



WingMan™ Ultra

Installation and User's Manual

OSA WingMan™ Ultra Introduction

Thank you for purchasing the Oregon Scale Aviation Inc. WingMan Ultra servo control system. This controller has been designed by scale aviation enthusiasts with the utmost concern for reliability, safety and usability.

WingMan Ultra enables the scale aviation enthusiast to control the folding or sweeping of model aircraft wings in a scale-like manner. Additionally, it independently controls a latching servo that insures positive locking of the wings, while requiring only a single transmitter channel. All servo movements are reversible. All servo endpoints are fully adjustable and are permanently stored in memory. The folding speed is fully adjustable, and you can even configure the system to stagger the folding of the wings. This staggering is very prototypical of WWII aircraft that used hydraulic systems to fold the wings. One side always pressurized and started folding before the other. The amount of stagger provided by Wingman is also fully adjustable. You can even configure WingMan to lower the wings slightly faster than it raises the wings, simulating true hydraulic behavior. Wingman incorporates an arming feature to prevent inadvertent folding of the wings, and incorporates many safety features to insure reliable operation. Wingman will function correctly even if it loses contact with the transmitter or the transmitter is inadvertently turned off. After completing a one-time installation and adjustment, no pre-flight adjustments are required, simply turn on your transmitter and receiver and fly!

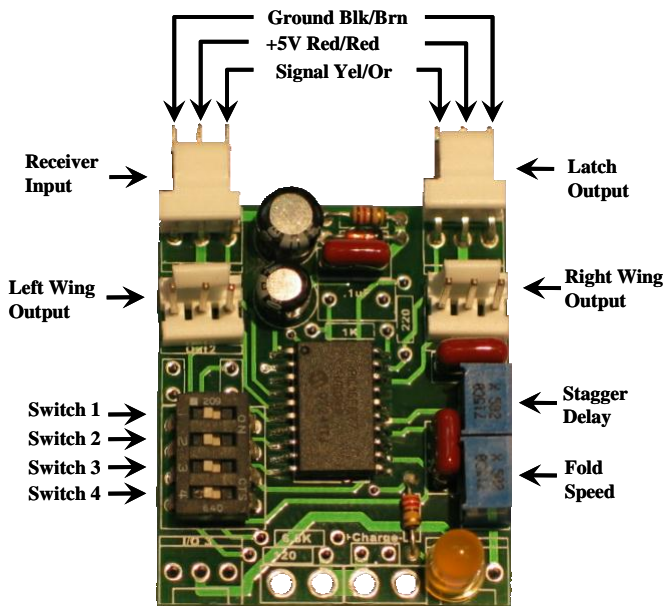


Figure 1

System Power Considerations

If you intend to use high current servos for wing folding, it is recommended that you supply power to the servos from a separate battery and switch. Please refer to the wiring diagram on page 6 for wiring details.

The best strategy for powering high current servos, is to provide power directly to the servos from an alternate power source. For example, use a 6V battery to power the wing fold servos. If you use an alternate power source, both the receiver and alternate power source grounds must be connected together. The +6V from the alternate power source is connected directly to the WingMan Ultra controller. **Do NOT connect the receiver +4.8V and the alternate +6.0V source positive wires together.** It is also recommended that you use heavy gauge wire in connecting the wing fold servos to reduce the voltage drop in the wiring and that you provide a separate high quality low resistance switch for the alternate power source.

Wing Fold/Sweep Introduction

WingMan Ultra assumes the use of servos for both wing folding and latching. The fold servos are driven by the Right and Left Wing outputs and the latch servo is driven by the Latch output. **Do not attempt to install folding wings without a latch.** The folding servo(s) will not provide adequate power to hold the wings down, and an in-flight failure is likely. Additionally, the current required to hold the wings down would quickly drain the battery.

