumstances should an incorrect type of fan blade be fitted to an atomiser. This could cause the atomiser to exceed its maximum operating speed of 10,000 RPM.

7.4.1 Standard Fan Blades (90 – 150 MPH)

AU5000 atomisers are normally supplied with EX1772/2 fan blades. These are 3.75 inches long, as measured from the atomiser hub to the blade tip (see Fig. 6).

EX1772/2 blades are designed for use at the flying speeds of most piston engine agricultural aircraft and are suitable for airspeeds between 90 – 150 MPH (145 – 240 Km/hr)..

7.4.2 Fan Blades for Slow Flying Aircraft (50 – 100 MPH)

In order to achieve the required rotational speed at lower airspeeds, it is necessary to use the longer EX2021 fan blades. These are 127 mm (5.0 inches) long, as measured from the atomiser hub to the blade tip (see Fig. 6). EX2021 fan blades are intended for airspeeds of between 50 – 100 MPH (80 – 160 Km/hr).

EX2021 fan blades are only supplied with installation kits if the kit is specifically intended for a suitable aircraft or if the blade type is specified at time of ordering. However, EX2021 blades are interchangeable with the EX1772/2 type and can be retrofitted at a later date.

7.4.3 Fan Blades for High Speed Aircraft (150 – 200 MPH)

These shorter blades are designed for use on high speed aircraft, including turbine powered agricultural types. EX6353 fan blades are 70mm (2.75 inches) long, as measured from atomiser hub to fan blade tip (see Fig. 6). EX6353 fan blades are intended for use at airspeeds of 150 – 200 MPH (240 – 320 Km/hr). These blades are also fully interchangeable with the standard EX1772/2 blades.

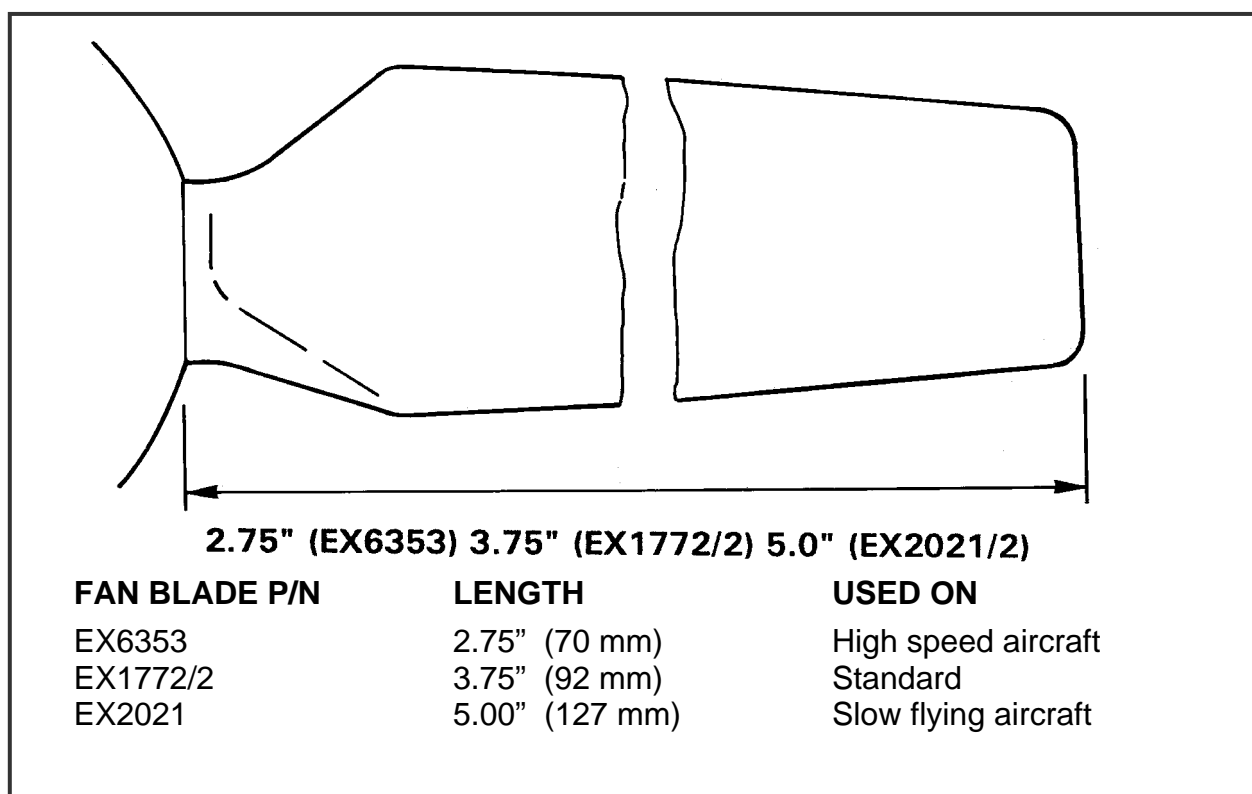


Fig. 6 – Dimensions of EX1772/2, EX2021 and EX6353 Fan Blades

7.5 Alternative Gauzes

Certain chemicals, especially those containing solids in suspension, may have a tendency to block the standard 20 mesh gauze. This results in the gauze 'flooding' with chemical and producing a poor droplet spectrum. There is also a risk that a build-up of chemical can lead to an out of balance condition and serious vibration. This problem can be overcome by the use of the coarser 14 mesh gauze, part number EX1510/14. This is unlikely to block under any conditions and will provide a good droplet spectrum whilst minimising the possibility of vibration.

Operators must note the importance of keeping all gauzes clean, especially when using chemicals containing solids in suspension.

8.0 MAINTENANCE OF ATOMISER

8.1 General

The AU5000 atomiser is precision engineered from chemical resistant materials to ensure maximum reliability under field conditions. In order to obtain the best performance and longest life it is vital that atomisers should be regularly checked and cleaned.

