



# **AU4000 ATOMISER**

## **Operator's Handbook and Parts Catalogue**

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# TABLE OF CONTENTS

1.	INTRODUCTION .....	1
2.	SPECIFICATION .....	3
3.	TEN KEY POINTS FOR OPERATORS .....	4
4.	INSTALLATION .....	6
4.1	Securing and Wire Locking of Atomisers .....	7
4.2	Installation of Electric Brake System .....	8
4.3	Alternative Mounting Clamps and Blocks .....	10
5.	OPERATION .....	12
5.1	General Comments .....	12
5.2	Daily Inspection .....	12
5.3	Calibration Procedure .....	12
5.4	Operating Technique .....	13
5.4.1	Low Volume Spraying .....	13
5.4.2	Ultra Low Volume Spraying .....	13
5.5	Observation in Flight .....	13
6.	HEALTH AND SAFETY .....	14
7.	CALIBRATION AND ADJUSTMENT .....	15
7.1	General .....	15
7.2	Application Rate .....	15
7.2.1	Aircraft Calibration .....	15
7.2.2	Adjustment of Flow Rate .....	16
7.3	Droplet Size .....	21
7.3.1	Determining Blade Angle .....	21
7.3.2	Setting of Fan Blade Angle .....	26
7.4	Alternative Fan Blades .....	27
7.4.1	Calibration .....	28
7.5	Use of Atomiser on Fast Aircraft .....	28
7.6	Alternative Gauzes .....	28
8.	MAINTENANCE OF ATOMISER .....	29
8.1	General .....	29
8.2	Pre-flight Checks .....	29
8.3	Dismantling Procedure .....	29
8.3.1	Removal from Aircraft .....	29
8.3.2	Removal and Dismantling of Spindle .....	30
8.3.3	Removal of Fan Blades .....	30
8.3.4	Removal of Gauze .....	30
8.3.5	Removal of Bearings .....	31
8.3.6	Removal of V-ring and Carrier .....	31

8.	MAINTENANCE (CONTINUED)	
8.4	Assembly Procedure.....	31
8.4.1	Installation of V-ring.....	31
8.4.2	Installation of Bearings.....	31
8.4.3	Gauze.....	32
8.4.4	Blades.....	32
8.4.5	Spindle.....	33
8.5	Balance.....	34
8.6	Bearing Lubrication.....	34
9.	ATOMISER BRAKES.....	35
9.1.	Maintenance.....	35
10.	VARIABLE RESTRICTOR UNIT.....	37
10.1	Principle of Operation.....	37
10.2	Instructions for Use.....	37
10.3	Maintenance.....	38
11.	DIAPHRAGM CHECK VALVE.....	39
11.1	Principle of Operation.....	39
11.2	Maintenance.....	39
11.3	Chemical Resistance of Diaphragms.....	40
12.	APPLICATION MONITOR.....	41
13.	RPM INDICATOR (TACHOMETER).....	41
14.	PARTS LISTS.....	43
14.1	AU4000 Atomiser EX2355.....	44
14.2	Electric Brake.....	46
14.3	Variable Restrictor Unit.....	48
14.4	Diaphragm Check Valve EX1242.....	50
15.	CONVERSION FACTORS.....	52



# 1. INTRODUCTION

The AU4000 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 at Bembridge Fort on the Isle of Wight, has enabled Micron Sprayers to produce a truly versatile and reliable atomiser for both normal and specialised agricultural and pest control spraying requirements.

The Micronair AU4000 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 five 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 AU4000 atomiser has been designed to operate over a wide range of flow rates. Although the unit is designed for all application techniques from conventional Low Volume (LV) spraying with water based formulations at 10 – 20 litres/hectare to Ultra Low Volume (ULV) spraying at 1 L/Ha or less, it is especially recommended for specialised ULV work such as public health, migrant pest and forestry spraying.

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. Fine adjustment of flow rate is carried out by varying the system pressure by means of the by-pass valve that is normally fitted to the standard spraying system.

The easy and independent adjustment of droplet size and flow rate enable an aircraft equipped with AU4000 atomisers to be calibrated for a wide variety of products 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 AU4000 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.

A diaphragm check valve is supplied with each atomiser. This fits onto the end of the spindle and ensures quick and effective chemical shut-off at the end of each spray run and eliminates the possibility of dripping from the atomiser on the ground. As an additional precaution, a secondary shut-off valve is fitted to the rear end of the spindle inside the atomiser.

An electrically operated brake is fitted to the mounting block or clamp of each atomiser to stop the rotation of the unit during ferry flights or in the event of an emergency.

The AU4000 atomiser is the preferred replacement for the now obsolete AU3000 model for specialised ULV spraying and for use on fast aircraft. The AU4000 can be used as a direct replacement for the AU3000 unit as both spindle mountings are identical. However, the use of both types at the same time on the same aircraft is not advised. For new installations for conventional agricultural spraying, Micron recommend the AU5000 atomiser.

The number of AU4000 atomisers installed on an aircraft depends upon the aircraft type, swath width, application technique and rate (see Calibration section). One or two units may be adequate for some specialised ULV spraying but a minimum of six atomisers is recommended to ensure an even swath in conventional agricultural spraying.

AU4000 atomisers are supplied with mounting clamps or blocks and all accessories including variable restrictors, diaphragm check valves and all necessary pipework, hardware etc.

AU4000 atomisers normally require special mounting booms or structure. Installation kits are available to mount atomisers on many popular models of fixed wing aircraft and helicopters. Full details and installation drawings are available from Micron on request.

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## 2. SPECIFICATION

Weight:	2.8 Kg (6.4 lb) (less mounting clamp or block)
Flow rate:	0 – 30 litres/min (0 – 8 USG/min) per atomiser <sup>[1]</sup>
Flow control:	By Micronair variable restrictor unit (VRU)
Chemical shut-off:	By diaphragm check valve and secondary shut-off in atomiser
Spray droplet size:	Variable between 30 – 400 microns VMD <sup>[2]</sup>
Rotational speed:	Variable between 2,000 – 10,000 (max) RPM
Operating airspeed:	120 – 200 MPH (190 – 320 Km/hr) with EX2665 blades <sup>[3,4]</sup> 90 – 150 MPH (145 – 240 Km/hr) with EX289/2 blades <sup>[3]</sup> 75 – 100 MPH (80 – 160 Km/hr) with EX252/2 blades <sup>[5]</sup>
Brake:	Electromagnetic brake available with 12 or 24 V DC coil Power requirement 20 W per atomiser maximum
Mounting:	By mounting clamp or block – types available to suit most popular aircraft types
Chemical feed:	From 3/4" (19 mm) I/D hose or 7/8" UNF fitting <sup>[6]</sup>

### 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. CBP289/2 blades supplied as standard.
4. EX2665 or other specially reduced length blades may be required for some faster aircraft types.
5. CBP252/2 blades supplied only when specified for slow aircraft.
6. Alternative fittings may be supplied for some installations if necessary.



### 3. 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 functioning of the atomiser brakes and 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 that 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 will be damaged.
4. If greased bearings are installed, ensure that they are greased regularly but not excessively. Overgreasing can cause heating and destroy the bearings.
5. Inspect all gauzes for chemical deposit, damage or any condition that 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 check 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, apply atomiser brakes and land as soon as possible. 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 contact your distributor or Micron Sprayers in England. Our staff will usually be able to give immediate advice.

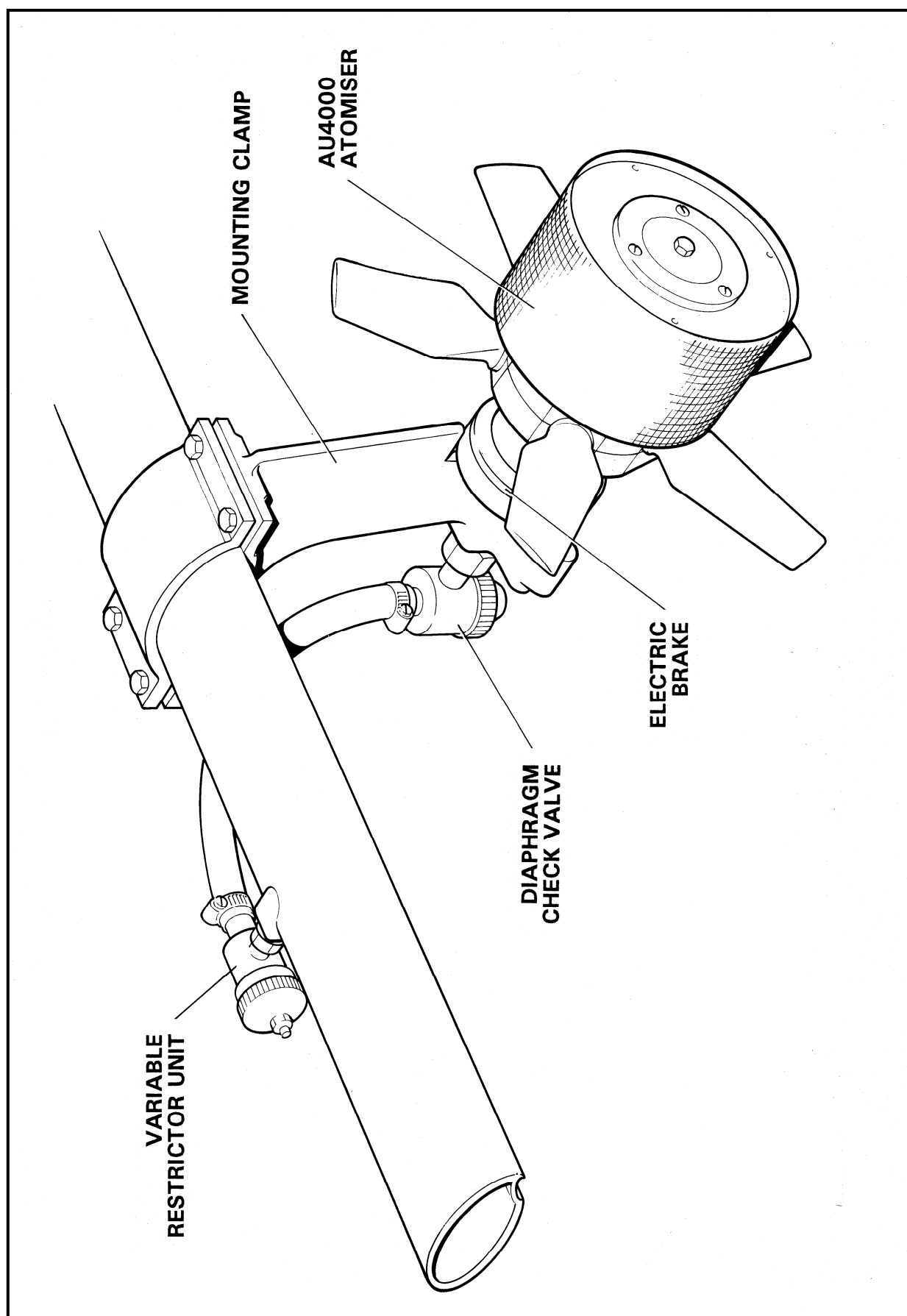


Fig. 1 – Typical Installation of AU4000 Atomiser

## 4. INSTALLATION

Micronair AU4000 atomisers are suitable for use on a wide range of aircraft types. The installation must be carried out exactly as described in this Handbook and particular attention must be paid to all aspects of the work that require structural additions or modifications to the airframe.

AU4000 atomisers must only be installed on booms or brackets that are of adequate strength. Installation kits supplied by Micron have been designed and stressed to meet this requirement. Micron can supply design data to organisations considering developing their own installations but cannot take any responsibility for the resulting design or its airworthiness approval.

The procedure for a typical AU4000 installation is as follows:

1. Install mountings or attachments for atomiser booms or brackets as required.
2. Install atomiser support booms on brackets or mountings.
3. Fit atomiser mounting clamps or blocks at the appropriate locations on the booms or mountings.
4. Install an atomiser in each clamp or block and secure with brass nut CB155. Tighten the nut to a torque of 14nm (10lb ft).
5. Attach a diaphragm check valve EX1242 to the spindle of each atomiser.
6. Fit a Variable Restrictor Unit (VRU) to each boom outlet or feedpipe, using the appropriate fitting or adaptor.
7. Connect the outlet of each VRU to the inlet of the appropriate check valve, using 3/4" I/D hose CBP239.
8. Close any unused boom outlets with suitable plugs (eg EX1227 with cap nuts CB154).
9. Wire (safety) lock all nuts and fittings as described in section 4.1.
10. Install an electric brake system as described in section 4.2.
11. 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 AU4000 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. Tighten the atomiser securing nut CB155 to a torque of approximately 14 nm (10 lb ft) and wire lock to the hole provided in the atomiser mounting clamp or block 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.

2. Tighten the diaphragm check valve outlet nut and wire lock to the second hole in the atomiser securing nut as shown in Fig. 2.