Receiver Connection

Before installing or configuring WingMan, you must connect the receiver output of the channel you will use to control the wings to the WingMan Receiver Input. The WingMan Receiver Input is in the upper left hand corner of the board as shown in Figure 1. You will need a female to female connecting wire of the appropriate length for your type of radio system. If you cannot purchase a female to female connector for you type of radio system, you can use the included connector and a servo pigtail or aileron extender to complete this connection. Please refer to the "Installing the Connector" section at the end of this document for instructions. Before powering-up the WingMan Ultra, always insure that the power, ground and signal wires are in the correct locations as shown in Figure 1. Note that ground is on the outside edge of the controller for all four connectors.

Please insure that the power and ground leads are properly connected to WingMan before applying power to the system. Reversing power and ground will damage the WingMan controller and void your warranty.

Standard JR, Futaba and Airtronics servos will plug directly into the WingMan connectors.

Before using the WingMan controller, you must complete some initial configuration settings and adjustments. There are five modes that require setting. Each mode is entered by setting the switches to a unique position, and then powering on the unit. The following instructions will walk you through each of the modes. During initial installation, please perform all steps in the order indicated. Note that a switch is turned “On” when it is moved towards the center of the WingMan controller.

Input Setup Mode:

The Input Setup Mode is used to configure the input signal direction. Make sure the receiver is connected to the Wingman controller and that the receiver is off. Adjust the travel throws for the transmitter to full throw for the channel you are using to control the wings (ie +100% and -100% for JR/Spektrum transmitters). Move Switch 3 and Switch 4 (on the WingMan controller) to the “On” position. Turn the receiver and transmitter on, and move the transmitter wing control to the “Down” position. Wait for approximately 15 seconds. If the input is configured correctly, the LED will blink continuously. If it does not blink, move Switch 1 to the “On” position. Once the LED is blinking, move Switch 4 to the “Off” position and turn off the receiver. Return all switches to the “Off” position. This completes the Input Setup Mode programming.

Configuration Mode

Configuration mode is used to configure the WingMan controller for Sweep, Stagger and Fast Down enabling. In this mode you will set the following parameters;

Function	Comments
Sweep Enable	In sweep mode, wing servos are always active. In fold mode, wing servos deactivate after the latch is closed
Stagger Enable	Stagger is user adjustable from no stagger to complete stagger. The staggered wing (left wing) starts moving some time after the non-staggered wing starts moving. The delay time is adjusted with the Stagger Delay pot.
Fast Down Enable	Fast Down makes the wings lower slightly faster than they rise to simulate hydraulic system behavior.

To enter Configuration Mode, with the receiver/controller turned off, move Switch 2, Switch 3 and Switch 4 to the “On” position. Insure that the receiver is still connected to the WingMan controller. Turn on the transmitter and the receiver. Wait approximately 15 seconds. You will notice that the LED blinks. This indicates it is ready for you to set Switches 1, 2 and 3 to configure the Sweep, Stagger and Fast Down respectively.

Sweep Enable: If your aircraft uses sweeping wings or you desire to have the wing servos continue to drive after the wings are lowered and the latch closes, move Switch 1 to the “On” position, otherwise move it to the “Off” position. If you are using a folding wing installation and wish to deactivate the wing servos after the wings are lowered and latched, move Switch 1 to the “Off” position. It is highly recommended to disable the Sweep configuration for folding wings. When Sweep is disabled, the wing servos can be adjusted to drive to a

fully down position and actually overdrive the servo briefly while the latch closes. This insures a positive closing of the latch even under a variety of temperature and wind conditions. The servos are then turned off to avoid draining the battery after the wings are lowered. When the wings are in the up position, the servos are always driven regardless of the sweep setting in order to hold the folding wings up even under gusty wind conditions.

Stagger Enable: Set Switch 2 to the “On” position if you want to enable the Stagger feature, otherwise leave it in the “Off” position. It is recommended that you enable the stagger feature for folding wing installations in order to avoid having both large wing folding servos surging at the same time. If you find that this is not an issue for your installation, you can always adjust the stagger delay pot to provide no stagger.