The entire spray system should be flushed out at the end of each day to ensure that no chemical remains inside the lines or atomisers to cause contamination or blockage. Note that clean water is only suitable for removing water-based formulations and can cause some ULV formulations to form a gel. Advice should be sought from the suppliers of ULV or specialised formulations as to the best cleaning solvent or detergent.

8.2 Pre-flight Checks

Before spraying, check each atomiser for the following points:

1. All screws, pipe connections and mounting brackets correctly tightened and wire locked where necessary.
2. Fan blades free of any chips (normally due to stone damage) and correctly adjusted. All three blades on each atomiser **MUST** be set to the same angle. See Calibration section for setting details.
3. Hub clamp ring bolts correctly tightened and not over-tightened so as to overload blade root.
4. Gauze free of dents and not blocked with dried chemical.
5. Bearings in good condition. The atomiser should spin smoothly when rotated by hand and must not have excessive play in any direction.

8.3 Dismantling Procedure

Should an atomiser require attention, the dismantling procedure is as follows:

8.3.1 Removal from Aircraft

1. Cut locking the wire and unscrew the check valve from the end of the spindle.
2. Remove the spindle retaining nut and special lock washer at the forward face of the mounting clamp. Use a 1¼" A/F spanner on the lock washer to prevent the spindle from turning in the rubber bush.
3. Withdraw the complete atomiser and spindle from mounting clamp. If necessary, tap the end of the spindle, using a **SOFT** hammer or block.
4. Remove the rubber shields at the front and rear face of the atomiser shock bush. Ensure that neither the shields nor the shock bush show any sign of deterioration. Any defective parts must be replaced.

8.3.2 Removal of Spindle

1. Remove the three pan head screws and washers securing the end cap at the rear of the atomiser. Remove the cap, together with the deflector assembly.
2. Remove the bush from the front (threaded) end of the spindle.
3. Push the spindle through the atomiser and remove through the end of the gauze.

8.3.3 Removal of Gauze

1. Remove the three pan head retaining screws and washers from the front face of the hub flange.
2. Withdraw the hub and drive tube assembly from the gauze.

8.3.4 Removal of V-ring

1. Identify the black Viton V-ring seal inside the drive tube at the front end of the atomiser.
2. Using a small screwdriver through a hole in the drive tube, ease the V-ring from its seat and allow it to drop out. Note that the gauze must be removed first. A special tool, part number EX1796, is recommended to re-fit the V-ring. The seal should not be removed unless it requires renewing.

8.3.5 Removal of Bearings

1. Remove the three screws securing the bearing retaining plate at the front of the hub assembly.
2. Remove the sealing washer from behind the plate.
3. Using a suitable drift inserted from the rear of the atomiser, tap both bearings through the hub. Ensure that the drift does not damage the rear sealing washer or V-ring. Remove both the inner and outer spacers from between the bearings. A drift is available from Micronair, part number EX4383.

NOTE: This procedure subjects the bearings and sealing washer to an end-load and hence should be used with caution. Bearings should not normally be removed except for replacement.

8.3.6 Removal of Shock Bush from Clamp

The shock bush must only be removed if it is to be replaced as removal can damage the outer sleeve of the bush.

1. Remove the two grub screws securing the shock bush, using a 3/32" Allen key.
2. Drive out the shock bush, using Micronair tool part number EX3903 or a pin punch inserted into the notches in the rear of the clamp.

8.4 Assembly Procedure

8.4.1 Installation of Bearings

1. Ensure that the bearing housing in the hub is not worn and is free of any chemical or grit.
2. Lightly grease and align the first sealing washer in the bearing housing.
3. Place the first (rear) bearing in the bearing housing and make certain it is lined up with the bore. Push in with a suitable drift. Ensure that pressure is applied to

the outer edge of the bearing only as this avoids transferring the load via the balls. An assembly tool is available from Micronair, part number EX4382.

NOTE: If the bearing has been modified for direct greasing, the exposed balls should face INWARDS towards the front of the atomiser. (See Bearing Lubrication section).

4. Lightly grease and insert both bearing spacers, one for the inner and one for the outer part of the bearing.
5. Fit the second bearing using the procedure in (3) above.

NOTE: If the bearing has been modified for direct greasing, the exposed balls should face INWARDS towards the rear of the atomiser.

6. Lightly grease and insert the washer in the end of the hub so that it rests against the outer bearing.
7. Fit the bearing retaining plate in the front of the hub and align the locating mark with the arrow on the hub.
8. Fit and tighten the three countersunk screws to secure the plate.
9. If the grease nipple has been removed, it must be replaced, otherwise an out-of-balance condition will result.

8.4.2 V-ring

NOTE: The V-ring is easier to install with a special tool available from Micron Sprayers Limited, part number EX1796.

1. Push the V-ring over the shaft of the tool with the lip facing away from the end.
2. Locate the tool over the V-ring seat inside the drive tube.
3. Push firmly down on the outer sleeve of the tool so as to force the ring on to its seat.

If the installation tool is not available, the V ring may be eased onto its seat with a screwdriver, taking care not to damage the rubber lip of the seal.

8.4.3 Gauze

Reverse the dismantling procedure, ensuring that the deflector end cap assembly is left off until the spindle is installed.

8.4.4 Blades

1. Replace all blades in their sockets and fit the clamp ring after checking that the numbers on the hub and clamp ring match. Check that the arrow on the ring aligns with the arrow on the hub. This ensures that the atomiser will be correctly balanced. Note that a locating pin on the hub will align with a hole in the clamp ring in this position.
2. Fit the three bolts and washers and tighten evenly just to trap the blades.
3. Adjust all three blades to the correct angle.

4. Tighten the clamp ring securing bolts just sufficiently to prevent the blades rotating in their sockets. See section 7.3.2.

IMPORTANT: The clamp ring bolts must be tightened evenly and must not be over-tightened. Over-tightening can damage the blades and cause in-flight failure.

8.4.5 Spindle

Reverse the dismantling procedure, making sure that the end cap of the gauze (together with the deflector assembly) is replaced.

