

# **Addendum 1 to Cavalon Pro Gyroplane Pilot Operating Handbook.**

**For the purpose of Gimbal  
mounted camera operation**

**Document number RSUK0370**

**This document must be read in conjunction with the current issue of  
Cavalon Pro Pilot Operating Handbook RSUK0344**

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## Addendum 1 to Pilot Operating Handbook for Gyroplane Cavalon Pro

Model: Cavalon Pro fitted with moving camera system (MC-338)

Serial number: \_\_\_\_\_

Registration: \_\_\_\_\_

Type certificate number: AAN29428 and AAN29428 Addendum 1

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This flight manual Addendum 1 should be carried on board of the aircraft and must be kept in current, up-to-date status. The latest revisions and version status is available at [www.rotorsport.org](http://www.rotorsport.org). Extent and revision status of the manual is recorded in the revision log and the table of content.

This gyroplane may be operated only in strict compliance with the limitations and procedures contained in this Addendum RSUK0370 and the original Manual RSUK0334.

**The manual is not a substitute for competent theoretical and practical training on the operation of this aircraft. Failure to adhere to its provisions or to take proper flight instruction can have fatal consequences.**

**Applicability**

This manual addendum is applicable for Cavalon 'Pro' models only and when fitted the moving camera system specified under modification MC-338 and AAN29428 Addendum 2

**REVISION LOG**

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Pilots Flight and Operation Manual Document approval				
Signature		Signature		Signature
Position: Chief Test Pilot		Position: Engineering Manager		Position: Head of Airworthiness



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**SECTION 1 - GENERAL**

**1.1 Introduction**

This manual addendum is designed as an operating guide for pilots, instructors, and owners/operators, providing information for the safe and efficient operation of this gyroplane when fitted with the moving camera mount specified under modification MC-338. It includes material required to be furnished to the pilot by the competent certification authority. This handbook addendum is not designed as a substitute for adequate and competent flight instruction.

Pilots of this aircraft must hold a proper license including the class rating ‘gyroplane’, corresponding to the aircraft’s registration and operation – eg, an appropriate CPL licence is required for aerial work. It is the pilot’s responsibility to be familiar with this handbook, the special characteristics of this gyroplane, and all other information and legal requirements relevant for the operation in his country. The pilot is responsible to determine the gyroplane is safe for flight, and to operate the aircraft with respect to the procedures and limitations provided in this manual.

It is the owner’s/operator’s responsibility to have this gyroplane registered and insured, according to country-specific regulations. The aircraft owner/operator is also responsible for maintaining the gyroplane in airworthy condition. Maintenance instructions are provided in the Cavalon Pro Aircraft Maintenance Manual (AMM) RSUK0335 and in SECTION 8 of this manual addendum. Note that depending on the kind of operation, type of maintenance activity, or component involved, the competent authority may dictate qualified personnel and/or respective facilities.

**1.2 Certification**

The Cavalon is designed, tested and certified according to the British Civil Airworthiness Requirements (BCAR) Section T issue 5, and the associated CRI E-01. A UK ICAO compliant Certificate of Airworthiness has been issued for the type. The moving camera



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mount defined by modification MC-338 may be fitted under the authority of AAN29428 Addendum 2.

### **1.3 Performance Data and Operating Procedures**

The legal basis for operating a gyroplane is provided by national law and its respective regulations. The instructions and conditions contained have to be considered when operating the gyroplane.

All documented performance data and operating procedures have been identified within the certification processes for this gyroplane by means of flight test and analysis.

#### 1.4 Definition of Terms

This manual uses **WARNINGS**, **CAUTIONs** and **NOTEs** in bold capital letters to indicate especially critical and important instructions. Additionally, the colour of the panel (red, yellow, and grey shading) highlights the significance of the instruction. Definitions for each term are given below.