Fast Down Enable: Set Switch 3 to the “On” position if you want to enable the Fast Down feature, otherwise leave it in the “Off” position. The Fast Down feature makes the wings lower slightly faster than they rise in order to simulate a true hydraulic system.

Once you have Switches 1,2 and 3 in the desired positions, move Switch 4 to the “Off” position. The LED will stop blinking indicating the values have been stored in memory. This completes the configuration mode programming! Turn the receiver and transmitter off and return all WingMan switches to the “Off” position.

Travel Limits Modes

The Travel Limits Modes are used to set the travel limits for the left and right wing and the latch servos. Each wing can have unique up and down travel limits to accommodate minor differences in servo and linkage installations. This allows you to have individually tailored limits for the left wing, right wing and latch while using only a single transmitter channel to control the wing folding or sweep. It also insures that the wing controller will be unaffected by inadvertent adjustments of transmitter trim for the wing channel; an added safety feature.

Right Wing Travel Limits Mode: Insure the right wing servo is connected to the Right Wing Output of the WingMan controller. The left wing and latch servos should not be connected to WingMan. Both the WingMan and the receiver should be off. Move the latch by hand to the fully open position. Connect the WingMan controller to the receiver throttle channel. (you will use the throttle stick and throttle travel for all wing and latch travel limit adjustments). Move the throttle stick to about mid-travel.

Move WingMan Switch 2 and Switch 4 to the “On” position and all other switches off. Turn on the transmitter. Gently hold the right wing at about 30 degrees. When you turn on Wingman, after about 15 seconds, it will drive the right wing servo. Do not be alarmed or try to prevent the wing from moving. Gently let the wing move to the position the servo desires. If you are uncomfortable with allowing the wing to move rapidly, you can disconnect the wing push rod until the servo is in its final position, then reconnect the pushrod. OK, now that you are ready, turn on the WingMan while gently holding the wing and wait 15 seconds. Once the wing is where the servo drives it, let go of the wing, and it should be at about 45 degrees. Notice that the LED blinks once and then pauses in a repeating pattern. This means WingMan is ready for the Right Wing Up Travel Limit setting. Very slowly move the throttle stick until the wing is in the desired up position. If the throttle stick detents prevent you from achieving exactly the position you desire, decrease the throttle travel limit on the Tx until you can get the stick to the full end position, and then use the

travel adjustment on the Tx to make fine adjustments of the wing. Once you are satisfied with the right wing up position, gently hold the right wing and move Switch 4 to the “Off” position. Notice that the LED stops blinking.

Without changing the throttle stick position move Switch 4 to the “On” position and release the wing. Notice that the LED blinks twice and then pauses in a repeating pattern. This indicates WingMan is ready to accept the Right Wing Down Travel Limit setting. Move the throttle stick slowly until the right wing is in the desired down position. You may need to use the Tx throttle travel adjustment to get the wing exactly where you desire. This position should ensure that the latch can freely close and it is recommended that you slightly overdrive the servo in this position. This helps insure the latch can operate freely under a variety of temperature and wind conditions. Once satisfied with this position, move Switch 4 to the “Off” position and notice that the LED stops flashing and the right wing servo stops driving. This completes the Right Wing Travel Limits adjustments. Turn off the WingMan and the transmitter. Return all WingMan switches to the “Off” position. You can re-enter this mode at any time without disturbing any of the other WingMan settings.

Left Wing Travel Limits Mode: Insure the left wing servo is connected to the Left Wing Output of the WingMan controller. The right wing and latch servos should not be connected to WingMan. Move the latch by hand to the fully open position. Both the WingMan and the receiver should be off. Connect the WingMan controller to the receiver throttle channel. (you will use the throttle stick and throttle travel for all wing and latch travel limit adjustments). Move the throttle stick to about mid-travel.

