Star Wars Legion AAT Modification Instructions

Overview

These instructions are for modifying a Star Wars Legion AAT Federation Battle Tank to add a rotating turret, movable side guns and LEDs in the launch tubes. Control for these modifications are current supported by using a free phone app (available for the iPhone or Android) provided but Adafruit. It is assumed you have soldering and basic electronics experience.

The instructions are presented din the following sections and should be followed as presented:

1. Turret Modifications
2. Side Gun Modifications
3. Upper Body Assembly
4. Lower Body Modifications
5. Electronics Assembly
6. Final Assembly
7. Operation

To complete this project you will need the schematic for electronic component assembly, the additional parts from the STL files and the parts listed in the Build of Materials (BOM).

BOM

Qty	Part
1	AAT Model
2	N20 3v 30 rpm DC Motors
1	Dual Motor Control Board
1	Adafruit Feather 32u4 Bluefruit LE
1	Adafruit Lithium Ion Polymer Battery 3.7v 1200mAh
6	Amber 3v 3mm LEDs
6	47 OHM Resistor
1	Sealed Bearing 18mm x1 2mm
1	Music Wire .062 (1.57mm) in Diameter
1	Two pole sliding switch

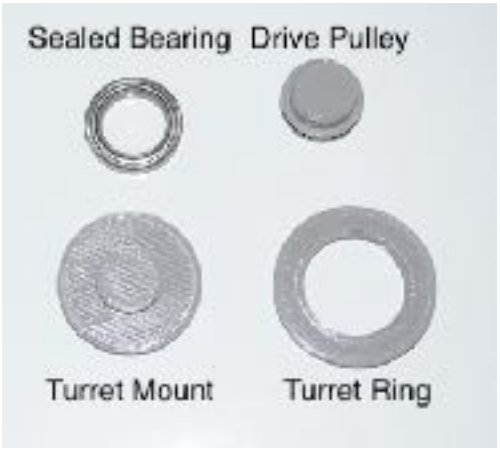
Section 1 Turret Modifications

The following parts from the base kit will be needed for this step:

- Bottom Turret Piece
- Left Half of Upper Body

In addition you will need the following parts from the BOM and from the provided STL files (See photo on right for part identification):

- Sealed Bearring
- Drive Pulley
- Turret Ring
- Turret Mount



Step 1 Turret Assembly Preparation

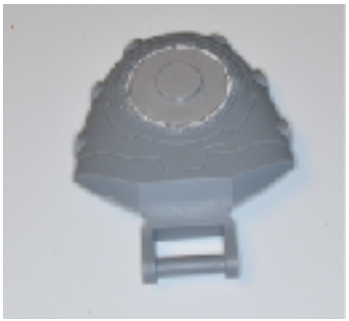
Modify the bottom turret piece by removing the lip where it connects to the body (See before and after photos below).

Before

After

Step 2 Turret Modifications Assembly

Glue the turret mount to the bottom turret piece as shown.



Glue the bottom piece of the turret ring to the body of the AAT as shown (only glue to the right side, wait until final body assembly to glue the left side).

Insert the sealed bearing into the turret ring and the drive pulley into the turret ring as shown.Attach the bottom piece of the turret to the body of the AAT by press fitting the the turret mount into the sealed bearing. The turret should spin around with little effort.

Section 2 Side Gun Modifications

The following parts from the base kit will be needed for this step:
- Left and Right Halves of Upper Body
- Left and Right Side Gun Mounts

In addition you will need the following parts from the BOM and from the provided STL files (See photo on right for part identification):
- Side gun music wire mounts
- Side gun motor mount
- Side gun music wire pulley
- Turret motor pulley
- Drive bands for the side guns and turret
-

Complete the side gun modifications and partial assembly using the following steps.

Step 1 Side Gun Mount Modifications

Complete the following for each of the two gun mounts. Modify the inside of the mount by removing the posts used to assist in assembly and cutting a hole in the end that will align with the previously created hole as shown (unmodified parts shown for comparison). Glue the two sides together making sure they are properly aligned. Clip the tips off of the end and then use a 2.5mm pin vise bit to create a hole in the end as shown.

Use a 3mm pin vise to create a hole in the upper body side that aligns with the holes in the gun mount as shown.

Prepare the side guns for mounting by inserting the axel mounts as shown.

Drill holes in the body sides as shown and attach the side gun mounts.