8.4.6 Shock Bush

If the shock bush is to be replaced, the new assembly must be installed as follows:

1. Coat the outer sleeve of the shock bush with a thin layer of non-setting chromate jointing compound.
2. Insert the assembly into the clamp, ensuring that the flat in the bore is at the bottom (i.e. away from the boom).
3. Press the shock bush home, using Micronair assembly tool part number EX4384 or a vice or press.

IMPORTANT: The load must be applied to the outer sleeve ONLY. No pressure should be applied to the inner sleeve. If the assembly tool is not available, apply the load via a short tube resting on the outer sleeve.

4. Insert and tighten the grub screws at the side of the clamp so as to lock the shock bush in position.

8.5 Balance

Both the hub assembly and the gauze of all Micronair atomisers are dynamically balanced. This ensures that the atomiser will run smoothly and without vibration, which might otherwise cause damage to the unit or its mounting. As the hub and gauze are individually balanced, any gauze may be fitted to any atomiser. It is, however, vitally important that the hub is correctly assembled with its original clamp ring.

As an additional precaution, a moulded rubber shock bush assembly is fitted in the atomiser mounting clamp. This is designed to absorb any vibration caused by an exceptional condition until the aircraft can be landed and the problem rectified. The shock bush is NOT intended to absorb vibration from a damaged or wrongly assembled atomiser for a prolonged period.

Any attempt to modify or repair either the atomiser or gauze is liable to cause it to run out of balance. No such repairs should be attempted unless full dynamic balancing facilities are available. Full balancing instructions are available to organisations equipped to handle this work.

Should any unusual vibration be noticed in flight, the atomisers must be inspected as soon as possible and any defective parts replaced immediately with genuine Micronair

spares. The shock bush must always be checked and replaced if it shows any sign of deterioration.

IMPORTANT: Use of substitute parts or unauthorised repair will void all warranties.

Vibration can also be caused by worn bearings, a build-up of dried chemical in the gauze or broken fan blades. These problems should not occur if the equipment is properly flushed out, cleaned and maintained. Operators and pilots must be made aware of the importance of regular inspection of the atomisers to prevent the above problems.

8.6 Bearing Lubrication

All Micronair AU5000 atomisers manufactured after January 1982 are fitted with sealed ballraces. Earlier units were fitted with metal shielded ballraces. Under normal circumstances, both types will give several hundred hours service and need never be lubricated. The grease nipple fitted as standard is false and will not accept grease. It must not, however, be removed as it is necessary to keep the unit in balance and prevent moisture and chemical entering the bearings.

Under exceptional conditions, some chemicals may attack the rubber seals or grease in the ballraces. Should this be the case, the atomisers may be modified for normal greasing by replacing the false nipple with a standard type and fitting ballraces with a single metal shield in place of the original sealed type.

The procedure to modify an atomiser is as follows:

1. Remove both ballraces and bearing spacers (see section 8.3.6 for details).
2. If the original bearings (CBP663) are in good condition, they may be modified by removing and discarding the rubber seal or metal shield on ONE side of each bearing. This is best done with a sharp instrument or knife.
3. If the bearings are worn or damaged, they should be replaced either with double sealed or shielded ballraces modified as above or with a single shielded type (CBP582).
4. Pack each ballrace with grease. A molybdenum disulphide based grease is preferred (e.g. Shell Retinax AM or Aeroshell Grease 8). Any other grease with similar properties may be used.
5. Re-fit both bearings and bearing spacers into the hub assembly, as described in section 8.4.1. Ensure that the unshielded sides of both ballraces face inwards towards each other.
6. Remove the false grease nipple (EX3329) and discard. Replace it with the standard nipple (CBP200).
7. Grease the assembly with two strokes of a standard grease gun.

If an atomiser is adapted for external lubrication, greasing should be carried out according to the conditions of use. As a general rule, the bearings should be lubricated with one stroke of a standard grease gun after every one to two days operation.

IMPORTANT: Atomisers must not be over-greased. Over-greasing will be indicated by excessive stiffness of the atomiser or by grease being forced out of the drain holes at the front of the hub flange.

9.0 VARIABLE RESTRICTOR UNIT

9.1 Principle of Operation

The Variable Restrictor Unit (VRU) controls the flow to each atomiser by means of an orifice plate with a number of holes of different sizes drilled around its periphery. The orifice plate lies against a selector plate. This has a single hole and is attached by a shaft to the calibrated knob at the end of the unit. The hole in the selector plate can be set to align with any one of the holes in the orifice plate, thus controlling the chemical flow according to the hole size. Additionally, the selector plate can be aligned with a blank part of the orifice plate, providing shut-off position. This applies only when plate EX194/O is fitted. The knob is made to 'click' into the appropriate position by means of a spring in the VRU body which engages in grooves inside the knob. This ensures that the hole in the orifice plate is aligned with the hole in the selector plate. The positive location of the knob eliminates any possibility of the selected orifice being altered unintentionally. A full flow position is also provided.

IMPORTANT: The flow must always enter the side of the VRU. This forces the selector plate against the orifice plate. Should the VRU be incorrectly installed with the chemical entering the end, the plates would be forced apart and an erratic flow would result.

9.2 Instructions for Use

The knob of the VRU is marked with odd numbers 1 – 13 at the side and even numbers 2 – 14 on the end. These numbers correspond to the hole sizes in the orifice plates EX194/O (odd) and EX194/E (even).

All variable restrictor units are fitted as standard with the odd plate EX194/O. This plate has all the odd numbered orifice sizes (1 – 13), and is supplied to enable the operator to use a wide flow range from ULV to high volumes without changing the plate. A number of alternative plates can, however, be supplied on request to suit special needs. It is seldom necessary to use these special plates and customers are encouraged to use the standard plate (EX194/O) to cover all ranges.

To establish which plate is installed in a VRU, the marking on the plate can be viewed through the outlet. See Fig. 7 for details of markings.