Move WingMan Switch 1 and Switch 4 to the “On” position and all other switches off. Turn on the transmitter. Gently hold the right wing at about 45 degrees. When you turn on Wingman, it will drive the left wing servo. Do not be alarmed or try to prevent the wing from moving. Gently let the wing move to the position the servo desires. If you are uncomfortable with allowing the wing to move rapidly, you can disconnect the wing push rod until the servo is in its final position, then reconnect the pushrod. OK, now that you are ready, turn on the WingMan while gently holding the wing and wait 15 seconds. Once the wing is where the servo drives it, let go of the wing, and it should be at about 45 degrees. Notice that the LED blinks three times and then pauses in a repeating pattern. This means WingMan is ready for the Left Wing Up Travel Limit setting. Very slowly move the throttle stick until the wing is in the desired up position. If the throttle stick detents prevent you from achieving exactly the position you desire, decrease the throttle travel limit on the Tx until you can get the stick to the full end position, and then use the travel adjustment on the Tx to make fine adjustments of the wing. Once you are satisfied with the left wing up position, gently hold the left wing and move Switch 4 to the “Off” position. Notice that the LED stops blinking.

Without changing the throttle stick position move Switch 4 to the “On” position and release the wing. Notice that the LED blinks four times and then pauses in a repeating pattern. This indicates WingMan is ready to accept the Left Wing Down Travel Limit setting. Move the throttle stick slowly until the left wing is in the desired down position. You may need to use the Tx throttle travel adjustment to get the wing exactly where you desire. This position should ensure that the latch can freely close and it is recommended that you slightly overdrive the servo in this position. This helps insure the latch can operate freely under a variety of temperature and wind conditions. Once satisfied with this position, move Switch 4 to the “Off” position and notice that the LED stops flashing and the left wing servo stops driving. Turn off the WingMan and the transmitter. Return all WingMan switches to the

“Off” position. This completes the Left Wing Travel Limits adjustments. You can re-enter this mode at any time without disturbing any of the other WingMan settings.

Latch Travel Limits Mode: Insure the latch servo is connected to the Latch Output of the WingMan controller. The right and left wing servos should not be connected to WingMan. Both the WingMan and the receiver should be off at this time. Move the latch by hand to the fully open position and then move both wings by hand to the fully down position. You may want to put a little weight on the wings if they do not rest in the fully down position. Connect the WingMan controller to the receiver throttle channel. Move the throttle stick to about mid-travel.

Move WingMan Switch 1, Switch 3 and Switch 4 to the “On” position. Move Switch 2 to the “Off” position. Turn on the transmitter. Turn on the WingMan and notice that the LED blinks five times and then pauses in a repeating pattern. This means WingMan is ready for the Latch Up Travel Limit setting. Move the throttle stick until the latch is in the desired up (closed or locked) position. If the throttle stick detents prevent you from achieving the exact desired position, decrease the Tx throttle travel limit until you can move the stick to the full end position, and then use the Tx travel adjustment to make fine adjustments of the latch. Once you are satisfied with the latch up position, move Switch 4 to the “Off” position. You will notice that the LED stops blinking.

Without changing the throttle stick position move Switch 4 to the “On” position. Notice that the LED blinks six times and then pauses in a repeating pattern. This indicates the WingMan is ready to accept the Latch Down Travel Limit setting. Move the throttle stick slowly until the latch is in the desired down position. You may need to use the Tx throttle travel adjustment to get the latch exactly where you desire. This position should ensure that the wing can freely move up past the latch without hitting it. Once satisfied with this position, move Switch 4 to the “Off” position and notice that the LED stops flashing and the latch servo stops driving. Turn off the WingMan controller and the transmitter. This completes the Latch Travel Limits adjustments. You can re-enter this mode at any time to make fine adjustments without disturbing any of the other WingMan settings.

This completes the programming of the five adjustment modes. Insure the receiver and the transmitter are turned off. Connect the right and left wing servos and the latch servo to the WingMan. Connect the WingMan to the receiver channel that you wish to use to control wing folding. Insure that the travel limits for that channel are set for full travel (ie 100%) on the transmitter.