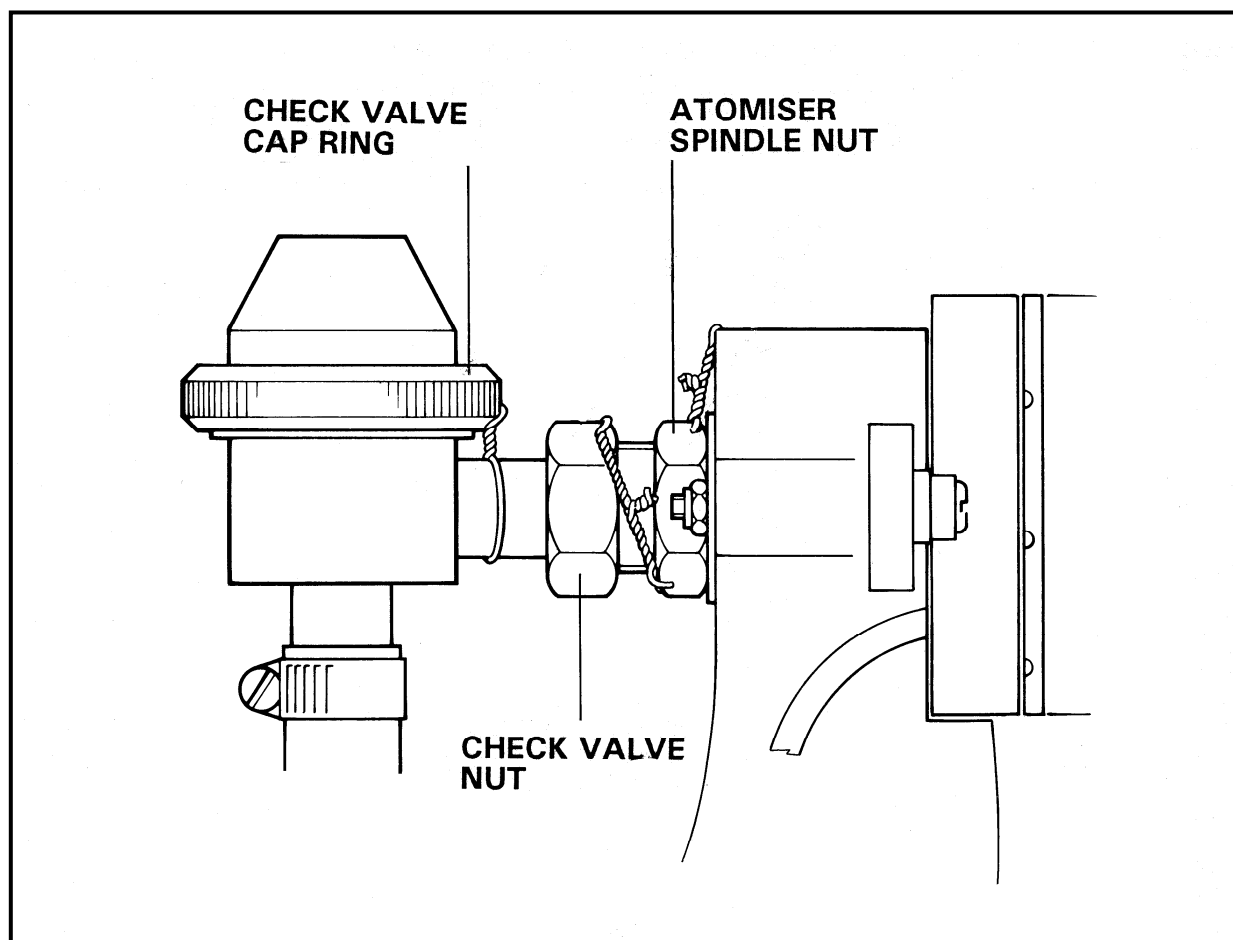


Fig. 2 – Wire Locking of Atomiser and Components

## 4.2. Installation of Electric Brake System

All AU4000 atomisers intended for use on new installations are supplied with electric brakes. These must be connected as described below.

**IMPORTANT: Electric brakes are supplied for either 12 or 24 V electrical systems. The voltage of the brake must be the same as the aircraft electrical system. Failure to use the correct voltage will result in overheating or impaired brake performance.**

Note that no wiring or parts other than the brakes themselves are supplied in standard atomiser kits unless shown otherwise in the packing list or specifically ordered by the customer. The installation must be carried out with approved components and materials in accordance with normal aircraft practice.

1. Install a 15 A circuit breaker adjacent to other existing circuit breakers. If a suitable spare circuit breaker is already fitted, this can be used instead. **DO NOT** use an existing circuit breaker that is already feeding a load.
2. Connect this circuit breaker to the bus bar using either a link strap or a piece of 8 gauge wire or heavier. Double insulate the strap or wire with plastic spiral wrap or similar.
3. Install a green indicator light in a position clearly visible to the pilot. If the aircraft is to be flown at night, this indicator must have a dimming iris.
4. Install the brake operating switch in a position convenient to the pilot. This may be in the instrument panel or on the control grip. Note that the switch will normally only be used once before and once after spraying.
5. Connect the atomiser brakes, control switch, indicator light and circuit breaker as shown in Fig. 3. Use 16 gauge wire or heavier for all connections. The ground for the atomiser brakes must be made at the airframe and not at the boom.
6. Insulate and support all wires and connections, paying particular attention to the wires and connections on the booms. The leads from the atomiser brakes must be securely attached to the atomiser clamps or blocks. The wires between atomisers must be protected in sleeving and secured to the boom at 15 cm (6") intervals to prevent them from moving in the airflow. Note that the Micronair streamline boom is provided with a channel to contain and protect the wires.
7. Fit identification labels adjacent to the brake circuit breaker, indicator and switch.
8. Test the atomiser brakes by operating the switch on the ground. All brakes should operate together and the atomisers should be tight to turn by hand. Note that the brakes will not reach their full effectiveness until they have 'bedded in' after being operated several times in flight.

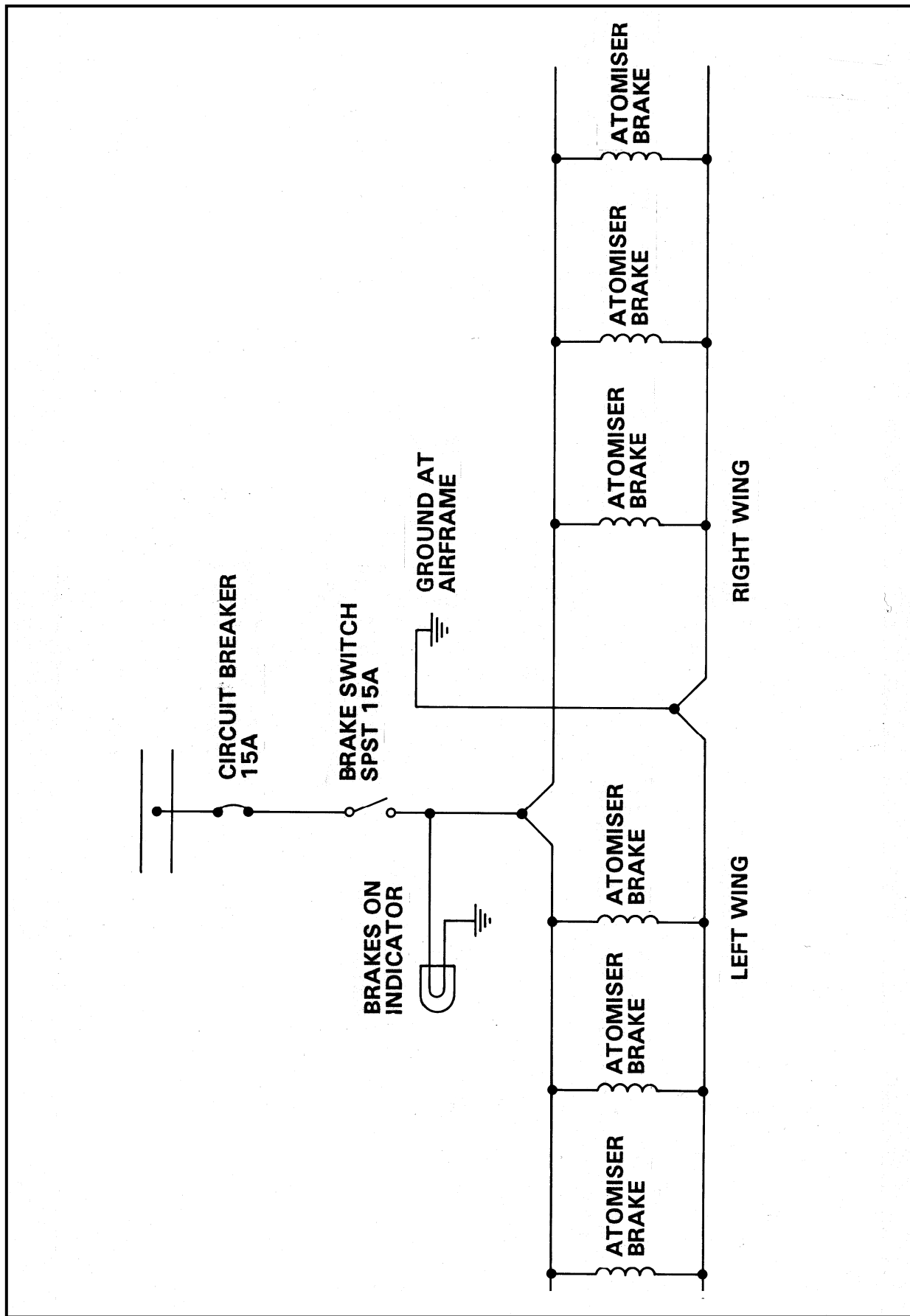


Fig. 3 – Wiring Diagram for Electric Brake System

### **4.3. Alternative Mounting Clamps and Blocks**

Mounting clamps and blocks are available to install AU4000 atomisers on many different brackets and streamline booms. Some of these are shown in Fig. 4, 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.

These clamps and blocks can be fitted with electric brakes. Details of brake and voltage must be specified at time of ordering.

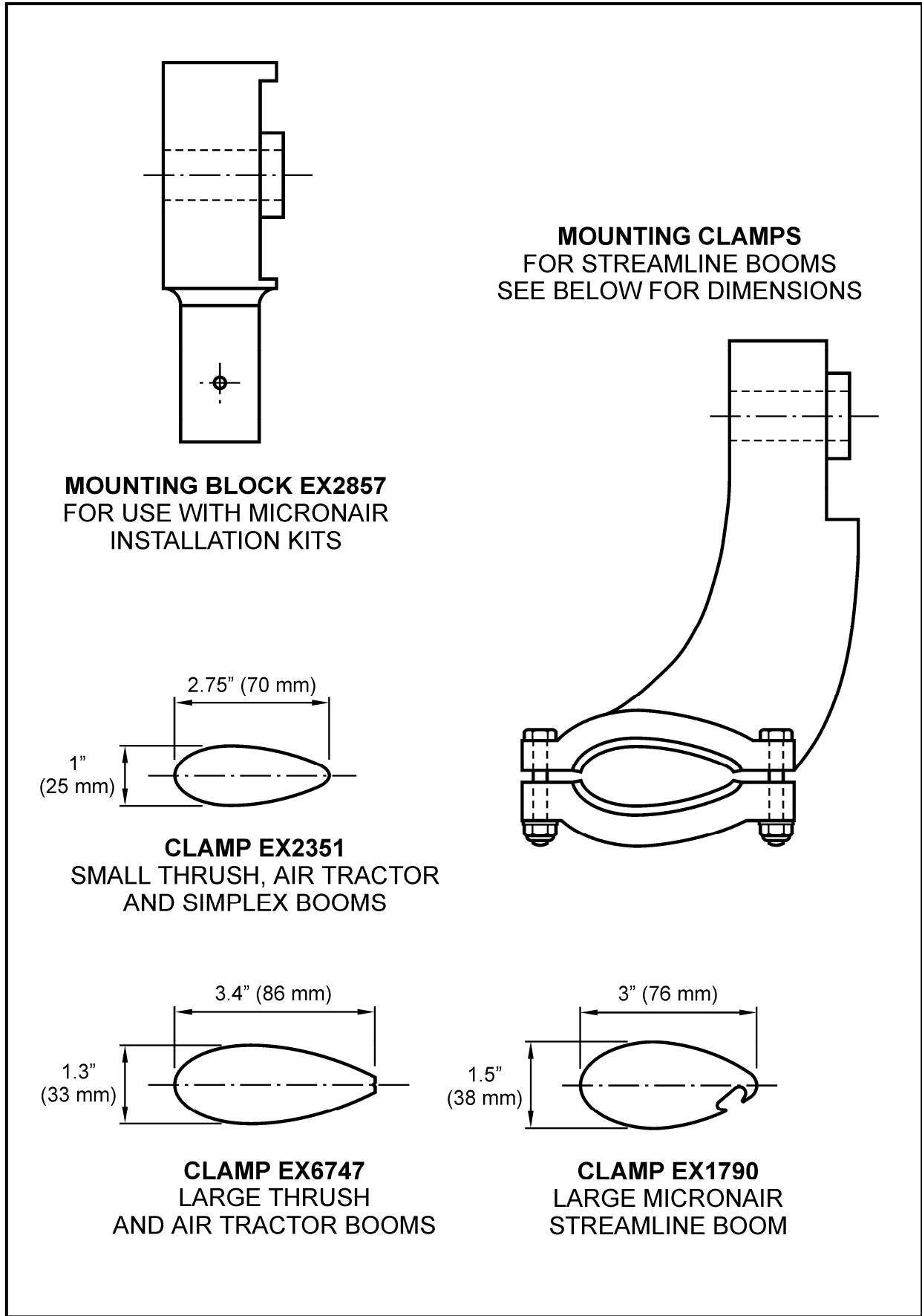


Fig. 4 – Atomiser Mounting Clamps and Blocks



## **5. OPERATION**

As with all spraying equipment, optimum results will only be obtained with AU4000 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 forestry, public health, tsetse, locust and similar applications.