Should an unrestricted flow be required, the VRU can be set to the full flow position by turning the knob to number 7, pulling back and rotating it through 90 degrees until it locks in the outward position, separating the two plates and providing an uninterrupted flow. To release the unit from the full flow position, turn the knob in either direction until the spring returns the selector plate to the normal position. It is advisable to push down on the knob with the palm of the hand to ensure positive seating. Should the unit become blocked after selecting the full flow position, it can sometimes be cleared by

turning the selector plate backwards and forwards. Any contamination between the plates will hold the plates apart and give an irregular output.

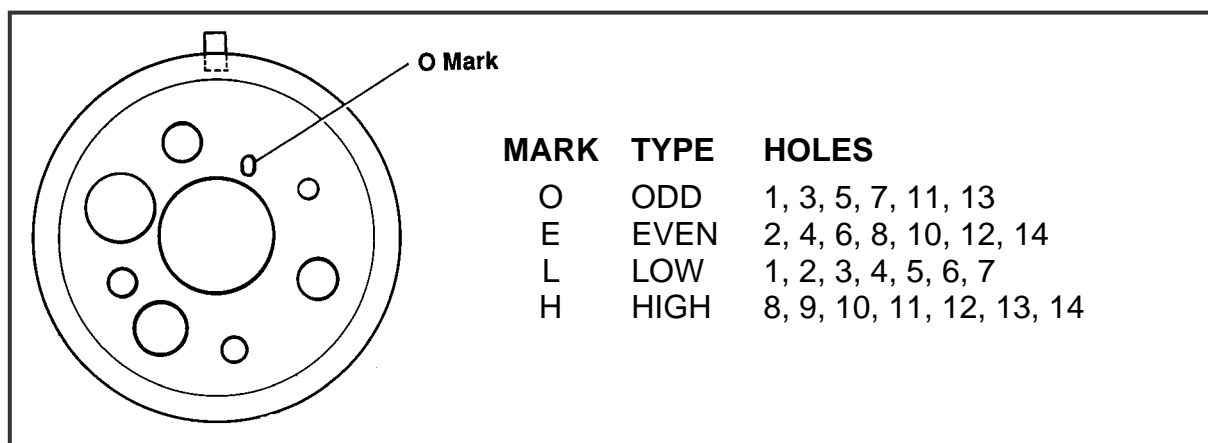


Fig. 7 – Alternative VRU Plates

9.3 Maintenance

Each VRU should be checked and cleaned periodically. Should it be necessary to dismantle the unit, the procedure is as follows:

1. Remove the VRU by disconnecting the outlet hose and unscrewing the unit from the boom.
2. Remove the red knob by unscrewing the 10-32 nut in the centre. Ensure that the washers on either side of the knob cap are not lost.
3. Using a spanner, unscrew the outlet fitting of the VRU. If this is tight, the body must be held by two locating holes under the knob at the opposite end to the outlet. A special key, part number EX1942, is available from Micronair to assist in dismantling the VRU.

IMPORTANT: Do not clamp the VRU by its body or inlet pipes as these may be permanently damaged.

4. Remove the orifice plate from the body and slide out the selector plate assembly and spring.
5. The shaft is sealed by a gland packing that is retained by a brass ring at the end of the body. This should not be disturbed unless the gland requires replacing. If replacement is necessary, the brass ring should be unscrewed and the old packing eased out of its seat.

Before re-assembly, all parts must be thoroughly cleaned. Particular attention must be given to the faces of the orifice and selector plates, the selector shaft and the indexing grooves inside the knob. Check that all are clean and correctly located.

The assembly procedure is as follows:

1. If the gland packing has been removed: fit a new packing into the seat in the body and screw down the retaining ring so that it just touches the packing. **DO NOT TIGHTEN AT THIS STAGE.**

2. Fit the spring against the selector plate and insert the assembly into the body, passing the shaft through the gland packing.
IMPORTANT: Do not allow the step at the end of the shaft to damage the gland packing in the body.
3. Position the orifice plate in the body, making certain that the FLAT face rests against the selector plate and the locating pin engages in the hole inside the body.
4. Screw the outlet into the body and tighten with a spanner.
5. If the gland packing has been replaced or if the gland has shown signs of leaking: tighten the gland retaining ring to compress the packing. The ring should be tightened about half a turn before rotating the shaft. This procedure should be repeated until the shaft has seated into the packing. Loosen the ring slightly to enable the plates to close positively. If the shaft has a tendency to stick, check that the spring has sufficient tension to overcome any resistance in the gland packing. If the packing shows signs of being tight or dry, lubricate the packing with light grease.
6. Fit the flat washer against the step on the selector shaft.
7. Fit the knob and lock in place with the 10-32 nut and lock washer.
8. Ensure that the knob rotates smoothly and 'clicks' positively in each position – see (5) above.

10.0 DIAPHRAGM CHECK VALVE

10.1 Principle of Operation

The diaphragm check valve uses a spring loaded diaphragm to shut off chemical flow to an atomiser when not spraying. This eliminates the possibility of leakage of any residual chemical in the boom or pipework and ensures a quick shut-off of spray when the control valve is closed at the end of a run. When the spray is turned on again, the pressure of the chemical acts against the spring behind the diaphragm and forces it away from its seat, allowing chemical to flow into the atomiser.

10.2 Maintenance

Because of its simple construction, the diaphragm check valve requires very little maintenance. The diaphragm, however, should be checked periodically and replaced if it shows any signs of wear or deterioration.

IMPORTANT: The diaphragm is made from either reinforced Viton or PTFE. It must only be replaced with the appropriate Micronair spare part (CBP487 – Viton or EX2762 – PTFE).

Should it be necessary to dismantle the unit completely, the procedure is as follows:

1. Cut all locking wire and remove the check valve from the atomiser spindle and feedpipe.
2. Unscrew the cap retaining ring and remove the ring, cap and diaphragm.