##### **WARNING**

**A warning means that the neglect of the appropriate procedure or condition could result in personal injury or loss of life.**

##### **CAUTION**

**A caution means that the neglect of the appropriate procedure or condition could result in damage to or destruction of equipment.**

##### **NOTE**

**A note stresses the attention for a special circumstance, which is essential to emphasize.**

## SECTION 2 - SYSTEM DESCRIPTION

### WARNING

**Incorrect operation of this system could result in major damage to the system or the aircraft itself. The cameraman must be briefed by the pilot and must agree responsibility for operation of the system controls.**

2.1. A nose-mounted moving camera system specified under modification MC-338 is available for fitment to Cavalon Pro gyroplanes, and has been approved by UK CAA under AAN29428 Addendum 2. A proprietary gimbal system is mounted on a vertical slide fitted to the front of the gyroplane. This gimbal system has three-degrees-of-freedom and enables the camera mounted inside it to be moved:

- 360 degrees in horizontal rotation (continuous) around a vertical axis
- 210 degrees in vertical rotation around a horizontal axis
- +/- 45 degrees in roll

The camera itself has motorised zoom and focus capability.

The whole gimbal arrangement, internal camera and control console is supplied by Dynamic Perspective GmbH as the DynaX5 gyro-stabilised camera platform. Various Broadcast-quality and Cine-quality camera options are supported by the Dynamic Perspective platform.



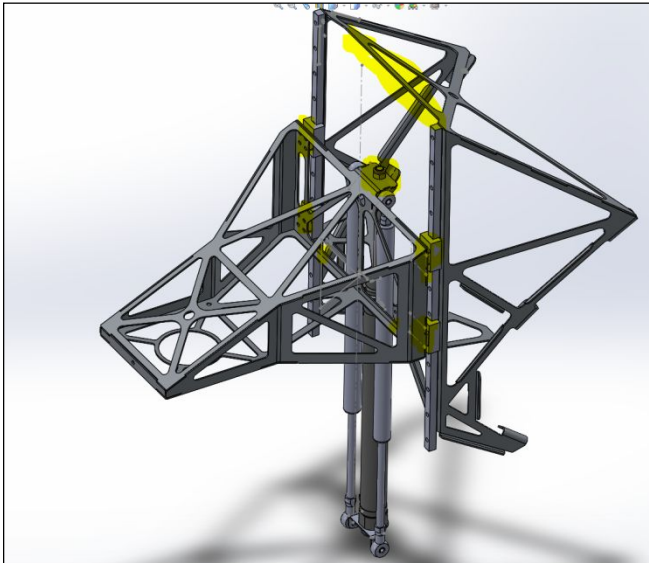
Externally-mounted gimbal



Console carried inside cockpit

2.2. In order that the field of view of the camera is not interrupted by the aircraft nose-wheel the gimbal system is mounted on the vertical sliding mount attached to the front of the aircraft. This slide is pneumatically powered and its movement is controlled by two conventional gas-struts. These gas struts also provide emergency lifting capability in the event of pneumatic system failure.

A schematic of the sliding mount is shown below:



The mount is normally moved up/down by the pilot using a rotary valve mounted on the instrument panel to the left of the aircraft's centre console. In the event of pneumatic system failure the air pressure can be released by means of a toggle-operated valve and the mount will then rise under power from the gas-struts alone. To show the pilot that the gimbal is in the lowered (filming) position a green LED is provided. There is no need for an indicator for the retracted (landing) position as the gimbal mounting moves into the pilot's field-of-view.

2.3. In order to provide compressed-air for the pneumatic system an electrically-driven compressor, air-drier and 0.8bar pressure switch are fitted into a single pneumatic control box. This box also contains adjustable flow-control valves used to control the air cylinder speed (these are set during system commissioning and should not be disturbed). Electrical supply to this control box is provided from the "Aux" circuit-breaker F19 (10A) which is controlled by the aircraft master-switch and the load-shedding relay arrangement. Interface is by means of a polarised connector mounted in the wall of the control box.

2.4. In order to provide 12VDC electrical supply for the gimbal/camera system a specific cable is run from the battery (at the rear of the aircraft) to the left of the instrument panel where a toggle switch is provided. This cable has a 40A line fuse (located near to the battery). No warning lights are provided.

Note: it is the camera operator's responsibility to place the gimbal in the nominated "Park" position before the vertical slide is operated for take-off or landing - no interlocking is provided.

2.5. The gimbal and turret are held in the nominated "Park" position by the action of internal servo-motors, so the system must be powered-up at all times the aircraft is moving on the ground or in the air, otherwise the components may droop or rotate uncontrollably.