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, brakes 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 spray liquid.

### **5.3. Calibration Procedure**

Before use, the aircraft 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 the

product being sprayed. It is therefore vital that the calibration of the system is checked whenever a new product is used.

## **5.4. Operating Technique**

### **5.4.1. Low Volume Spraying**

An aircraft fitted with AU4000 atomisers should be operated in exactly the same way as 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 AU4000 atomisers will be the same as with conventional spray equipment.

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 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 track spacing 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 used 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 or tank 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 of a hose, 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 maximum continuous speed for any AU4000 atomiser is 10,000 RPM. **Under no circumstances** must the speed of an AU4000 atomiser be allowed to exceed 12,000 RPM (see Calibration section)

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 safely possible, apply the atomiser brakes and land at the nearest airstrip. Full details of 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. 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, Micron Sprayers advise the users of their equipment to take all possible care to ensure the health and safety of the users 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 product should follow the recommendations of the manufacturer. Extreme care should be taken to prevent product 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 product being used.
3. Suitable clothing, 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 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.

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## 7. 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 spray liquid 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 10.1). 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. There is also a shut-off position marked 0. In addition to this standard plate, other special plates are available on request (see section 10.2 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 10.2 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 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 track spacing.
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 10.2). 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 tank or hopper with the spray liquid 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. VRUs with standard plates (/O) use only the odd numbers, 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 to turn the pump fan (or to operate an hydraulic or electric 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
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
180	3.6	4.2	4.8	5.4	6.0	9.0	12.0	15.0	22.5	30.0
190	3.8	4.4	5.1	5.7	6.3	9.5	12.7	15.8	23.7	31.7
200	4.0	4.7	5.3	6.0	6.7	10.0	13.3	16.7	25.0	33.3
210	4.2	4.9	5.6	6.3	7.0	10.5	14.0	17.5	26.3	35.0
220	4.4	5.1	5.9	6.6	7.3	11.0	14.7	18.3	27.5	36.7
230	4.6	5.4	6.1	6.9	7.7	11.5	15.3	19.1	28.7	38.3

**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 AU4000 ATOMISER WITH SECONDARY SHUT-OFF AND DIAPHRAGM CHECK VALVE**

SETTING NUMBER	PRESSURE PSI	FLOW PER MINUTE PER ATOMISER		
		Imp pints	US pints	Litres
1	30	0.59	0.72	0.34
	40	1.05	1.27	0.60
	50	1.24	1.50	0.71
3	30	2.19	2.64	1.25
	40	2.71	3.28	1.55
	50	3.19	3.85	1.82
5	30	4.13	4.99	2.36
	40	4.90	5.92	2.80
	50	5.78	6.97	3.30
7	30	6.48	7.81	3.70
	40	7.35	8.87	4.20
	50	8.40	10.14	4.80
9	30	9.10	10.90	5.20
	40	10.05	13.10	6.20
	50	12.78	15.42	7.30
11	30	14.00	16.90	8.00
	40	16.80	20.28	9.60
	50	19.25	23.24	11.00
13	30	28.35	34.23	16.20
	40	33.95	40.99	19.40
	50	37.63	45.43	21.50

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*

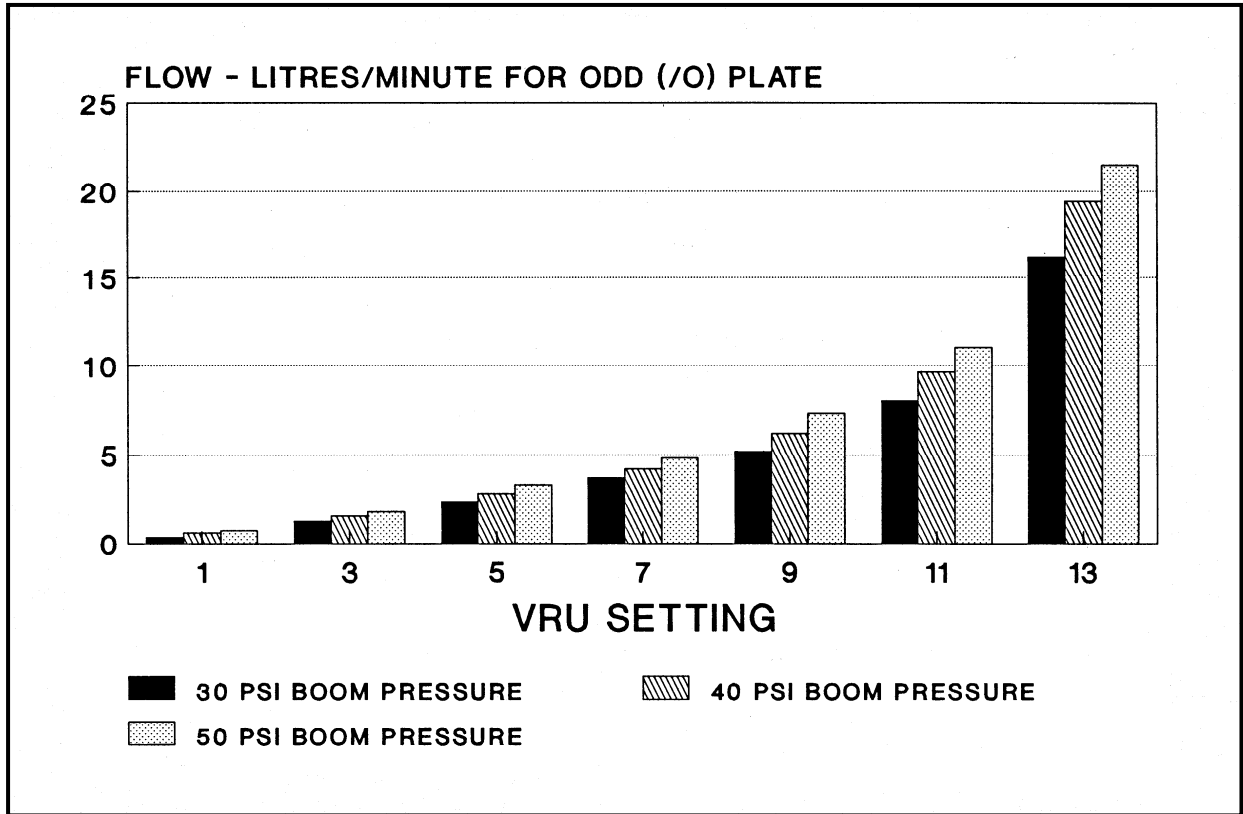
**FLOW THROUGH VRU WITH AU4000 ATOMISER WITH SECONDARY SHUT-OFF AND DIAPHRAGM CHECK VALVE**

SETTING NUMBER	PRESSURE PSI	FLOW PER MINUTE PER ATOMISER		
		Imp pints	US pints	Litres
2	30	1.05	1.27	0.60
	40	1.23	1.48	0.70
	50	1.58	1.90	0.90
4	30	2.19	2.64	1.25
	40	3.50	4.23	2.00
	50	3.90	4.71	2.23
6	30	4.30	5.20	2.46
	40	5.67	6.85	3.24
	50	6.13	7.39	3.50
8	30	6.65	8.03	3.80
	40	8.40	10.14	4.80
	50	9.69	11.70	5.54
10	30	9.98	12.04	5.70
	40	12.25	14.79	7.00
	50	14.53	17.54	8.30
12	30	17.85	21.55	10.20
	40	21.35	25.78	12.20
	50	25.38	30.64	14.50
14	30	29.05	35.08	16.60
	40	36.40	43.95	20.80
	50	41.65	50.30	23.80

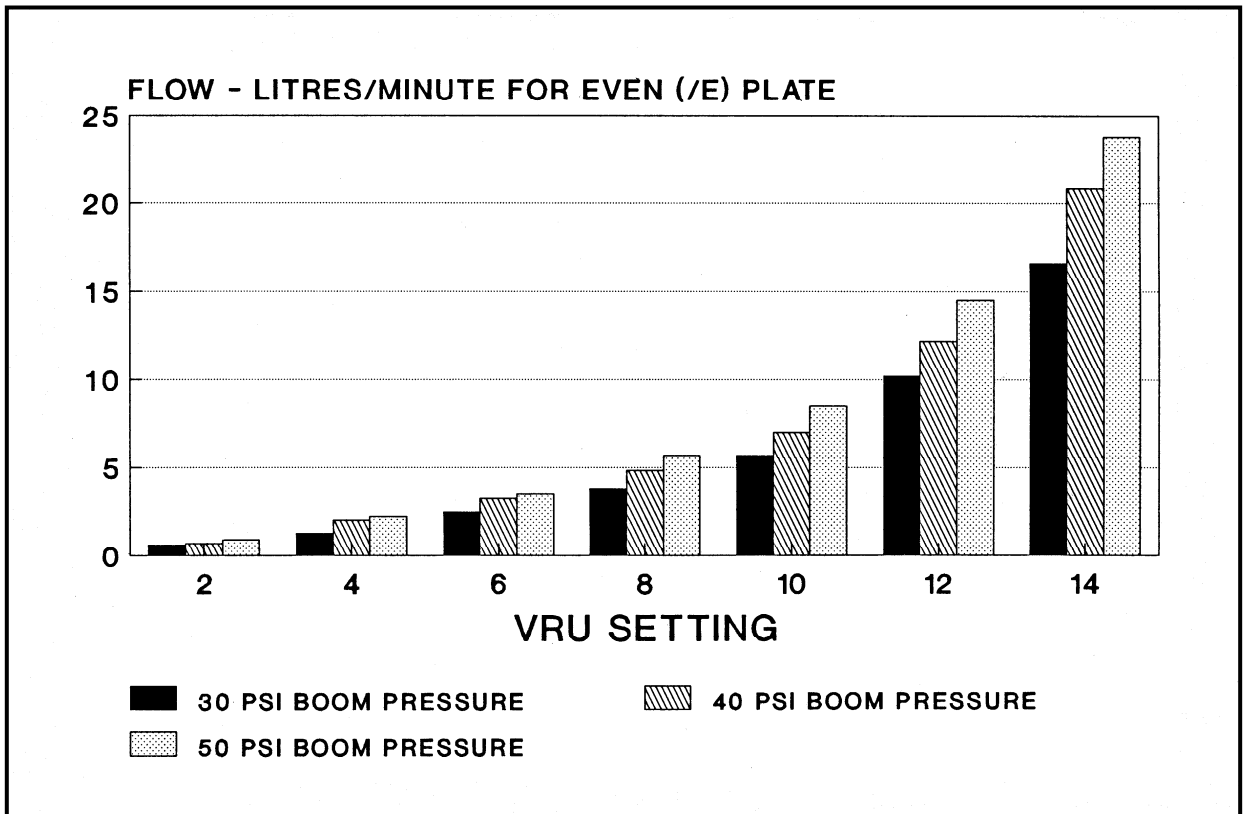
The above figures are based on tests with water. Actual flow rates will vary according to the installation and chemical used. Operators should always check flow rates under field conditions.