3. Ease the spring clip from its groove inside the cap and remove the plunger and spring.

Before re-assembling the valve, clean all parts and remove any traces of chemical, especially from inside the cap behind the plunger and around the seating faces of the diaphragm. To re-assemble, reverse the dismantling procedure, ensuring that the spring clip is correctly positioned and the diaphragm is accurately aligned. When tightening the cap retaining ring, the cap should be held firmly to prevent it from rotating and buckling the diaphragm. A drop of oil inside the retaining ring can assist assembly.

After re-fitting the valve on the aircraft, wire lock the cap and the outlet fitting as described in the Installation section.

10.3 Chemical Resistance of Diaphragms

The standard diaphragm supplied with all check valves is made from fabric reinforced Viton. This material has proved to provide excellent resistance to a wide range of chemicals. However, some ULV formulations may reduce the life of Viton diaphragms. Should this be the case, alternative PTFE diaphragms are available (see the parts list in section 14.3).

11.0 AIR DEFLECTOR KIT

The Air Deflector Kit Part No EX5211 consists of a profiled disc mounted forward of the atomiser gauze. The disc deflects the airflow away from the gauze surface, ensuring that spray droplets are produced in an area of low velocity air. This minimises any tendency for the droplets to be sheared by the axial airflow and results in an improved droplet spectrum, especially at higher airspeeds and with low viscosity chemical formulations.

The air deflector is supplied either as a modification kit for existing AU5000 atomisers or may be supplied ready installed on new atomisers.

The air deflector kit consists of the deflector plate, a special reduced diameter gauze, a modified end cap assembly and all necessary screws, washers etc.

11.1 Installation

If an existing atomiser is to be modified, the procedure for the installation of the deflector kit is as follows:

1. Remove the original deflector cap (EX4386).
2. Remove the original gauze (EX1510) and discard the 3 EX1262 screws.
3. If not already assembled, attach the deflector plate EX5212 to the new gauze EX5213, using the countersunk screws A206-C12 provided.
4. Slide the deflector and gauze assembly over the atomiser drive tube and secure to the hub flange using screws CBP2286 and washers SP123-C supplied.

IMPORTANT: The CBP2286 screws are shorter than the EX2612 screws used to attach the original gauze. The original longer screws must not, therefore, be used.

5. Fit the new end cap assembly EX5214 to the gauze using the original EX2612 screws and SP123-C washers.
6. Inspect the installation, ensuring that the gauze, deflector plate and end cap are all securely seated and that all screws are tight.

11.2 Calibration

The dimensions of the air deflector and gauze have been chosen to provide a droplet size (VMD) substantially the same as a standard unmodified AU5000 atomiser under the same operating conditions. It should not, therefore, be necessary to change the atomiser rotational speed to produce the same droplet size as produced by the unmodified atomiser. However, the atomiser blade angle should be adjusted if it is found necessary to produce larger or smaller droplets. In this case, the calibration procedure for the atomisers fitted with the air deflector assembly remains exactly as described in sections 7.3 and 7.4.

11.3 Gauze Types

The EX5213 gauze used with the air deflector can be supplied in either 14 or 20 mesh sizes. See section 7.5 for details.

11.4 Parts List

Item	Part No	Description	Qty	Notes
1	EX5212	Air Deflector Ring	1	
2	EX5213/14	Gauze Assy (14 mesh)	1)	Alternatives
2	EX5213/20	Gauze Assy (20 mesh)	1)	
3	EX5214	Deflector	1	
4	EX2612	Screw	3	
5	SP123C	Washer	6	
6	A206-C12	Screw Csk	3	
7	CBP2286	Screw 8.32 x 3/8"	3	
8	EX5211	AU5000 Air Deflector kit complete	1	