## SECTION 3 – PRE-FLIGHT CHECKS

### WARNING

**These additional pre-flight checks must be carried-out in addition to the aircraft's Daily/Pre-flight inspection as defined in the body of POH RSUK0334**

- 3.1. Visually inspect the vertical slide system structure for cracks, broken welds or other damage. Check the body interface for cracks and security of mounting (6-places)
- 3.2. Visually inspect the slide-system pipework for cuts, bursts and security of attachment
- 3.3. Visually inspect the gimbal/camera system cables for damage, breaks and security of attachment
- 3.4. Visually inspect the (unheated) pitot tube for straightness and security of flexible pipework. Remove any temporary closure protecting the pitot-tube.  
NB: this (unheated) pitot tube may only be used in Day-VFR conditions and is not approved for Night-VFR use.
- 3.5. Clean the visible surfaces of the slide-way rails with a soft cloth or tissue moistened with thin oil or WD40. Inspect for damage to the rails, there must be no dents (e.g. from flying object damage) or accumulated debris.
- 3.6. Clean the visible surface of the cylinder rod and gas-strut rods with a dry soft cloth. There must be no damage or accumulated debris.
- 3.7. Check for free movement of the rod-end bearings of the gas-struts (4-places)
- 3.8. Using two people lift the nose-wheel of the gyroplane onto a suitable block at least 300mm high. Apply the parking brakes.
- 3.9. Significant electrical power is now required so either a high-current ground-power connection should be made or the checks must be conducted with the engine running. In the former case temporarily release the Gen1 and Gen2 circuit breakers. In the latter case the pilot must occupy the P1 seat and appropriate safety precautions MUST be established and observed.

### WARNING

**When the system is being moved on the ground ensure that both the operator and any third-parties cannot be trapped by the moving parts**

- 3.10. Using the toggle switch turn on the gimbal/camera supply. Follow the Dynamic Perspective operating instructions to establish/confirm the default "Park" position

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3.11. Turn on the aircraft master switch and listen for the compressor running to establish system pressure. Ensure that the toggle-operated valve is set to "Closed". Select the rotary valve to "Down" - the slide system should move slowly (about 18secs) to the down position. Select the rotary valve to "Up" – the slide system should move slowly to the up (retracted) position (about 10secs).

3.12 Return the system to the "Down" position then test the emergency lifting mechanism by changing the toggle valve to the "Open" position – the slide system should lift to the "Up" position. If satisfactory revert to the standard operating arrangement by setting the rotary valve to "Up" position then the toggle-operated valve to "Closed" – there should be no movement but the compressor may be heard running.

3.13 Position the slide system to the "Down" position and carry-out the system checks required by the Dynamic Perspective operating instructions.

3.14 Follow the Dynamic Perspective operating instructions to establish the default "Park" position then lift the slide system by selecting the rotary valve to "Up"

3.15 Stop the engine (if running) and turn off the master switch. Disconnect ground power (if fitted). Reset all circuit-breakers. Lift the gyroplane off the raising block and remove this from the gyroplanes path.

## SECTION 4 - FLIGHT CONTROLS AND LIMITATIONS

4.1. Pitch control is affected only by the additional nose weight and intuitive compensation by greater aft stick movement.

4.2. Roll control is not noticeably affected by the installation.

4.3. Yaw control is affected by the installation as air-flow passing around and through the turret "steers" the nose of the aircraft. However, intuitive compensation can be made within normal control limits.

4.4. With the modification installed the aircraft's Vne (Never exceed speed) is reduced to 75KIAS. Other notable speeds are unchanged:

**V<sub>A</sub>** Design manoeuvring speed 75KIAS

**V<sub>B</sub>** Design speed for maximum gust intensity 20-70KIAS

**V<sub>H</sub>** Maximum level-flight speed at maximum continuous power 75KIAS

**V<sub>Hmin</sub>** Minimum level-flight speed 25KIAS

4.5. Reference airspeeds for safe operation are unchanged:

Climb .....	60 KIAS
Best rate of climb / best endurance .....	50 KIAS
Best range .....	60 KIAS
Approach .....	50-55 KIAS

4.6 Take-off distance is increased and landing data remains unchanged:

Take-off roll.....	80 – 120 m
Take-off distance (560Kg MTOW).....	602 m
Landing roll .....	0 – 20 m
Landing distance from a 15m obstacle at 560Kg and 45KIAS .....	200 m

4.7 Climb rate.

Climb rate with the camera fitted, and at 560Kg MTOW, is reduced to 500fpm.

4.8 Sink rate and glide ratio.

The drag from the camera gimbal will increase the rate of descent at 50kts by around 150fpm

#### 4.9 Day VFR limitation.

The pitot fitted to the gimbal mounting is unheated, meaning the aircraft does not carry the required equipment for night flight. So with the camera gimbal mounting fitted the aircraft is only approved for day VFR operation.

## **SECTION 5 – ENVIRONMENTAL LIMITATIONS**

5.1. The environmental limitations are unchanged, excepting in that the camera gimbal must be operated within the limitations contained within the manufacturers instruction.



## **SECTION 6 - WEIGHT AND BALANCE**

6.1. Installation of the system (total system weight 38kg) has a significant impact on the aircraft empty weight and its centre-of-gravity. As part of approval under AAN29428 Addendum 2 the maximum take-off weight is unchanged (560kg). However, the longitudinal centre-of gravity forward limit has been revised and is now 590mm forward of the datum

Under AAN29428 Addendum 2 the CG limits are therefore:

- In x 345 to 590mm forward of the datum
- In z 750 to 940mm above the datum

### **NOTE**

**If the aircraft is loaded and operated as described in POH RSUK0334 and this Addendum 1 (RSUK0370), then these limits will not be exceeded**



## SECTION 7 – FLIGHT OPERATIONS

### 7.1. General

The gimbal system should be powered-up in the nominated “Park” position and the slide system in the “Up” position at all times other than when manoeuvring for filming

### 7.2. Taxi

Taxi slowly and avoid as far as possible inclines, pot-holes, etc. Cross thresholds at an angle to avoid the nose dropping and the gimbal contacting the ground.

### 7.3. Take-off

No noticeable change in technique, noting that the aircraft flies off in a flatter attitude.

### 7.4. Climb

No noticeable change in technique

### 7.5. Cruise

No noticeable change in technique

### 7.6. Manoeuvring (during filming)

Prior to filming the slide system should be lowered (and the “Down” position LED illuminated) by means of the rotary valve. Control of the gimbal/camera is considered the responsibility of the cameraman while the pilot manoeuvres the aircraft as required. On conclusion of filming the cameraman will park the gimbal and request that the slide system is raised and visually confirmed.

### 7.7. Approach

No noticeable change in technique, however as part of the pre-landing checks visually confirm that the slide system is “Up”

### 7.8. Landing

Landing has a flatter attitude. Landing very slowly with a high nose up attitude tends to result in a faster nose drop, potentially damaging the gimbal.

### 7.9. After landing

No noticeable change in technique

Maintain power to the gimbal/camera system until the aircraft has been parked and the engine switched off

### WARNING

**AutoGyro GmbH and RotorSport UK Ltd have used their best endeavours to design a safe and reliable gimbal support system. It is the operators responsibility to ensure the system is properly functioning and without defects prior to use, and neither AutoGyro GmbH or RotorSport UK Ltd take any responsibility for any gimbal or camera damage in use whilst fitted to the Cavalon Pro.**



## **SECTION 8 - MALFUNCTIONS AND EMERGENCIES**

8.1. If the slide system cannot be raised by the normal or back-up controls try flying at  $V_{min}$  (to reduce aerodynamic load on the gimbal) and cycling the pneumatic controls. If unsuccessful prepare for a very slow, nose-high approach to land on soft ground with minimised landing roll. In this case it is likely that the gimbal will suffer significant damage, and may cause the aircraft to roll over onto its side. Therefore land in preparation for an accident!

8.2. If the gimbal cannot achieve the nominated "Park" position use the toggle switch to power-down the system, which will allow the gimbal and turret to move freely. Then select the slide system "up" accepting that there may be damage to the gimbal/turret installation if the camera is pointing straight down.

8.3. If the 'LOW VOLT' lamps lights then in accordance with the existing manual all non-essential systems must be powered down to preserve electrical energy for safe flight. The camera system should be powered off, and raised ready for landing.

### **Section 9 – Pitot**

9.1. The heated pitot tube is removed during fitment of the gimbal, and replaced by an unheated tube mounted in the top of the moving gimbal mounting. The modification approval flight evaluation demonstrated that the calibration of the ASI was relatively unaffected by fitment of the modification, but should there be reason to consider the ASI calibration incorrect then this may be cross checked by flying in still air in level flight with reference to a GPS groundspeed. Flights in two opposing directions should be undertaken to eliminate wind effects. Adjustment is undertaken via a bleed located behind the instrument panel as per the AMM.