*Table 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. As 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 Blade Angle

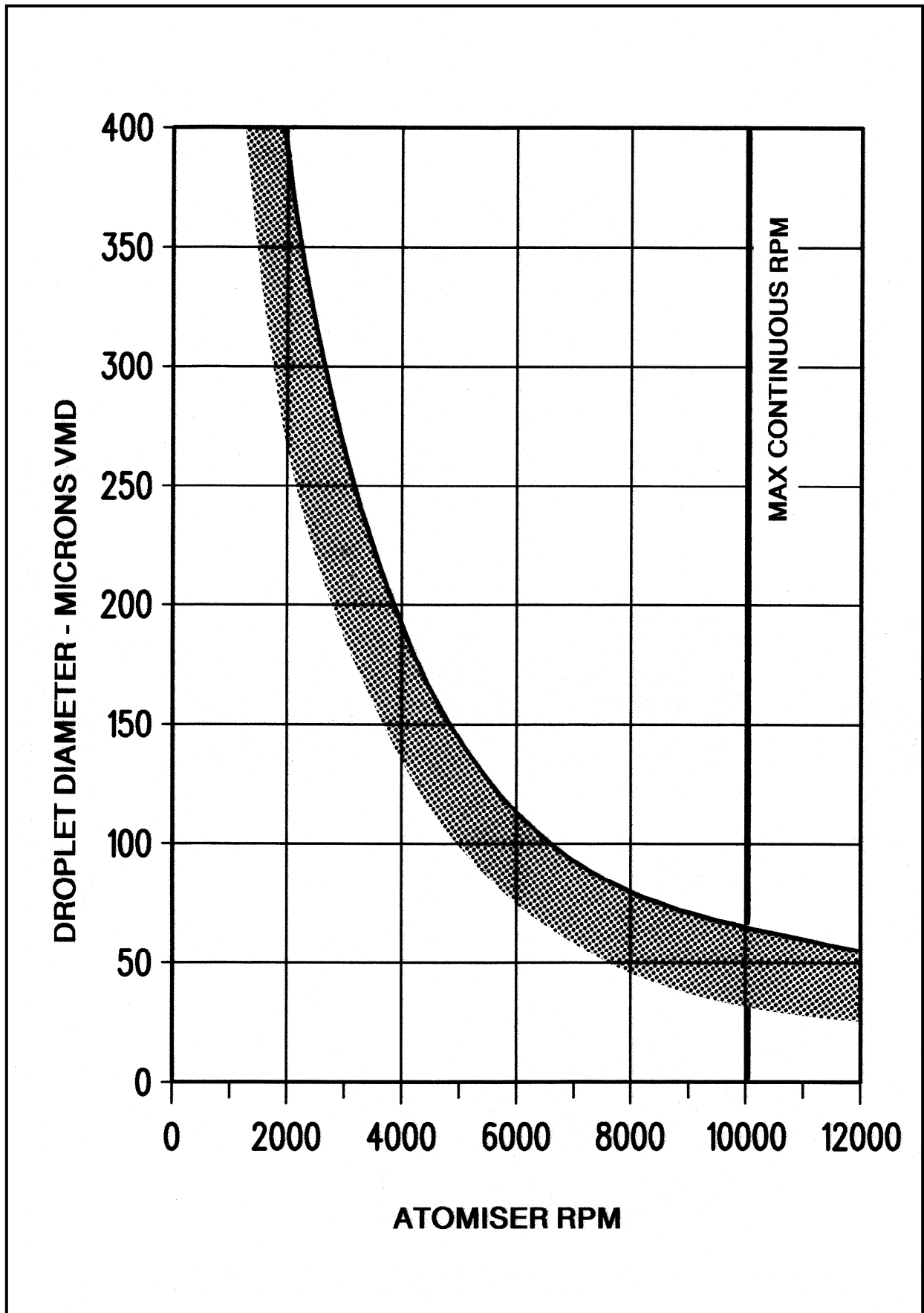
The approximate relationship between droplet size and rotational speed is shown in Graph 3. To determine the correct rotational speed (RPM), find the desired droplet size on the vertical scale and draw a line across to meet the curve. Next, draw a vertical line down from this point and read the RPM on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

Note that the droplet size produced by an AU4000 atomiser is influenced by the properties of the liquid 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.

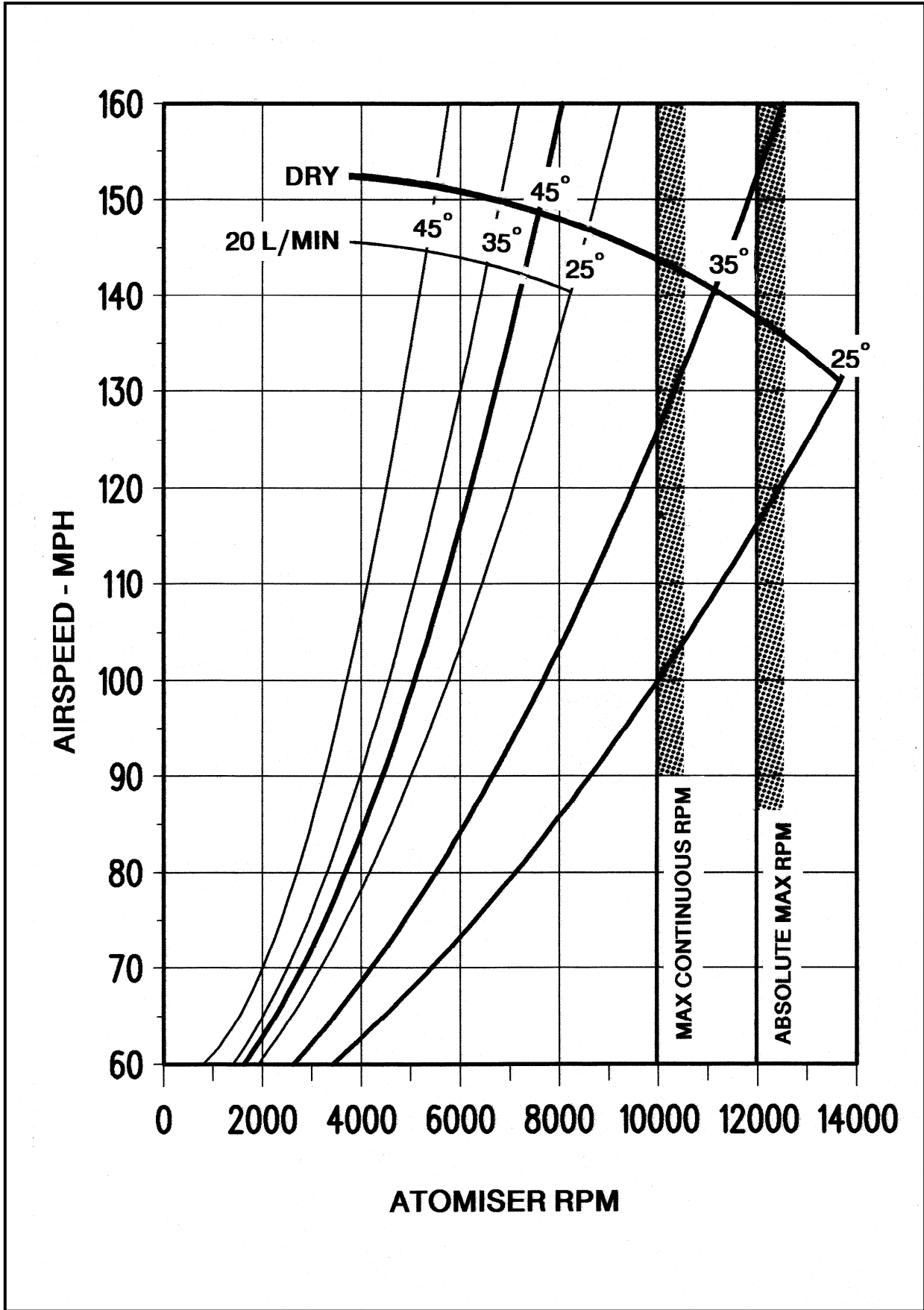
Having established the correct RPM it is necessary to find the appropriate blade angle setting to produce this RPM at the operating airspeed. The relationship between airspeed, RPM and blade angle is shown in Graphs 4, 5 and 6. Graph 4 is for standard CBP289/2 fan blades and Graph 5 is for the alternative longer CBP252/2 fan blades for use on slower aircraft and Graph 6 is for short EX2665 fan blades for use on fast aircraft.

The blade angle is shown in degrees over the range of 25 – 45 degrees, which is the normal operating range for the AU4000 atomiser. There are two lines on Graphs 4, 5 & 6 for each blade setting shown. These are marked Dry and 20 L/min, corresponding to an atomiser spraying no (or very little) liquid and 20 L/min (5 USG/min) respectively. As the volume of liquid 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.

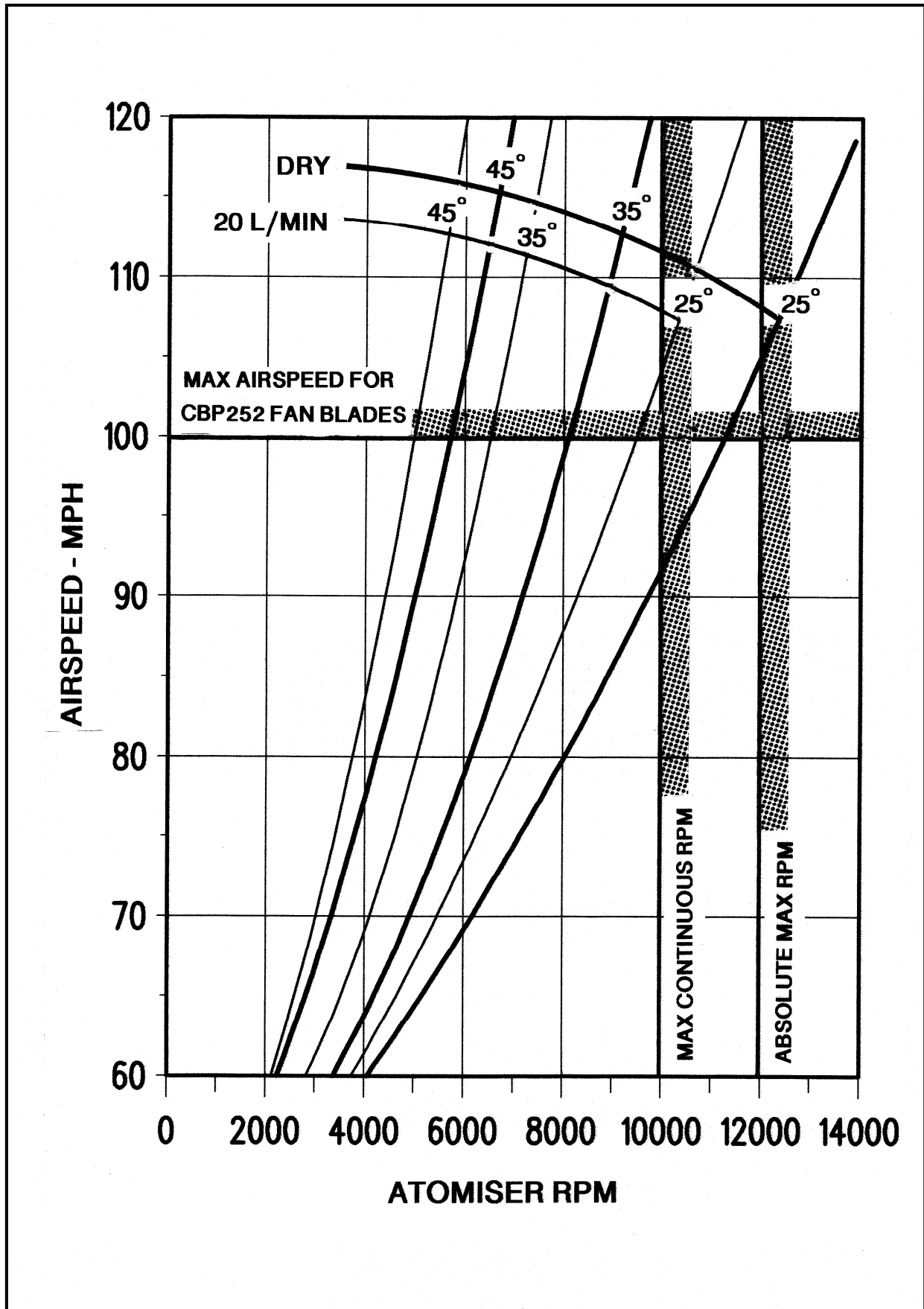
**IMPORTANT: The Micronair AU4000 atomiser is designed for a maximum continuous rotational speed of 10,000 RPM. The speed must never be allowed to exceed 12,000 RPM, even for a short time. When determining the fan blade adjustment, allowance must be made for increased airspeed during ferry flying and on the descent to spray runs. Note that the rotational speed of an atomiser increases when the flow of liquid is shut off. The maximum rotational speed must, therefore, be established from the DRY lines on Graphs 4, 5 or 6.**



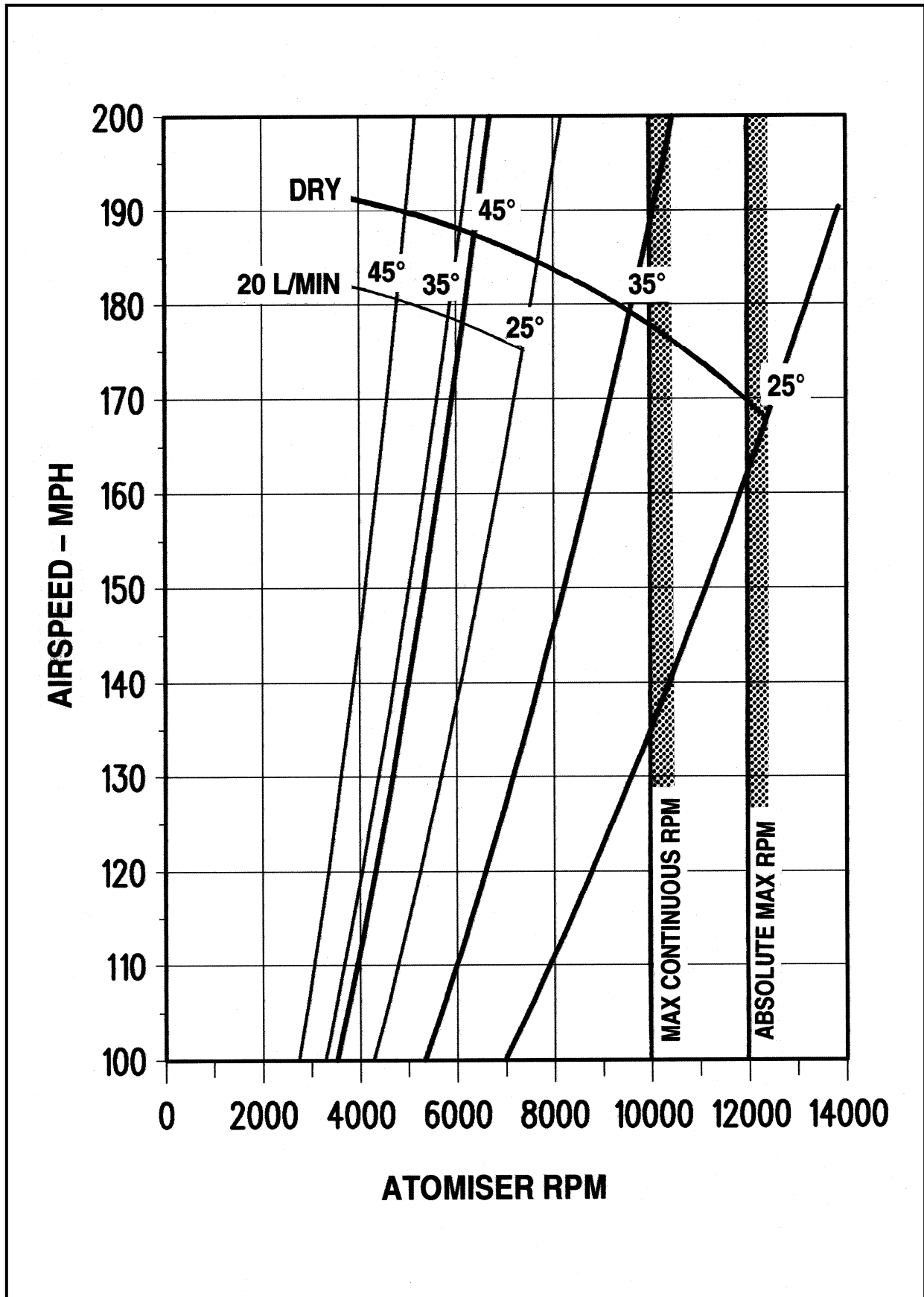
Graph 3 – Relationship Between Droplet Size and RPM



Graph 4 – Relationship Between Atomiser RPM and Airspeed for Standard CBP289/2 Fan Blades



Graph 5 – Relationship Between Atomiser RPM and Airspeed for Optional CBP252/2 Fan Blades for Slow Aircraft



Graph 6 – Relationship Between Atomiser RPM and Airspeed for Optional EX2665 Fan Blades for Fast Aircraft

### 7.3.2. Setting of Fan Blade Angle

To adjust the fan blade angle, first slacken the five 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 five 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 firmly to prevent them from moving without being over-tightened. Check that the blade angles have not altered.

**IMPORTANT: The clamp ring bolts must not be tightened to a torque in excess of the specified figure. This could cause serious stresses in the roots of the blades and could lead to cracking and blade failure.**

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 overtightened. 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 five bolts have been evenly tightened to the correct torque. The minimum blade setting is 25 degrees. Fan blades should not be set to a smaller angle as they will not produce adequate torque and the atomiser speed may become unstable.

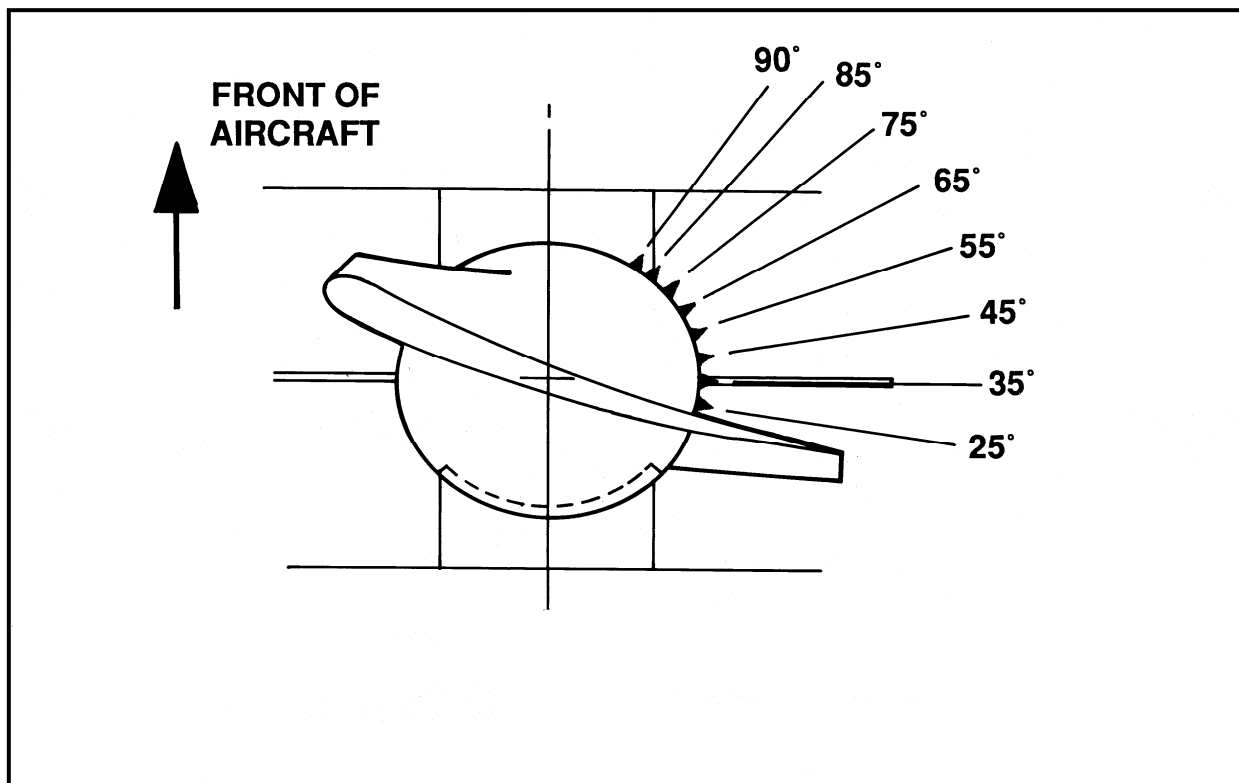


Fig. 5 – Adjustment of Fan Blade Angle

## 7.4. Alternative Fan Blades

AU4000 atomisers are normally supplied with CBP289/2 fan blades. These are 95 mm (3.7 inches) long, as measured from the atomiser hub to the blade tip (see Fig. 6).

CBP289/2 blades are designed for use at the flying speeds of most agricultural aircraft and are suitable for airspeeds between 90 – 150 MPH (145 – 240 Km/hr).

AU4000 atomisers can also be used on many types of slower flying aircraft and helicopters. In order to achieve the required rotational speed at lower airspeeds, it is necessary to use the longer CBP252/2 fan blades. These are 125 mm (4.9 inches) long, as measured from the atomiser hub to the blade tip (see Fig. 6). CBP252/2 fan blades are intended for airspeeds of between 75 – 100 MPH (80 – 160 Km/hr).

On fast aircraft, the standard CBP252/2 fan blades could cause the atomiser to over-speed at all but the coarsest blade angles. The shorter EX2665 fan blades should be used when operating at airspeeds of between 140 – 200 MPH (225 – 320 Km/hr)

CBP252/2 or EX2665 fan blades are only supplied if the blade type is specified at time of ordering. However, CBP252 or EX2665 blades are interchangeable with the CBP289/2 type and can be retrofitted at a later date.

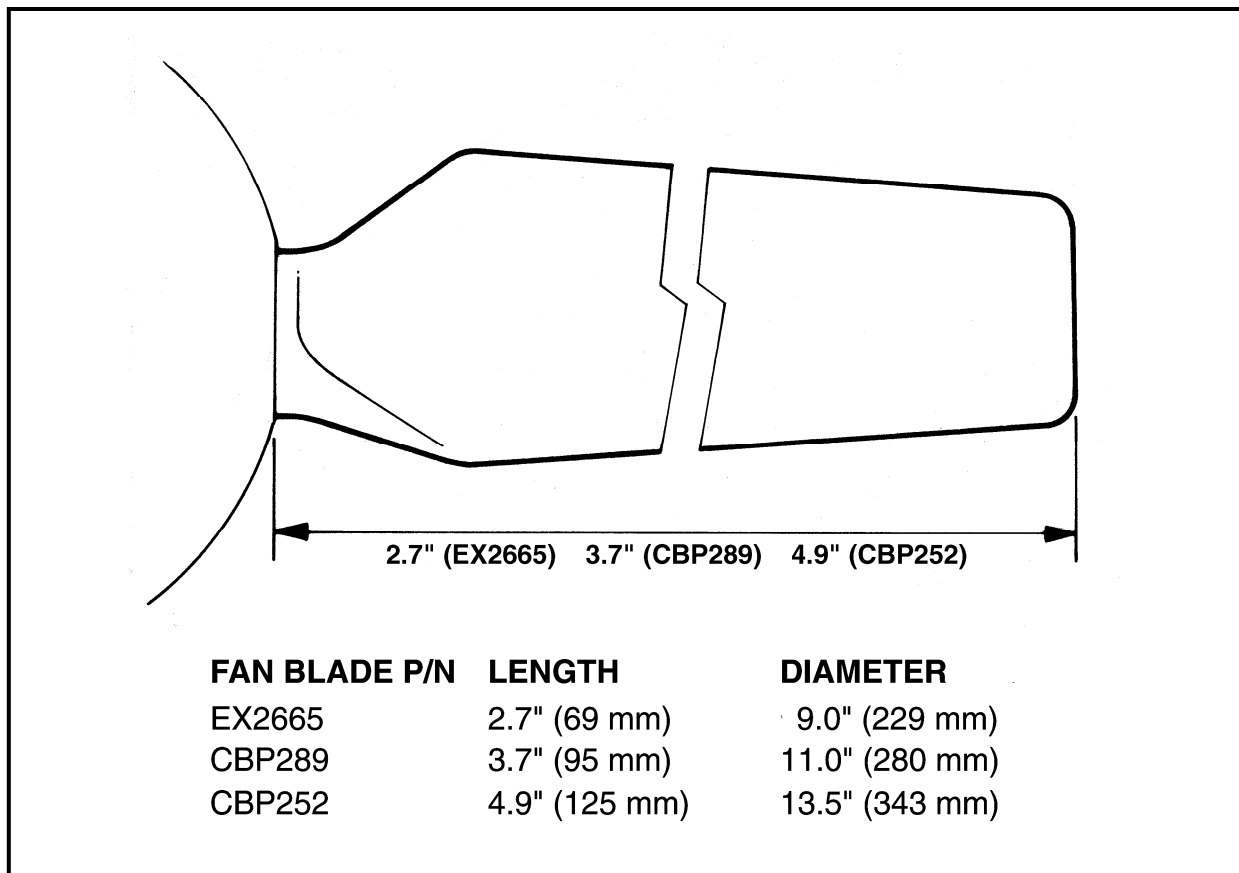


Fig. 6 – Dimensions of Fan Blades



### 7.4.1. Calibration

When CBP252/2 blades are fitted, the relationship between airspeed and rotational speed is as shown in Graph 5. When EX2665 blades are fitted, the relationship between airspeed and rotational speed is as shown in Graph 6. It is important that these graphs are used for initial calibration instead of Graph 4. The calibration procedure is in all other respects exactly as described for CBP289/2 fan blades.

**IMPORTANT: CBP252/2 fan blades are intended specifically for use on slower aircraft and at a maximum continuous rotational speed of 10,000 RPM. They must not under any circumstances be used on aircraft at airspeeds in excess of 100 MPH, which would result in the atomisers overspeeding.**

### 7.5. Use of Atomiser on Fast Aircraft

EX2665/2 (short) fan blades are intended for use on aircraft with a maximum speed of 200 MPH (320 Km/hr). If AU4000 atomisers are fitted to faster aircraft, specially shortened blades must be used to avoid the possibility of atomisers overspeeding.