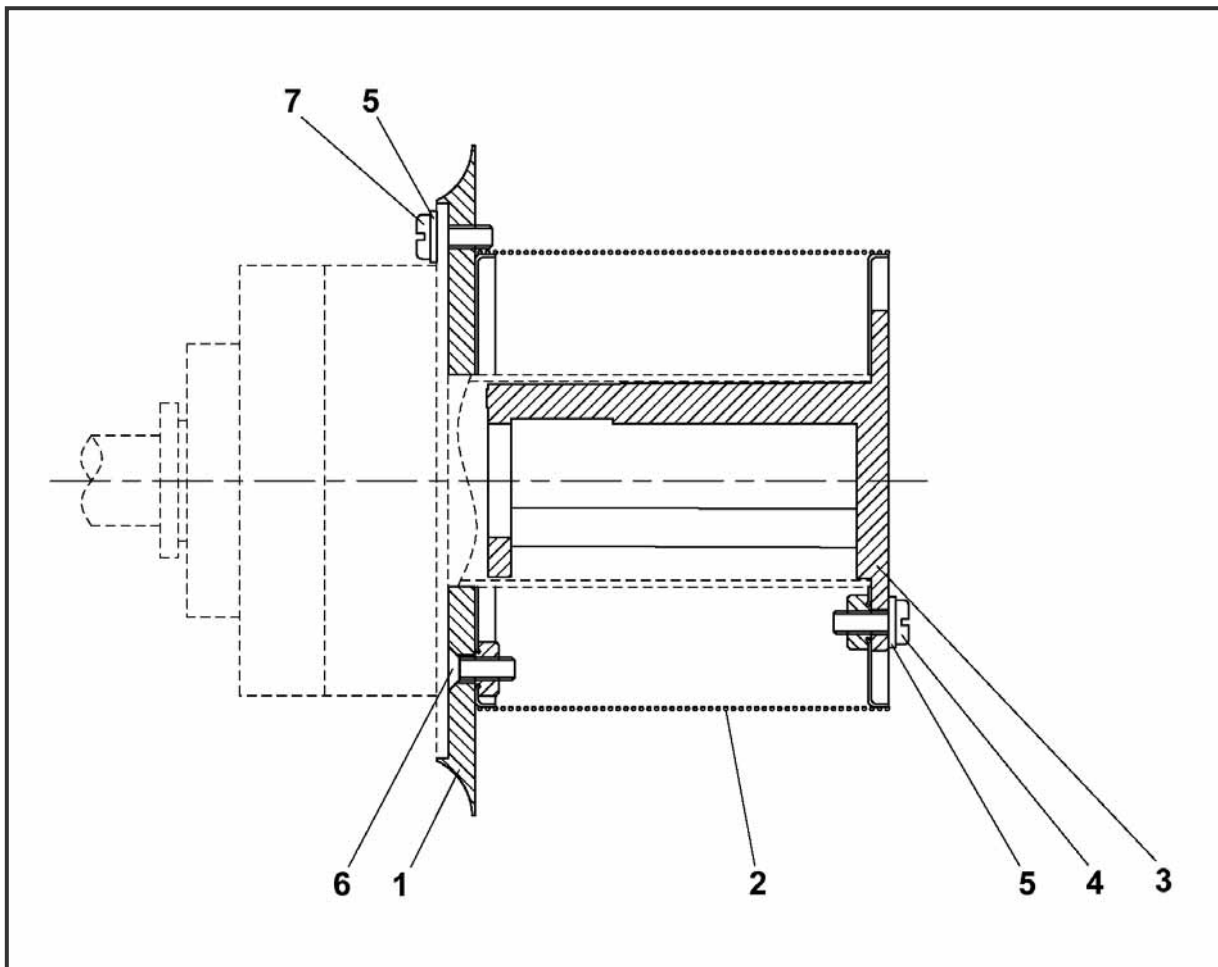


Fig. 8 – Air Deflector Kit

12.0 APPLICATION MONITOR

The Micronair Application Monitor is a complete monitoring system for any spray aircraft. Chemical flow is measured by a flowmeter turbine, which is connected to a microprocessor-based electronic unit. This takes the chemical flow rate, together with the swath width and ground speed of the aircraft and displays:

- Application rate in litres/Ha or gallons/acre
- Flow rate in litres or gallons/minute
- Total volume A, which can be reset at any time
- Total volume B, which cannot be reset and provides a job total
- Area sprayed in Ha or acres
- Work rate in Ha or acres/minute
- Spray time

The electronic unit incorporates a large liquid crystal display and a touch keyboard. The keyboard is used to select the function shown on the display. All information is shown in plain English and prompts are displayed whenever necessary.

The unit is provided with an adjustable back-light for use under poor lighting conditions and at night.

The unit can be programmed by the user to operate in Metric, US or British units. The Application Monitor can be calibrated to work with either of two flowmeter turbines. This provides maximum flexibility for operators who require a wide flow range.

Every Application Monitor is programmed to operate with the optional Application Printer. When this is installed, the unit will print a permanent record of every spray job.

13.0 RPM INDICATOR (TACHOMETER)

The application Monitor may be used to measure the rotational speed of each of up to 10 atomisers. These may be Micronair AU3000, AU4000, AU5000 or AU7000 units. In order to do this, each atomiser must be provided with a transducer and associated wiring etc. These parts may be ordered with the Application Monitor or may be added later.

14.0 PARTS LISTS

When ordering spare parts, please specify the following information:

- Serial number of atomiser
- Approximate date of purchase
- Description of part
- Part number as shown in this section
- Number of parts required

14.1 AU5000 Atomiser

Item	Part No	Description	Qty	Notes
1	EX2478	Hub Body Assembly	1	
2	EX1514	Nut	1	
3	EX1975	Washer	1	
4	EX2493	Spacer Bush	1	
5	EX2485	Bearing Retaining Plate	1	
6	EX2492	Washer Sealing	1	
7	EX2675	Screw 8-32 csk	3	
8	EX2479	Washer, Sealing	1	
9	CBP663	Bearing	2	
10	CBP482	'V' Ring	1	
11	EX1510/20	Gauze Assy 20 Mesh	1	Alt EX1510/14
12	EX4386	Deflector Cap	1	
13	EX2612	Screw 8-32	6	
14	SP123C	Washer	6	
15	EX3329	False Grease Nipple	1	
16	EX1772/2	Fan Blade	3	Alt EX2021, EX1939
17	EX1489	Bearing Spacer Inner	1	
18	EX1541	Bearing Spacer Outer	1	
19	EX2477	Clamp Ring	1	
20	AN3C10A	Bolt	3	
21	SP123D	Washer	3	
22	EX2292	Spindle Assy	1	
23	EX2825	Spindle Bare	1) These items
24	EX2291	Cap	1) supplied assembled
25	CBP766	Seal	1) together as
26	CBP845	Spring	1) item 22
27	CBP828	Circlip	1)
28	Various	Mounting Brackets		Supplied separately
29	EX1949	Shock Bush		Supplied separately
30	EX1974	Shield Front		Supplied separately
31	EX1973	Shield Rear		Supplied separately