Speed and Stagger Adjustments:

To make the first time Speed and Stagger adjustments, move the wings, latch and transmitter switch/knob to the down position. Turn the Wing Fold Speed and Stagger Delay potentiometers to the full counterclockwise position. Moving these pots counter clockwise slows the wing fold speed and reduces the stagger delay to zero. Turn on the transmitter and the receiver, and wait for about 15 seconds or until the latch is in the up position. Move the transmitter switch to the up position for at least 1 second, then to the down position for at least one second and then back up. The latch will lower and the wings will start to rise. Adjust the Wing Fold Speed pot until you achieve the desired speed. It may take a few up-down cycles to achieve the desired fold speed. Always wait until the entire cycle is completed before moving the switch in order to avoid entering Failsafe mode.

Once satisfied with the fold speed, adjust the Stagger Delay pot clockwise until you achieve the desired delay between the folding of the wings. Again, this may require a few up-down cycles to achieve the correct setting.

This completes the adjustments and configuration of the WingMan controller. Wrap the controller in vibration reducing foam (the same kind you use on the receiver) and install in the airplane. The recommended location is in the center of the wing to minimize the number of wires that must be disconnected to remove the wing.

Using WingMan Ultra

Many safety features have been incorporated in Wingman Ultra, in order to avoid an inadvertent wing fold sequencing during flight. Wing folding will only be initiated after an arming sequence of the transmitter switch. The transmitter switch must first be moved to the up position and held there for at least 1 second. Then the switch must be moved to the down position and held there for at least 1 second. After this sequence, Wingman Ultra is armed and will remain armed for approximately 10 seconds. If the transmitter switch is not moved to the up position within this 10 second period, WingMan will return to the disarmed state. If the transmitter switch is moved to the up position within this 10 second period, and held there for at least 1 second, the wing folding sequence will be initiated. Once a sequence is initiated, the sequence will run to completion as long as power is supplied to the unit. The transmitter signal can be lost completely or the signal connection to WingMan Ultra may be severed, but the sequence will complete. In addition, once the wings are in the up position, the WingMan will continue to drive the wing servos even if the transmitter is turned off or the signal is lost. Once the wings are in the down position and the latch is secured, the Wingman will drive the latch servo even if the transmitter is turned off or the signal is lost. It will not drive the wing servos while the wings are in the down position however. This feature prevents the typically large wing servos from stalling and draining the battery. **Be aware however that radio interference could send false signals to the WingMan Ultra that could actuate a sequence. Always insure that no other transmitters are operating on your frequency before commencing flight and that you have a reliable radio link to the receiver.** WingMan Ultra was designed to be immune to random noise and false signals. All signals are verified to be present for numerous samples consecutively before a sequence will be initiated. In this way, WingMan Ultra will not react to an occasional spurious signal. However, it cannot be expected to function properly in an extremely noisy environment. It is recommended that you always follow the manufacturer's recommendation for radio installation, and avoid running the antenna close to the WingMan controller or in parallel with the wing fold or latch servo leads.

The WingMan controller is designed assuming your plane is stored with the wings of your aircraft and the position of the transmitter wing fold switch/knob in matching positions. Failure to insure matching positions on power-up may result in excessive airframe stress or damage as the controller drives the wings to the full up or down position (dependent on transmitter switch position) very quickly on power-up. DSM radio systems may require 15 seconds or more to establish a link on power up. WingMan will drive the servos to the power-up switch position only after the link is established (6-15 or more seconds). For 72MHz systems WingMan will wait approximately 6 seconds after power-up before driving the servos.

If during a folding sequence, you move the transmitter switch to the opposite position, WingMan will drive the wings and latches to the new position at a moderately fast rate, regardless of the speed setting. As a result, it is best to allow all sequences to complete before moving the transmitter switch.

Installing the Connector

Before you can install your WingMan controller, you must make the appropriate connections to your servos and receiver. If you are using a JR, Airtronics or Futaba radio system, the servos will connect directly to the servo output pins of the WingMan controller (see Figures 1 & 2 for correct polarity). Connections to the receiver for these systems can be easily made with standard aileron servo extension leads or servo pigtailed and the supplied connectors.