Special blades can be supplied by Micronair. Alternatively, cutting and weighing instructions are available to organisations equipped to modify standard EX2665 or CBP289 blades.

### 7.6. Alternative Gauzes

Certain spray liquids, 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 solids can lead to an out of balance condition and serious vibration. This problem can be overcome by the use of a coarser 14 mesh gauze, part number EX2326/14. This is unlikely to block under any conditions and will ensure a good droplet spectrum whilst minimising the possibility of vibration.

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

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## 8. MAINTENANCE OF ATOMISER

### 8.1. General

The AU4000 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 spray liquid remains inside the booms, hoses or atomisers to cause contamination or blockage. Note that clean water is only suitable for removing water-based formulations and can cause some ULV products 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 five 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 spray liquid.
5. Bearings in good condition. The atomiser should spin smoothly when rotated by hand and must not have excessive play in any direction.
6. All atomiser brakes working effectively.

### 8.3. Dismantling Procedure

Should an atomiser require attention, the dismantling procedure is as follows (numbers in brackets refer to the parts list in Fig. 9):

#### 8.3.1. Removal from Aircraft

1. Cut all locking wire and unscrew check valve from end of spindle.
2. Remove spindle retaining nut (3) and washer (2) at forward face of mounting clamp or block.
3. Withdraw complete atomiser and spindle from mounting clamp. If necessary tap end of spindle, using a **soft** hammer or block.

4. Place the atomiser on a bench for further dismantling. Take care not to damage the gauze whilst handling the atomiser and do not rest the unit on its fan blades for prolonged periods. The weight of the atomiser resting on the blades could cause distortion of the blades and vibration in service.

### 8.3.2. Removal and Dismantling of Spindle

1. Remove the three pan head screws (7) and washers (8) securing the end cap (26) at the rear of the atomiser. Remove the cap, together with the deflector assembly (31).
2. Push the spindle (1) through the atomiser and remove through the end of the gauze.
3. Unhook the three clips of the valve cap (24) from the spring (21) and remove.
4. Carefully pull the black Viton valve seal (23) from the end of the spindle.
5. If necessary, remove the valve spring (21) from the spindle by twisting it over the circlip (22) on the rear end of the spindle. Note that it is not normally necessary to remove the spring except for replacement.
6. The circlip (22) should only be removed for replacement. The circlip is likely to be damaged when it is removed.

### 8.3.3. Removal of Fan Blades

1. Unscrew the grease nipple (19) from the hub.
2. Remove the five clamp ring securing bolts (12) and washers (13) from the clamp ring (9).
3. Remove the clamp ring and extract the five fan blades (20).

**IMPORTANT: Clamp rings are individually numbered to match corresponding hubs. Do not allow rings to become interchanged between atomisers as this will affect the balance of the units and cause vibration in service.**

### 8.3.4. Removal of Gauze

1. Remove the five pan head retaining screws (7) and washers (8) from the front face of the hub flange.
2. Withdraw the hub and drive tube assembly from the gauze (25).

The gauze is a balanced assembly and cannot be dismantled. No attempt should be made to repair it. Small dents, however, may be removed by gently pressing against the mesh from the inside.

### 8.3.5. Removal of Bearings

1. If an electric brake is fitted, remove the three screws (5) securing the diaphragm of the pole plate assembly (2) to the brake plate, (see Fig. 10).
2. Remove the five screws (4) securing the brake plate (17) at the front of the hub assembly (see Fig 9).
3. Using a suitable drift inserted from the rear of the atomiser, tap both bearings (11) through the hub. Ensure that the drift does not damage the V-ring or its carrier. Remove both the inner and outer spacers from between the bearings.

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

4. If necessary, remove bearing bush (16) and shield (18) from the front bearing.

### 8.3.6. Removal of V-ring and Carrier

1. Remove the Viton V-ring (15) together with its brass carrier (14) from the bottom of the bearing housing.
2. Carefully lift the V-ring from its carrier, taking care not to cut or damage the ring.

## 8.4. Assembly Procedure

All parts must be thoroughly cleaned and checked prior to re-assembly. Any defective items must be replaced with genuine Micronair spares.

### 8.4.1. Installation of V-ring

1. Fit the V-ring onto the carrier, ensuring that the thick part of the ring is pushed into the groove of the carrier. Apply a thin film of grease to the lip of the V-ring.
2. Insert the V-ring and carrier into the bearing housing of the hub, with the V-ring facing backwards towards the perforated drive tube. Ensure that the V-ring is not trapped inside the bore of the hub.

### 8.4.2. Installation of Bearings

1. Ensure that the bearing housing in the hub is not worn and is free of any chemical residue or grit.
2. Pack both ballraces with grease (see section 8.6 for specification). This only applies if unsealed bearings are used. See Bearing Lubrication section for full details.
3. Insert the first ballrace, ensuring that the exposed balls (if not of the sealed type) face outwards towards the front of the hub.

4. Coat both bearing spacers with a thin film of grease and place them into the bearing housing.
5. If previously removed, assemble the bush and bearing shield onto the second (outer) ballrace, ensuring that the shield and protruding part of the bush are on the side of the ballrace on which the balls are not exposed.
6. Insert the second ballrace, with the bush facing outwards and the exposed balls (if not of the sealed type) inwards.
7. Locate the brake plate in the end of the hub and align the dot adjacent to one hole with the arrow on the side of the hub body as shown in Fig. 7. Secure with five countersunk screws, ensuring that these are securely and evenly tightened.
8. If an electric brake is fitted, secure the pole plate assembly to the brake plate with its three screws.

### 8.4.3. Gauze

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

Place the gauze on the perforated drive tube, aligning the arrow on the front face of the gauze with the arrow on the hub body as shown in Fig. 7.

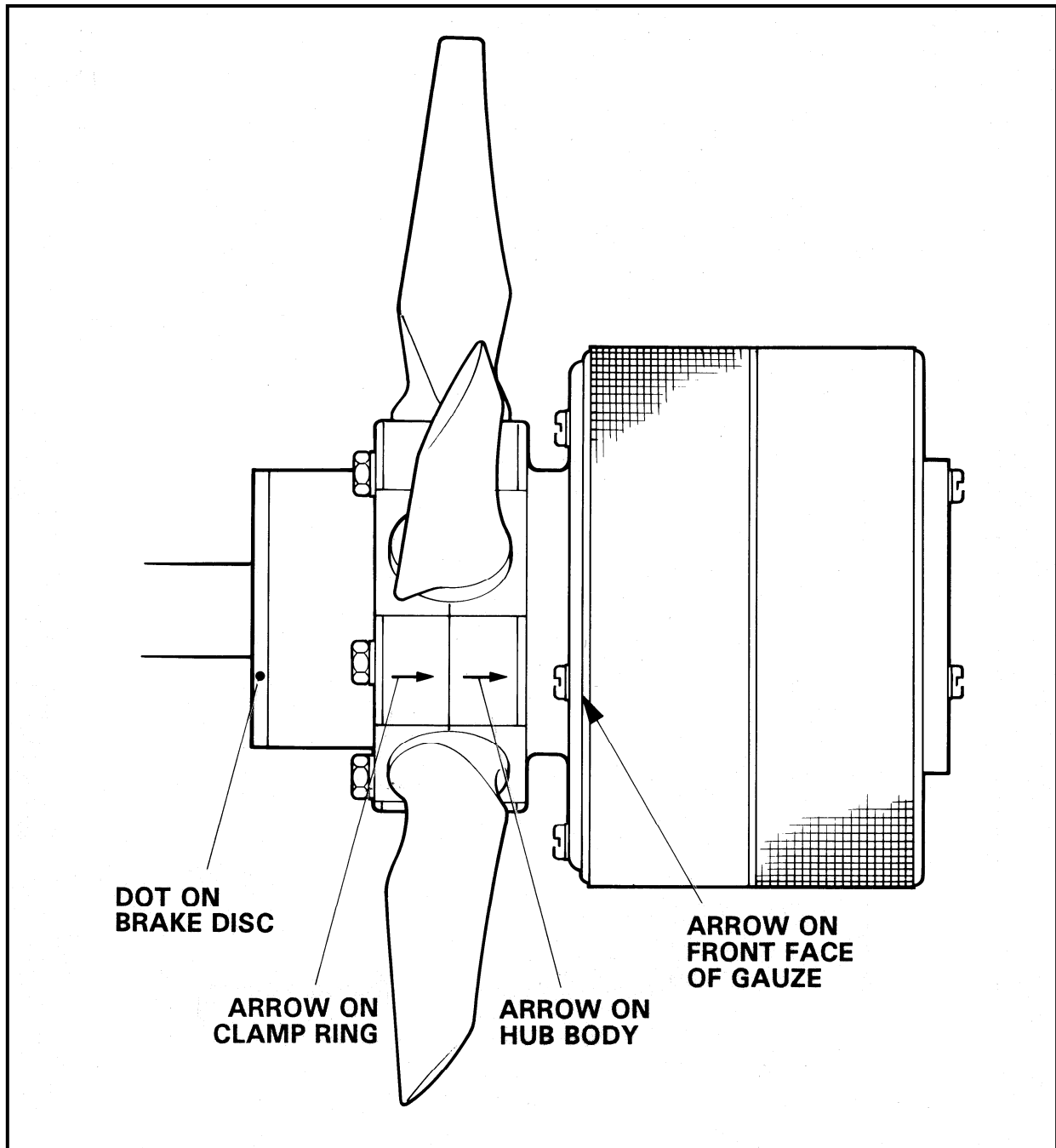
Secure the gauze with five pan head screws and washers. Do not fit the end cap until the spindle is installed.

### 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 as shown in Fig. 7. This ensures that the atomiser will be correctly balanced.
2. Fit the five bolts and washers and tighten evenly just to trap the blades.
3. Adjust all five blades to the correct angle.
4. Tighten the clamp ring securing bolts to a torque of 2.3 nm (1.7 lb ft). See section 7.3.2.

<p><b>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.</b></p>
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5. Fit the grease nipple in the hub. Note that this is important for balance and the grease nipple must be installed regardless of whether greased or sealed ballraces are used.



*Fig. 7 – Alignment of Components*

#### **8.4.5. Spindle**

1. Fit the valve spring over the circlip at the end of the spindle, using a twisting action. Ensure that the entire spring is pushed beyond the locating flange.
2. Fit the spring retaining clip in the groove behind the spring.
3. Push the Viton valve seal over the end of the spindle and ensure that it is correctly positioned in its retaining groove.

4. Position the valve plate over the valve seal, ensuring that the three retaining lugs pass outside the spring.
5. Hook all three retaining lugs over the end of the spring and ensure that the valve shuts positively when pulled from the seal and released.
6. Insert the spindle into the bearings in the hub and replace the end cap and deflector assembly.

### **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 each hub is correctly assembled with its original clamp ring.

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.

**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 damaged 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 AU4000 atomisers are fitted as standard with ballraces intended for external lubrication.

Bearings must be checked and lubricated regularly. Recommended grease types are Aeroshell Grease 8, Shell Retinax AM or BP Energrease LS-EP 2. Molybdenum base greases may also be used.

The amount of grease required will depend upon the operating conditions but as a general guide one stroke of a standard grease gun after every one or two days operation should be adequate.

**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.**

Under exceptional conditions, some operators may find it more convenient to fit sealed ballraces in place of the standard externally lubricated type. Should this be the case, an atomiser may be modified as follows:

1. Remove both ballraces and bearing spacers (see section 8.3.5 for details).
2. Remove the bearing bush and shield from the front bearing.
3. Re-fit the bearing bush and shield on a sealed ballrace (Micronair Part No CBP621).
4. Fit both sealed bearings and bearing spacers into the hub assembly and replace the brake plate as described in section 8.4.2.
6. Remove the original grease nipple CBP200 and discard. Replace it with either an EX3329 false grease nipple or a CBP200 nipple blocked with solder to prevent accidental greasing.

## 9. ATOMISER BRAKES

AU4000 Atomisers can be supplied with electric brakes to stop the atomiser rotating during ferry flights or in an emergency.

**IMPORTANT: Atomiser brakes are not intended for use between each spray run. The brakes will normally be applied before take-off and released before starting spraying. They should not be re-applied until the end of the job. Whenever possible, the brakes must be applied at a low airspeed (e.g. during the climb out from the last spray run). This will ensure the maximum life of the brake linings.**

The electric brake consists of a fixed electromagnet fitted on the atomiser clamp or block and a rotating pole plate mounted on the atomiser hub by means of a flexible diaphragm spring. When the electromagnet is energised, the pole plate is attracted to the coil housing which incorporates a friction lining. The friction between the plate and the lining brakes the atomiser.

### 9.1. Maintenance

The electric brake requires a minimum of maintenance as the air gap between the pole plate and the electromagnet housing is self-adjusting. The edges of the housing wear at the same time as the friction lining to ensure that there is always contact between the plate and the lining.