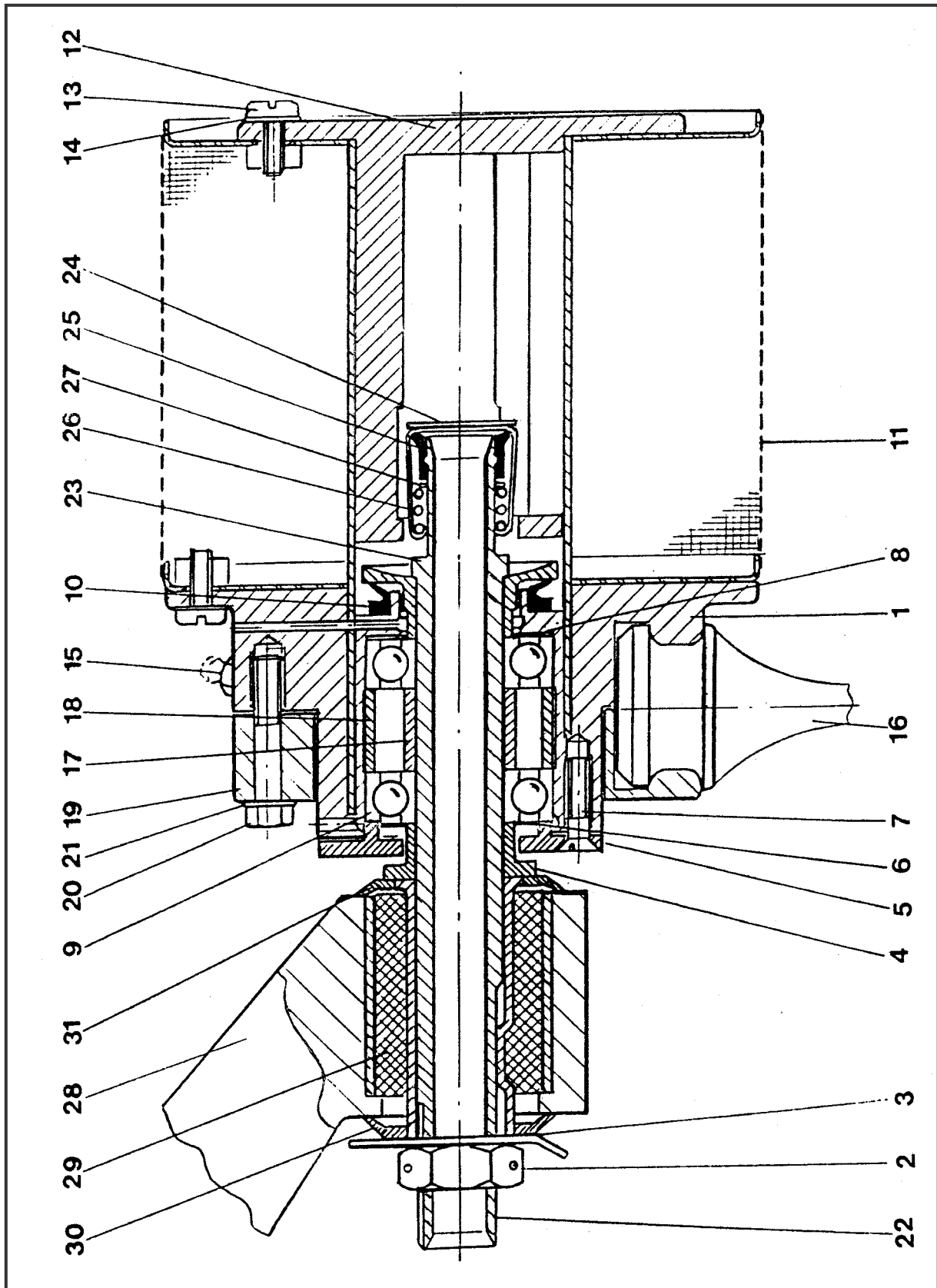


Fig. 9 – AU5000 Atomiser

14.2 Variable Restrictor Unit

NOTE: Variable restrictor units are supplied with various inlet and outlet adaptors according to the installation kit. The standard configuration is EX4156. This includes adaptors and fittings to suit most standard spray booms.

Item	Part No	Description	Qty	Notes
1	EX1556	Outlet Fitting	1	1/2" Hose
2	EX194/O	Restrictor Plate	1	Odd (Standard)
2	EX194/E	Restrictor Plate	1	Even (Option)
2	EX194/H	Restrictor Plate	1	High (Option)
2	EX194/L	Restrictor Plate	1	Low (Option)
3	EX2081	Shaft & Selector Assy.	1	
4	CBP493	Spring	1	
5	EX2078	Body Assy (Standard)	1	1/8" + 1/4" NPT
6	EX2077	Spring, Index	1	
7	EX72	Gland Packing	1	
8	EX71	Gland Retainer	1	
9	SP127D	Washer	1	
10	EX2069	Knob (Thimble)	1	
11	AGS2037C	Washer, Lock	1	
12	AN364-1032C	Stiffnut	1	
13	EX1670	Cap, Blanking	1	1/8" NPT
14	EX1671	Cap, Blanking	1	1/4" NPT
15	EX1672	Elbow	1	1/4" NPT
16	EX2084	Body Assy (Alternative)	1	7/8" UNF Inlet
17	EX2094	Body Assy (Alternative)	1	1/4" NPT Inlet
18	EX1954	Inlet Adaptor	1	1/2" Hose
19	EX2080	VRU Assy. Complete		
20	EX4156	VRU Assy. with Standard Fittings		

14.3 Diaphragm Check Valve

Item	Part No	Description	Qty	Notes
1	EX1533	Ring, Securing	1	
2	EX1530	Cap	1	
3	CBP485	Spring	1	
4	EX1531	Plunger	1	
5	CBP486	Spring Clip	1	
6	CBP487	Diaphragm	1	Viton (Standard)
6	EX2762	Diaphragm	1	PTFE (Optional)
7	EX1526	Body Assy.	1	
8	EX1527	Cap Assy.	1	Items 2,3,4 & 5
9	EX1525	Check Valve Assy. Complete		