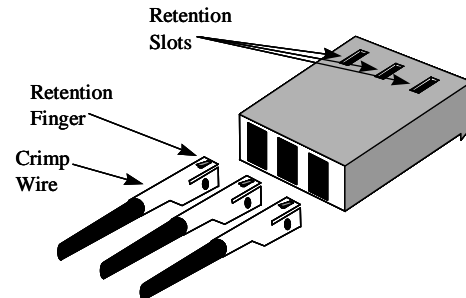


Figure 2

If you use a system other than those listed above, you may need to use the supplied connectors to complete your installation. Please be sure to observe the polarities shown in Figures 1 & 2. To attach your wiring to the supplied pins, simply strip the servo or receiver wire back approximately 1/8" and crimp the wire into the pin supplied using a crimping tool or needle nosed pliers. Be sure the wire is firmly crimped in place, and insert all 3 leads into the supplied housing until the retention fingers snap into the housing slot. Test your installation by gently pulling on the leads to insure they are firmly seated. Plug your receiver output into the "Receiver Input" connection, and the wing fold servos into the "Right Wing Output" and "Left Wing Output" connections (see Figure 1). The wing fold latch servo is plugged into the "Latch Output" connection.

WingMan Features

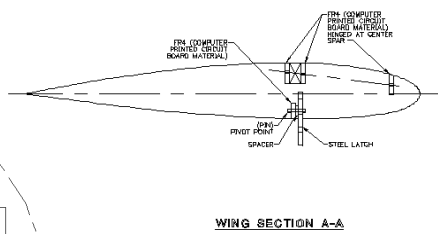
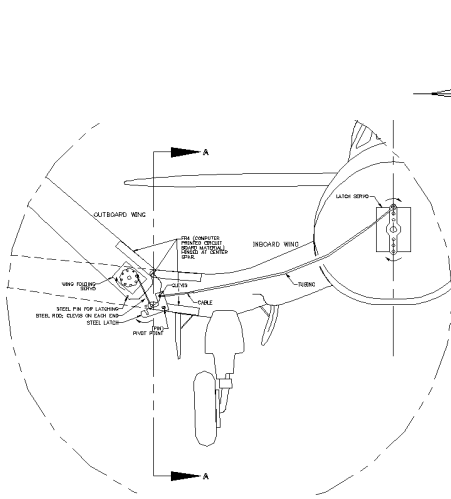
- Variable wing sweep or fold speeds
- Fast Down mode to simulate faster lowering than raising speed
- Arming feature to prevent accidental folding sequence
- Servo travels fully adjustable
- Automatic servo reversing eases installation
- Continuous control even during loss of transmitter signal. Sequences uninterrupted by noisy or missing transmitter signal.
- Digital noise filtering prevents spurious sequencing
- All travel limits and configurations stored in non-volatile memory. No preflight adjustments required - just power up and fly!

WingMan Specifications

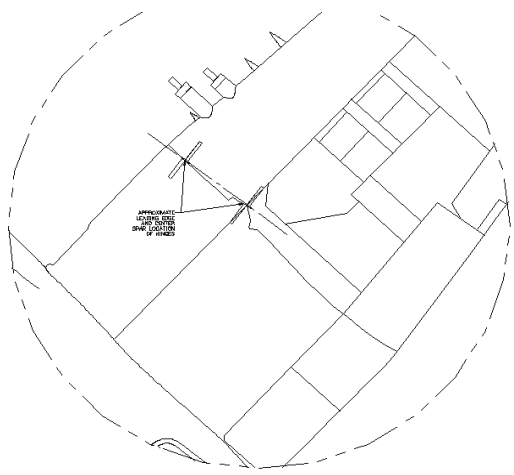
Voltage Range	4.2V – 7.6V
Current Consumption	< 10ma @ 5.0V < 15ma @ 7.0V
Operating Temp.	0°C - 70°C

Warranty

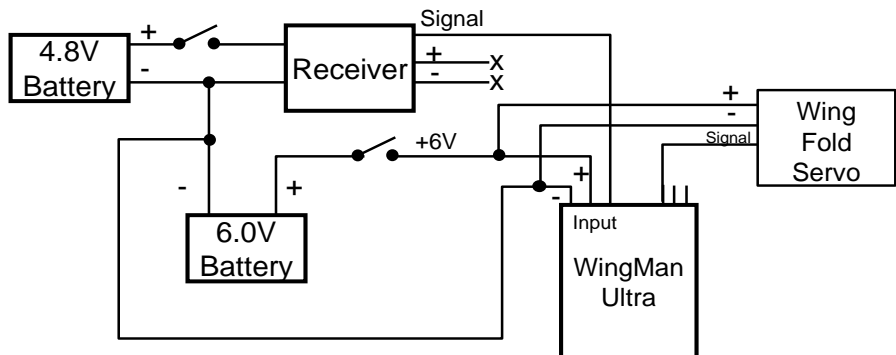
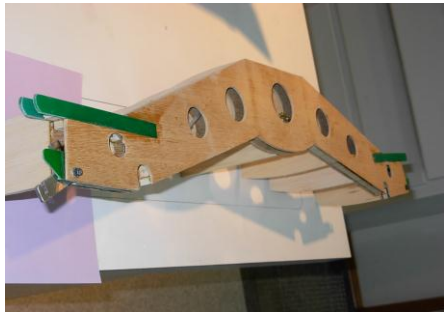
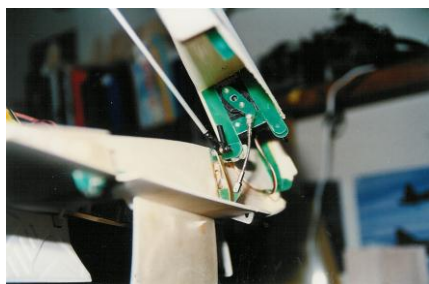
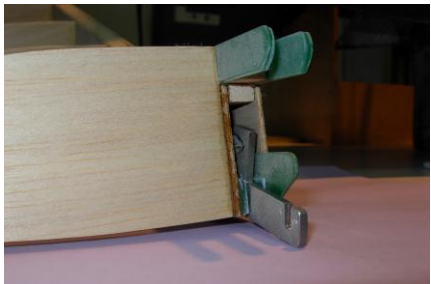
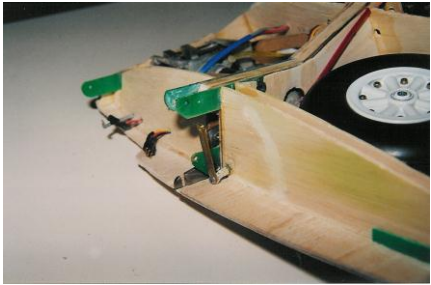
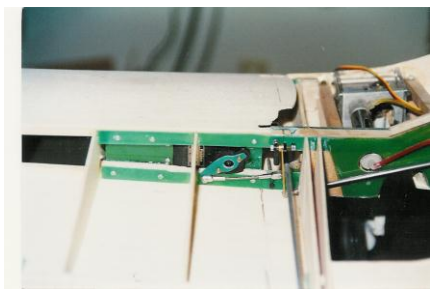
OSA warrants the WingMan controller to be free from defects in materials and workmanship for a period of 90 days from the date of purchase. If your unit is defective, return to OSA and we will repair or replace the unit as deemed appropriate by OSA. This warranty does not include damage due to accidents, misuse, improper installation, tampering, radio interference, unauthorized repair or acts of God. OSA will not be responsible or pay for loss of time, loss of use, inconvenience, incidental, consequential or property damages due to the use of this product.



WING SECTION A-A



TOP VIEW ENLARGED WING DETAIL



Wiring Diagram for Separate 6.0V Wing Servo Battery and High Current Servo