Each brake must be inspected every week or after each 20 hours flying and the following points checked:

- Brake operates effectively when energised.
- Pole plate, diaphragm spring and securing screws tight and in good condition.
- Gap between pole plate and electromagnet housing should not exceed 3 mm (0.12") when brake is released. A wider gap indicates excessive wear of the friction lining.



- Electrical connections secure and properly insulated.

As it is not possible to replace the friction lining, the entire electromagnet assembly should be discarded and replaced when necessary. The pole plate should also be replaced at the same time as use of a worn plate will shorten the life of a new lining.

See Fig. 10 for details of components of the electric brake.

## 10. VARIABLE RESTRICTOR UNIT

### 10.1. 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 thimble 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 liquid 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 thimble is made to 'click' into the appropriate position by means of a spring in the VRU body that engages in grooves inside the thimble. This ensures that the hole in the orifice plate is aligned with the hole in the selector plate. The positive location of the thimble 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.**

### 10.2. Instructions for Use

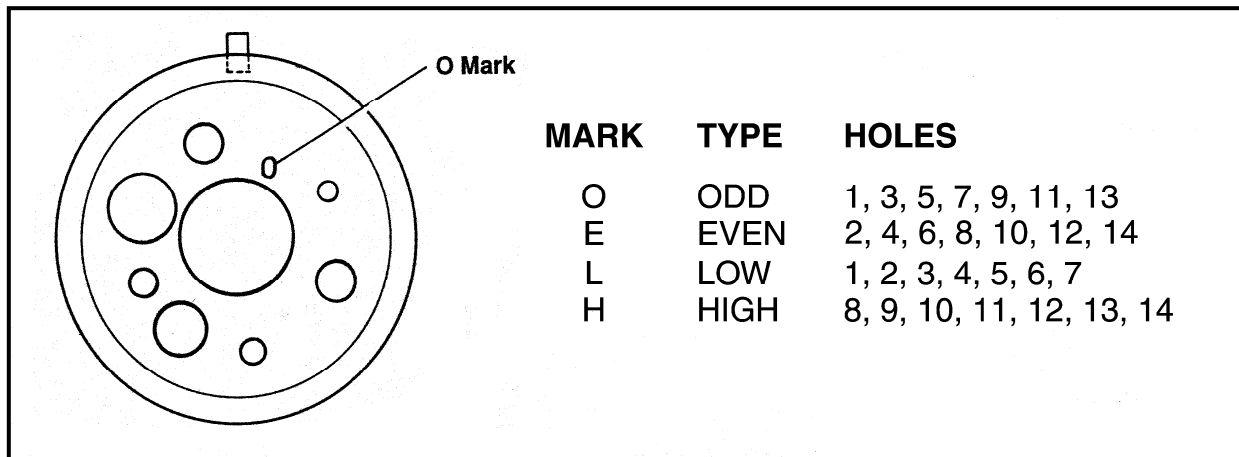
The knob of the VRU is marked with odd numbers 1 – 13 and even numbers 2 – 14. These numbers correspond to hole sizes in the orifice plates EX194/O (odd) and EX194/E (even) respectively.

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 covering all ranges unless exceptional circumstances exist.

To establish which plate is installed in a VRU, the marking on the plate can be viewed through the outlet. See Fig. 8 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. 8 – Alternative VRU Plates*

### 10.3. 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 thimble 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 fitting 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 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 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. If the knob is tight the gland ring should be adjusted – see (5) above.

## 11. DIAPHRAGM CHECK VALVE

### 11.1. Principle of Operation

The diaphragm check valve uses a spring loaded diaphragm to shut off flow to an atomiser when not spraying. This eliminates the possibility of leakage of any residual liquid 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 liquid acts against the spring behind the diaphragm and forces it away from its seat, allowing liquid to flow into the atomiser.

### 11.2. 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 (CBP446 – Viton or EX2836 – 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 residue, 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 circlip 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 section 4.1.

### **11.3. Chemical Resistance of Diaphragms**

The standard diaphragm supplied with all check valves is made from fabric reinforced Viton. This material has proved to provide the best possible resistance to a wide range of agricultural chemicals. However, operators may occasionally have to use a formulation that damages the Viton diaphragm. Should this occur, the Viton diaphragm can be replaced with a PTFE diaphragm, part number EX2836.

## **12. APPLICATION MONITOR**

The Micronair Application Monitor is a complete monitoring system for any spray aircraft. Spray liquid flow is measured by a flowmeter turbine, which is connected to a microprocessor-based electronic unit installed in the cockpit. This takes the chemical flow rate, together with the swath width and ground speed of the aircraft and computes all the vital parameters of the spray operation.

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 display 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.

The Application Monitor can be used with an optional Application Printer. When this is installed, the unit will print a permanent record of every spray job.

## **13. 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 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.

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## 14. 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. AU4000 Atomiser EX2355

Item	Part No	Description	Qty	Notes
1	EX2319	Spindle, Complete	1	With shut off
1A	EX2360	Spindle, Bare	1	Without shut off
2	CB128	Washer	1	
3	CB155	Nut	1	
4	A206 C12	Screw, 8.32 Csk	5	
5	CB189	Bearing Spacer, Outer	1)	Supplied only as pair
6	CB190	Bearing Spacer, Inner	1)	
7	EX2612	Screw, 8.32	8	
8	SP123C	Washer	8	
9	CB164	Clamp Ring	1)	Supplied only as pair
10	EX2312	Hub and Drive Tube	1)	
11	CBP621	Bearing, Sealed	2	Standard
11A	CBP187	Bearing, Unsealed	2	Alternative
12	AN3C11A	Bolt	5	
13	SP127D	Washer	5	
14	CB197	V-Ring Carrier	1	
15	CBP170	V-Ring	1	
16	CB204	Bearing Bush	1	
17	EX2658	Brake Disc	1	See also Fig. 10
18	CB483	Bearing Shield	1	
19	CBP200	Grease Nipple	1	
19A	EX3329	False Grease Nipple	1	Alternative
20	CBP289/2	Fan Blade 11" dia	5	Standard
20A	CBP252/2	Fan Blade 13½" dia	5	Alternative
20B	EX2665	Fan Blade 9" dia	5	Alternative
21	CBP845	Spring	1)	
22	CBP828	Circlip	1)	Supplied with
23	CBP766	Seal	1)	item 1
24	EX2291	Cap	1)	
25	EX2326/20	Gauze Assy 20 Mesh	1	Standard
25A	EX2326/10	Gauze Assy 10 Mesh	1)	
25B	EX2326/14	Gauze Assy 14 Mesh	1)	Alternatives
25C	EX2326/30	Gauze Assy 30 Mesh	1)	
26	EX2334	End Cap	1	
27	EX4047	Nameplate	1	
28	A104 5C	Bolt	1	
29	SP127C	Washer	2	
30	AN363C 8-32	Stiffnut	1	
31	EX2304	Deflector Assy	1	
32	EX2321	End Cap Assy	1	Assy of items 26 – 31
	EX2355	Atomiser complete	1	Assy of items 1 – 32

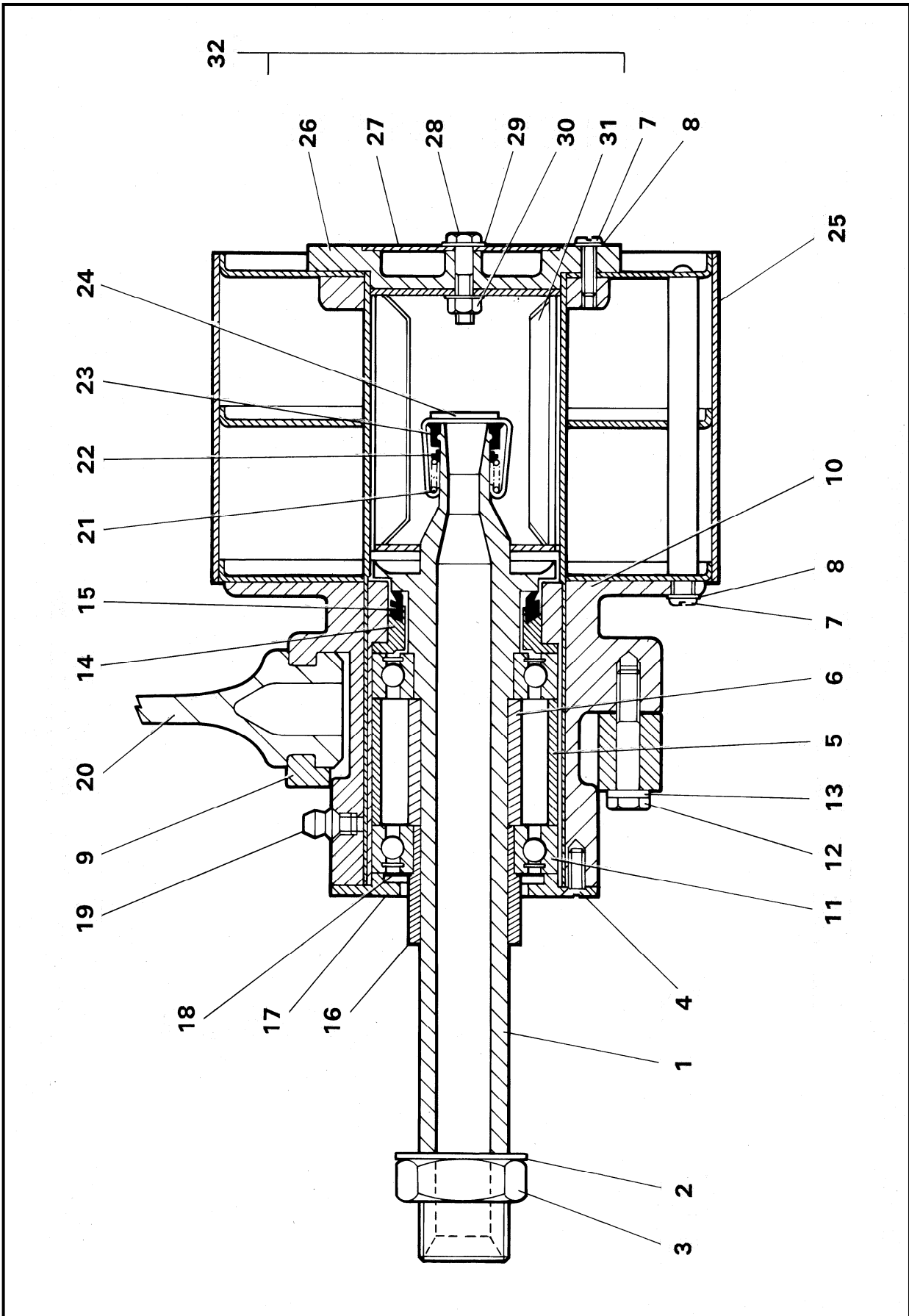


Fig. 9 – AU4000 Atomiser

**14.2. Electric Brake**

<b>Item</b>	<b>Part No</b>	<b>Description</b>	<b>Qty</b>	<b>Notes</b>
1	EX2813/12	Body & coil assy	1	12 V
1A	EX2813/24	Body & coil assy	1	24 V
2	EX2812	Pole Plate	1	
3	EX2658	Brake plate, modified	1	
4	CBP620	Spring	1	
5	CBP519	Screw	6	
6	AN364-1032C	Nut	2	
7	SP127D	Washer	2	
	EX4152/12	Brake Kit 12V	1	All items 1,2 – 7
	EX4152/24	Brake Kit 24V	1	All items 1A – 7