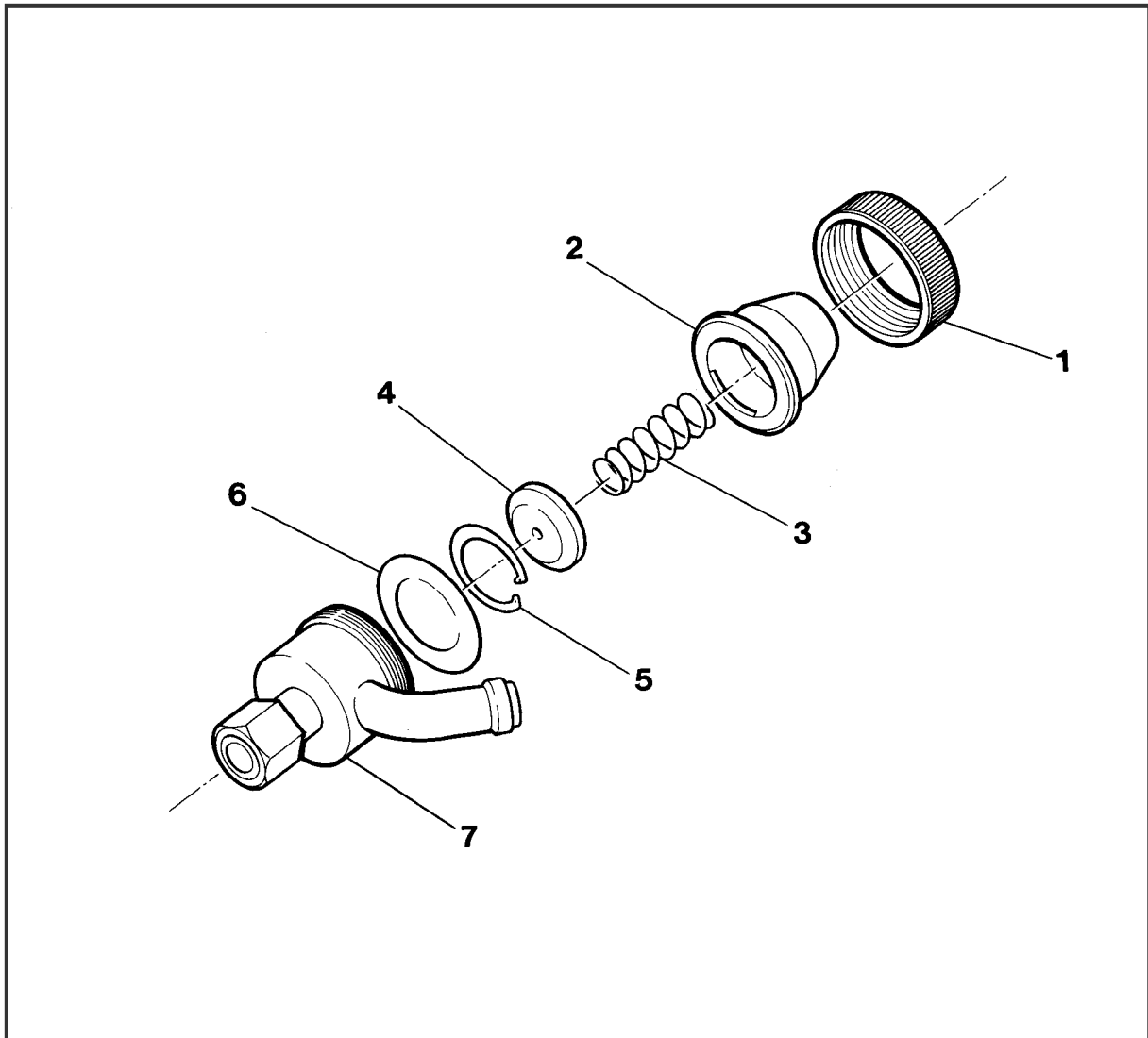


Fig. 11 – Diaphragm Check Valve

14.4 Special Tools Available from Micron Sprayers Ltd

The following special tools are available from Micron to assist with the maintenance of AU5000 atomisers and accessories. None of these tools are essential to carry out any work described in this Handbook but they are highly recommended for any workshop maintaining a number of atomisers.

Part No	Description
EX1796	Tool for installing V-ring seal
EX1942	Key for dismantling and tightening VRU body
EX3903	Tool for removing shock bush from mounting clamp
EX4384	Tool for pressing shock bush into mounting clamp
EX4383	Drift for removal of bearing assembly
EX4382	Tool for installation of bearings

15.0 CONVERSION FACTORS

1 yard	= 3 feet	= 0.91 metre
1 metre	= 39.37 inches	= 1.09 yards
1 statute mile	= 0.87 nautical mile	= 1.61 kilometres
1 nautical mile	= 1.15 statute mile	= 1.85 kilometres
1 kilometre	= 0.62 statute mile	= 0.54 nautical mile
1 statute mile	= 1760 yards	= 5280 feet
1 nautical mile	= 2027 yards	= 6081 feet
1 kilometre	= 1094 yards	= 3282 feet
1 metre/sec	= 2.237 miles per hr	= 196.9 ft/min
1 acre	= 43560 sq feet	= 4840 sq yards
1 acre	= 4047 sq metres	= 0.40 hectare
1 hectare	= 107600 sq feet	= 11955 sq yards
1 hectare	= 10000 sq metres	= 2.47 acres
1 sq mile	= 640 acres	= 259 hectares
1 sq kilometre	= 247 acres	= 100 hectares
1 US gal	= 0.83 Imp gal	= 3.78 litres
1 Imp gal	= 1.20 US gals	= 4.54 litres
1 litre	= 0.26 US gal	= 0.22 Imp gal
1 US pint	= 16 US fl ounces	= 0.47 litres
1 Imp pint	= 20 Imp fl ounces	= 0.57 litre
1 US gal/acre	= 8 US pint/acre	= 9.45 litres/hectare
1 Imp gal/acre	= 8 Imp pints/acre	= 11.35 litres/hectare
1 litre/hectare	= 0.11 US gal/acre	= 0.081 Imp gal/acre
1 pound	= 16 ounces	= 0.45 kilogram
1 kilogram	= 2.20 pounds	= 35.3 ounces
1 ounce	= 28.35 grams	
1 pound/sq inch	= 0.068 atmosphere	= 0.067 bar
1 atmosphere	= 14.70 pounds/sq in	= 1.01 bar
1 bar	= 14.50 pounds/sq in	= 0.98 atmosphere

Micronair is the registered trademark of Micron Sprayers Limited, Bromyard, United Kingdom.

Every care has been taken in the design of this equipment and the preparation of this Handbook. However, Micron Sprayers Limited cannot accept responsibility for errors or the consequences thereof. The user must satisfy himself that the equipment is suited to his needs, is performing according to his requirements and that all statutory requirements and airworthiness regulations are being complied with.

Notes: