OWNER'S MANUAL

Model A702 / A702-5 Aviation Light with Switch

Self-contained and maintenance free with no battery or bulb replacement required for five years!

Easy installation for most qualified maintenance departments.

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1.0 Introduction

Congratulations on purchasing the Carmanah Model A702 and or Model A702-5 (with additional top-mounted solar panel) Aviation Light with Switch. Using LED illumination, these solar-powered units are designed to operate reliably with no scheduled maintenance for up to five years.

Combining advanced electronics and software with solar power and LED technology, the Model A702 and Model A702-5 are advanced, portable, self-contained aviation lights. These lights have been designed to operate reliably under all environmental conditions at most locations across North America.

Note: Both the A702 and A702-5 operate in exactly the same way, so although the instructions from here forward will only refer to the "Model A702" it will also apply to the Model A702-5.

Note: This guide covers the functional details of both the Standard and Infrared Aviation Light with switch.

Note: For infrared safety precautions and product specifications for the Model A702 and Model A702-5 Infrared Aviation Light with Switch, please refer to Sections 2.3 and 6.0 respectively.

1.1 How it Works

Unlike conventional airfield lights, the Model 702 Switched Aviation Light offers four distinct outputs. The A702 offers three 'sustainable' output modes, in which a light can operate indefinitely for dusk to dawn operation. In addition, an "emergency" high intensity output mode is available for short-term operation. Each output setting can be easily selected by the user by simply pressing a button on the unit itself. If the light needs to be extinguished immediately for any reason, a single press of the button places the light into "Blackout Mode."

During the day, the light charges from ambient daylight. The size of the battery ensures that even with poor solar availability over extended periods, the light will continue to perform reliably. The lights are completely power-autonomous: no wiring to an external power supply is required, offering easy installation in locations where external power is hard to access or unavailable.

2.0 Using The Light

2.1 Understanding The Product

The Model A702 Aviation Light with Switch does not require an external power supply - it operates using solar-charged batteries that are maintenance free for up to five years. The light consists of a housing covered by a solar panel on each side and a head that contains the electronics and LEDs.

Installing the light requires no special training and can be easily and quickly carried out by existing maintenance crews.

The Infrared model uses a red "telltale" LED mounted upright on the LED array – use this to see the function of the light, as infrared wavelengths are invisible to the naked eye.

2.2 How to Use the Model A702 Aviation Light with Switch

2.2.1 Programming The Light

After unpacking the light, a small black pushbutton mounted on the top plate will be visible. This push button allows control over all light features.

The first level of control over the light is setting its output level. This is done by pressing the button a number of times in quick succession. The types of output accessible are summarized in the following table:

Output	**Gesture**
BLACKOUT (Off)	Single press
DEFAULT	Two presses
LOW	Three presses
FLASH	Four presses

The light will operate once programmed. If the light is programmed during the night (i.e. very little light falling on the solar panels), it will continue to operate in the programmed state until daylight is detected. If the light is programmed during the day, it will remain active for one hour only, then turn off.

2.2.2 24-Hour Shutoff

If a light is left in an active state for 24 hours, it will switch itself off to preserve the battery, as the light will assume this is an error. This could occur, for example, if the light has been placed in a container preventing it from sensing ambient light.

2.2.3 Blackout Mode

To switch the light OFF, simply press the button once. This will immediately extinguish the light. The light will remain off until triggered by a subsequent day-night transition.

2.2.4 Emergency High-Intensity Mode

To activate the emergency high-intensity mode, hold the button down until the light flashes three times (roughly 3 seconds). Release the button, and then press it again briefly. The light will turn on at the high intensity. If high-intensity mode is activated during the daytime, it will shut off after one hour to conserve battery power. If high-intensity mode is activated at night, the light will remain in that mode until daylight is detected, or for 24 hours, whichever occurs first. The high-intensity mode can be cancelled at any time by selecting any other output mode, or by putting the light into "blackout" or "storage" modes.

2.2.5 Turning The Light Off (Storage)

If the light needs to be turned off for storage, press and hold the button until the light flashes once (about two seconds), then immediately release the button. The light is now off and will only respond to key presses for activation; it will not automatically switch on at night.

2.2.6 Battery Status Check

The state of the battery can be checked by holding the button down for 2 seconds. The light will flash once at 1 second and twice at 2 seconds. At this point release the button and press it again one more time.

The light will produce a long flash and then a sequence of short flashes; one flash for every 10% of the functional battery level up to a maximum of ten flashes (100%).

When the battery level check cycle is complete, the light will return to its prior operation state.

2.2.7 ALC (Automatic Light Control)

ALC (Automatic Light Control) is a patented algorithm that allows the light to adjust its energy consumption to the solar environment. This extends the range of use of the light in poor solar charging conditions.

ALC is enabled in the default mode, and may be switched off as required. This control is activated in the same way as the battery status check, however following the 2-second hold, either 2 or 3 presses are used.

Mode	Action	Confirmation
ALC ON	2 sec. press, then 2 quick presses	Long flash, short flash
ALC OFF	2 sec. press, then 3 quick presses	Long flash, long flash

2.3 Using the Model A702-Infrared Aviation Light with Switch

The function and interface of the Model A702-IR (Infrared) Aviation Light with Switch is identical to the standard (visible) color Model A702 Aviation Light with Switch, except that a single red LED is used to provide feedback to the naked eye.

Because of the nature of infrared light, certain precautions should be observed when in close proximity to the light.

2.3.1 Infrared and Telltale LEDs

The light source in the A702-IR light is a center-mounted component consisting of an array of 24 infrared LEDs pointing outwards, and a single visible red LED pointing upwards. As the infrared LEDs are not visible to the naked eye, the red LED acts as a telltale, indicating to a user standing directly over the light when the IR LEDs are energized. This allows a user to examine the performance of the light from a safe position, and to obtain feedback during programming without specialized equipment.

2.3.2 Infrared Precautions

The IR power output from the Model A702-IR is low and insufficient to cause any damage through viewing with the unaided eye under normal conditions. However, LED sources are intense and it is recommended that precautions be taken. Do not stare into the beam of the light – i.e. directly from the side at close range when the light is active.

A safe limit for near-IR viewing, as been established by the American Conference of Governmental and Industrial Hygienists (ACGIH), is 10mW/cm^2 as the maximum exposure limit for viewing for up to 16 minutes. This power density can be produced by an A702 IR light close to the lens surface. To provide a safety margin, we recommend not viewing an active IR light from the side (close to or on beam) from a range of less than one meter from the surface of the lens.

3.0 Installing the Model A702 Aviation Light with Switch

3.1 Installation

Installation typically takes very little time. A minimum of three fasteners are required - 120° apart - for stability and safety, but it is strongly recommended that all available mounting holes are used. Use a washer under the head of the fastener to protect the top surface of the mounting flange from damage.

NOTE: It is a good idea to test the light before heading out into the field – the light does not need to be mounted before programming occurs. Try the different functions to become familiar with the behavior of the light.

3.2 Location

Mount the light in the required location, but take the following precautions to ensure good performance:

- Shadowing or shading the panels during daylight hours will reduce the charging performance. Make sure the light is not placed in a location where a shadow may be cast onto the light during the day throughout the year.
- Avoid mounting the light directly in contact with tarmac or asphalt – ambient temperatures of these surfaces during the warm season can rise above the maximum recommended operating temperatures of the light. If the light must be mounted on tarmac, asphalt or other similar dark surface, place a square of plywood or other insulating material between the base and the mounting surface.

4.0 Maintenance / Product Care

Although the light is designed to be maintenance free, large performance gains can be made with clean solar panels and lenses. Clean the solar panels on a regular basis (monthly). Use water and a soft sponge or cloth for cleaning and a mild non-abrasive cleaning agent for more stubborn residue. Rinse well.

The following other maintenance precautions should also be taken:

- Clean solar panels and lenses more frequently during drier months, as they may become soiled more quickly. A pressure washer may be used, but avoid direct spray onto the switch at close proximity.
- Visual inspection – check the exterior assembly for cracks, missing or broken hardware or other potential problems.

4.1 Battery Self-Discharge

Depending on the temperature where the light is stored, the unit will require periodic recharging to maximize the life of its battery. Table 1 provides the recommended maximum storage intervals between charging, depending on the ambient temperature of the storage location.

Table 1: Recharge Intervals

Storage Temperature		Recharge Interval [Months}
^{o}C	^{o}F	
20 or lower	68 or lower	9
25	77	6
30	86	4
35	95	2.5
40	104	1.5
45 or more	113 or more	1

WARNING: Exercise caution when handling the battery packs. They are capable of generating enormous short-circuit currents. Remove all jewelry (bracelets, metal-strap watches, rings) before attempting to handle or remove the battery packs.

NOTE: If the battery pack is replaced after its useful lifespan has ended, do not throw the old pack into the garbage. Lead is toxic and harmful to the environment. Please recycle.

For replacement batteries contact your Authorized Carmanah Distributor.

5.0 Product Specifications – Standard Color

Light Output

DEFAULT	6cd / 18cd*
LOW	3cd / 9cd*
EMERGENCY HIGH INTENSITY	24cd
FLASH MODE	60 fpm @ 13cd Effective Intensity.
Vertical Divergence	6 degrees
Horizontal Output	360°

**Intensities for Model 702-5 (equipped with top-mounted solar panel)*

Operation

Daily Operational Profile	For 60 minutes once switched on during the day. Until dawn once switched on at night.
Latitude Range[1]	55° N to 55° S A702 30° N to 30° S A702-5
Illumination Technology	21 or 24 LEDs, depending on Color
Lifespan of LEDs	Up to 100,000 hrs.
Color Output	180° Sectored Red/Green or White
On/Off Lux Level	23 lux average / 85 lux average Response to lux level change: approx. 10 sec.
FLASH MODE - On Time/Off Time	0.25 sec. / 0.75 sec.

Autonomy

A702		
	ALC Disabled	130 hours DEFAULT 260 hours LOW
	ALC Enabled	250 hours starting at DEFAULT
A702-5		
	ALC Disabled	45 hours DEFAULT 90 hours LOW
	ALC Enabled	100 hours starting at DEFAULT

All figures assume starting at 100% battery state-of-charge.

Solar Panels

Type	Mono-Crystalline Potted with UV-protected polyurethane
Maximum Power	11.2 Watts
Efficiency	14%

Battery

Cell Type	Pure-lead thin plate with starved electrolyte
Nominal Battery Voltage	4 Volts
Battery Capacity	24 Amp-Hours at 10 Hour discharge rate

Environmental

Maximum Temperature Range[2]	-40 °C to +80 °C (-40 °F to +176 °F)
Waterproofing	As per IP67 (NEMA 6)

Construction

Lens Color	Clear
Lens Material	UV-resistant polycarbonate
Battery Venting	One-way 4 psi vent at bottom of light
Head Assembly Material	Powder coated aluminum
Housing Assembly Material	Powder coated aluminum
Sealing	Self-contained unit, sealed with NBR rubber gaskets
Weight	7.75 kg (17 lbs.)

Patents and Trademarks

Patents and Trademarks	U.S. Patents	5,782,552
		6,013,985
		6,573,659
	Canadian Patents	2,241,044
	U.S. Trademarks	2,862,539
	Canadian Trademarks	TMA496,756
	Other Patents and Trademarks Pending	

[1] Lights will function reliably outside their specified latitude ranges, however solar performance will be diminished due to decreased incident solar insolation. Extra care should therefore be taken to preserve operational capacity when operating outside this latitude range. For advice on usage please contact Carmanah Technologies Inc. to discuss your specific requirements.

[2] Consistent ambient temperatures above +25°C (+77°F) will affect overall battery life. Temperatures above +60°C (+140°F) may affect output.

All specifications are subject to change without notice.

6.0 Product Specifications - Infrared

Light Output	
DEFAULT	30mW/Sr
LOW	15mW/Sr
EMERGENCY HIGH INTENSITY	60mW/Sr
FLASH MODE	60 flashes per minute @ 120mW/Sr (peak)
Vertical Divergence	6 degrees or greater (Full Width Half Max)
Horizontal Output	360°

Operation	
Daily Operational Profile	For 60 minutes once switched on during the day. Until dawn once switched on at night.
Latitude Range[1]	55° N to 55° S
Illumination Technology	24 Infrared LEDs, one tell-tale Red LED
Lifespan of LEDs	Up to 100,000 hrs.
Color Output	Infrared Light (870nm)
On/Off Lux Level	23 lux average / 85 lux average Response to lux level change: approx. 10 sec.
FLASH MODE - On Time/Off Time	0.25 sec. / 0.75 sec.

Autonomy	
ALC Disabled	130 hours @ DEFAULT/FLASH (100% Battery); 260 hours @ LOW
ALC Enabled	250 hours starting at DEFAULT/FLASH (100% Battery)

Solar Panels	
Type	Mono-Crystalline Potted with UV-protected polyurethane
Maximum Power	11.2 Watts
Efficiency	14%

Battery	
Cell Type	Pure-lead thin plate with starved electrolyte
Nominal Battery Voltage	4 Volts
Battery Capacity	24 Amp-Hours at 10 Hour discharge rate

Environmental

Maximum Temperature Range[2]	-40 °C to +80 °C (-40 °F to +176 °F)
Waterproofing	As per IP67 (NEMA 6)

Construction

Lens Color	Clear
Lens Material	UV-resistant polycarbonate
Battery Venting	One-way 4 psi vent at bottom of light
Head Assembly Material	Powder coated aluminum
Housing Assembly Material	Powder coated aluminum
Sealing	Self-contained unit, sealed with NBR rubber gaskets
Weight	17 lbs. (7.75 kg)

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[1] Lights will function reliably at latitudes higher than 55° North or South, however solar performance will be diminished due to decreased incident solar insolation. Extra care should therefore be taken to preserve operational capacity when operating outside this latitude range.

[2] Consistent ambient temperatures above +25°C (+77°F) will affect overall battery life. Temperatures above +60°C (+140°F) may affect output.

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