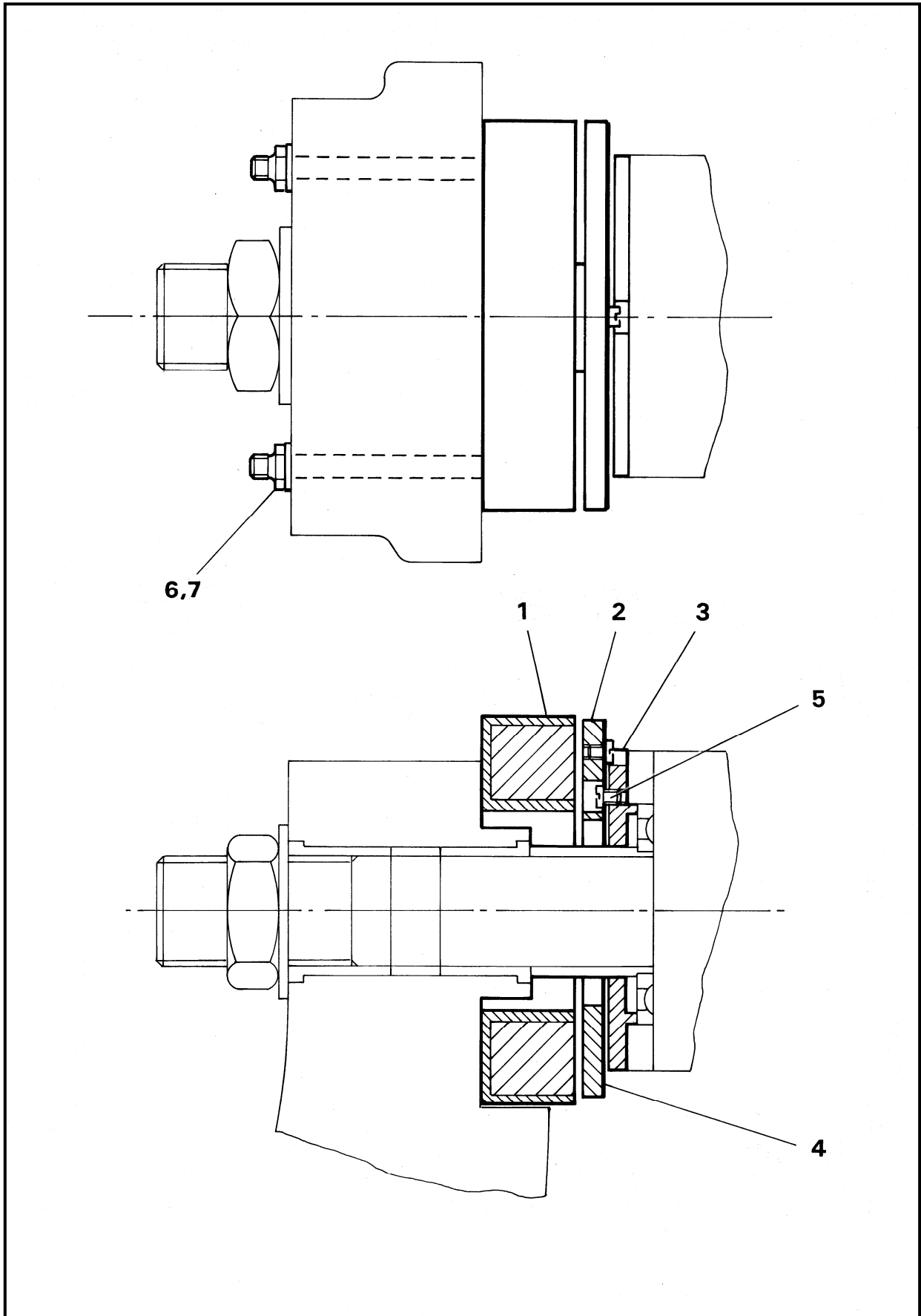


Fig. 10 – Electric Brake

### 14.3. Variable Restrictor Unit

**NOTE:** Variable restrictor units are supplied with various inlet and outlet adaptors according to the installation. The standard configurations are:

- EX2085 With 7/8" UNF inlet and 3/4" diameter outlet adaptors. This is for use on standard Micronair spray booms.
- EX4672 As EX2085 but with additional inlet and outlet adaptors as shown.
- EX2080 With 1/8" and 1/4" NPT inlets and 1/2" diameter outlet. This is for use on spray booms with 1/8" or 1/4" NPT nozzle holes.
- EX4156 As EX2080 but with additional inlet fittings and outlet adaptor as shown. The EX4648 adaptor must be used change from the 1/2" hose from the VRU to a short length of 3/4" hose adjacent to diaphragm check valve inlet.

Item	Part No	Description	Qty	Notes
1	EX69	Standard Outlet	1	3/4" I/D hose
2	EX194/0	Orifice Plate	1	Odd (standard)
2A	EX194/E	Orifice Plate	1	Even (optional)
2B	EX194/H	Orifice Plate	1	High (optional)
2C	EX194/L	Orifice Plate	1	Low (optional)
3	EX2081	Shaft & Selector Assy	1	
4	CBP493	Spring	1	
5	EX2084	Body Assy	1	7/8" UNF inlet
6	EX2077	Spring, Index	1	
7	CBP237	Gland Packing	1	
8	EX71	Gland Retainer	1	
9	SP127D	Washer	1	
10	EX2069	Thimble	1	
11	AGS 2037C	Washer, Lock	1	
12	AN364 1032C	Stiffnut	1	
13	EX93	Alternative Outlet	1	7/8" UNF
14	EX94	Inlet Adaptor	1	3/4" I/D hose
15	EX1556	Outlet	1	1/2" I/D hose
16	EX2078	Body Assy	1	1/8" + 1/4" NPT
17	EX1670	Cap, Blanking	1	1/8" NPT
18	EX1671	Cap, Blanking	1	1/4" NPT
19	EX1672	Elbow	1	3/8" I/D hose
20	EX4648	Adaptor	1	1/2" - 3/4" hose

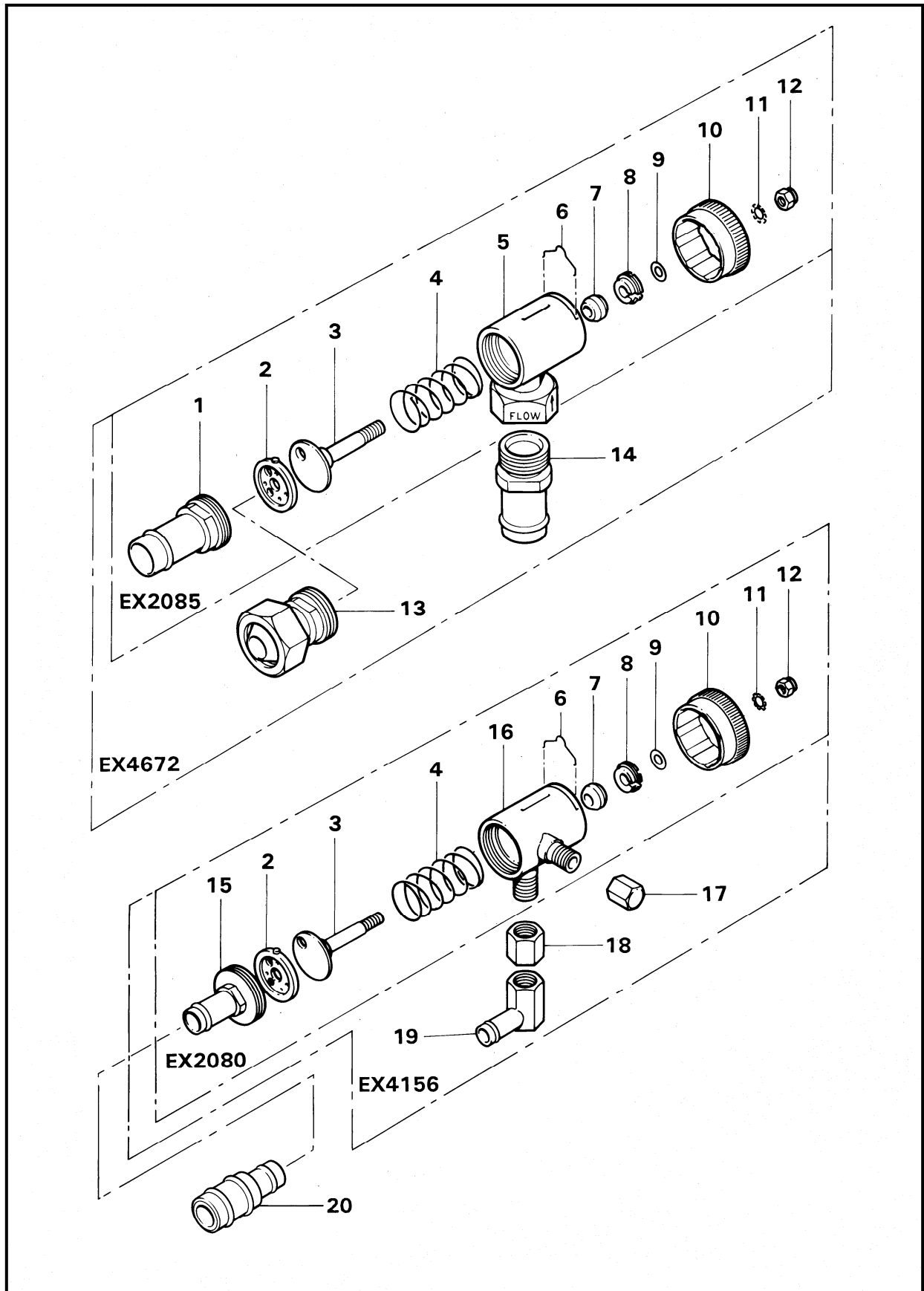


Fig. 11 – Variable Restrictor Units and Optional Adaptors

**14.4. Diaphragm Check Valve EX1242**

<b>Item</b>	<b>Part No</b>	<b>Description</b>	<b>Qty</b>	<b>Notes</b>
1	EX1249	Ring, Securing	1	
2	EX1245	Cap	1	
3	CBP440	Spring	1	
4	EX1246	Plunger	1	
5	CBP451	Spring Clip	1	
6	CBP446	Diaphragm	1	Viton (standard)
6A	EX2836	Diaphragm	1	PTFE (optional)
7	EX1243	Body Assy.	1	
	EX1242	Check Valve Assy. Complete	1	

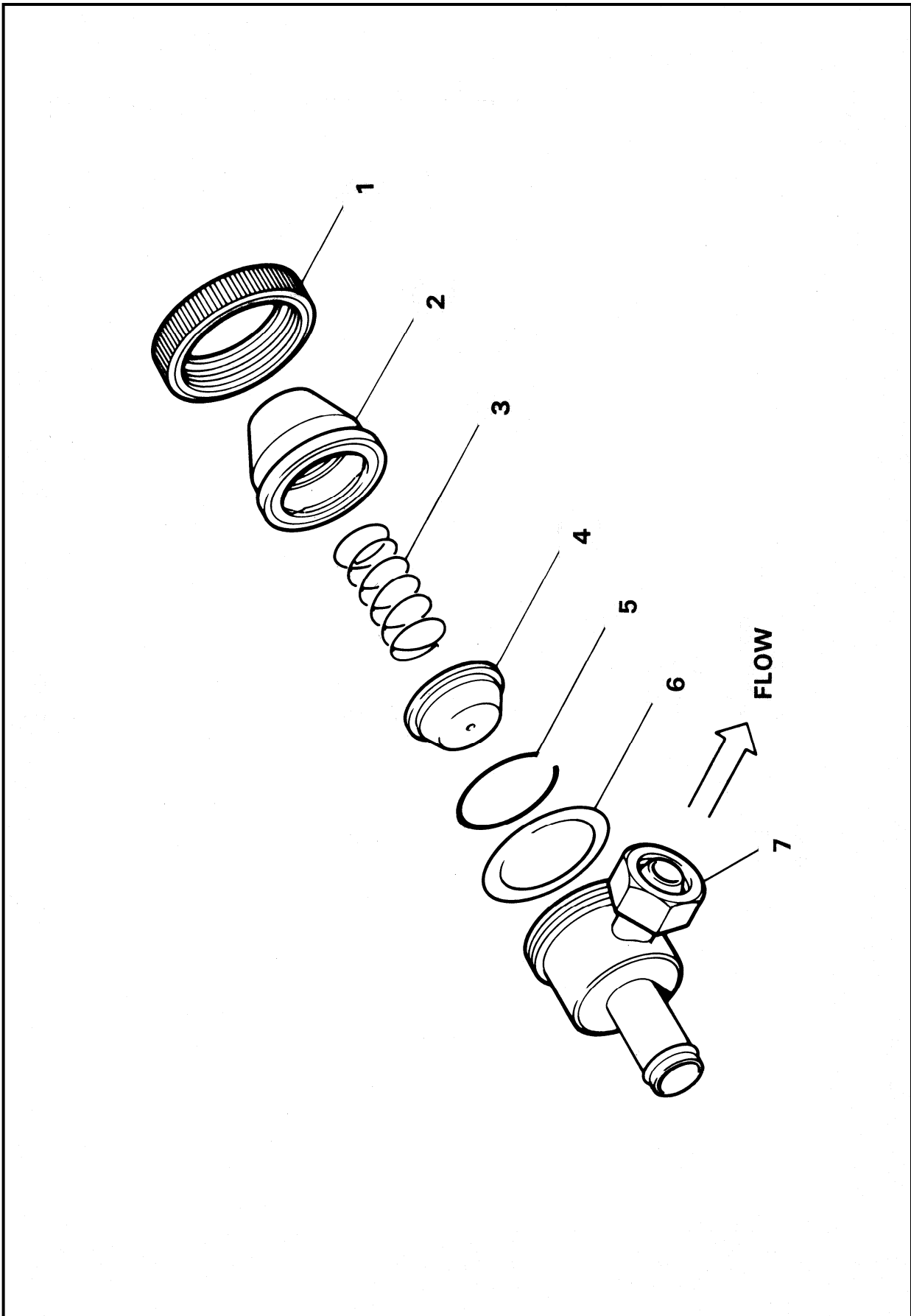


Fig. 13 – Diaphragm Check Valve



## 15. 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

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