Press fit a small pulley onto one of the motors and insert into the side gun motor mount. Glue this assembly to a body support as shown.

Step 2 Assemble and Connect Side Guns

Start assembly of side gun system by gluing the music wire into one of the side guns. Insert the side gun assembly into the gun mount and slide the drive pulley onto music wire and add a drive band around the assembly. Test fit the wire by assembling the body and inserting the wire into the modified gun mounts and make sure it can freely spin. Make any additional modifications, such as widening holes, as needed.

Step 3 Complete upper body assembly

Prepare for assembly by adding a drive band on the turret pulley and wrapping the other end around the gun mount. Assemble the two body sides (body sides only, do not assemble the body parts under the turret or under the motors) with the turret motor mount in-between the two body parts.

Press fit a small drive pulley onto the turret motor and insert motor into it's mount from the bottom, checking to make sure it does not extend too high for the top cover piece to fit. Insert the music wire with the side gun mounted through the gun mount, then through the drive pulley while adding the drive band and then through the opposite gun mount. Attach the drive bands to their respective motor.

Section 4 Lower Body Modifications

Using 3mm drill bit, drill out the center of the launch tubes and a hole in the center rear as shown below:

Using copper tape (available in hobby shops in the stained glass section) to create a bus that will be used as the common ground as shown.

Section 5 Electronics Assembly

The following items from the BOM will be needed for this section:

- Adafruit Feather 32u4 Bluefruit LE
- Motor Controller Breakout Board
- Adafruit Lithium Ion Polymer Battery 3.7v 1200mAh

- Six 3v 3mm Amber LEDs
- Six 47ohm Resisters
- Two pole sliding switch

In addition you'll need hook up wire. Before beginning these steps, place the 32u4 Bluefruit LE, motor controller and battery in their final locations but do not secure them to the lower body top at this time.

Step 1 Controller Preparation

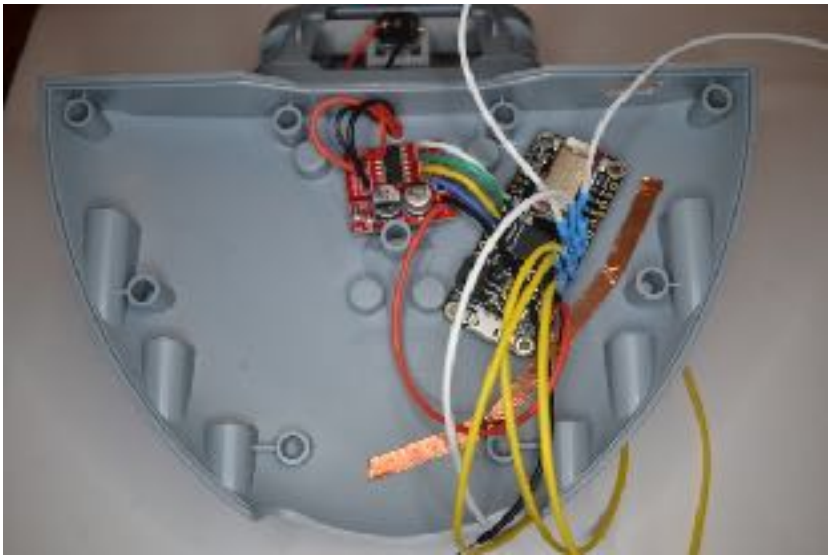
Using your method of choice, flash the provided code to the Adafruit Feather 32u4 Bluefruit LE. (See https://learn.adafruit.com/adafruit-feather-32u4-bluefruit-le/setup for instructions on setting up and using the Arduino IDE and installing the BLE Libraries needed.) Solder hook up wires between the Adafruit Feather 32u4 Bluefruit LE and motor controller breakout board. Pre-measure the wire length by placing the Feather and the motor controller board in the lower body top. Pull the motor wires through the hole previously made and connect to the motor controller breakout board. Solder 47 ohm resisters into pins A0-A5, with hook up wire on the ends. Use heat shrink tubing to reenforce the connections. Solder hookup wires to the Adafruit GND and motor controller breakout board PWR- for later connectivity to the ground bus. Using hookup wire, solder one pole of the sliding switch to the pin labeled EN on the Adafruit Feather 32u4 Bluefruit LE and another to the ground bus. Install the switch in the hole previously prepared. See tables for proper connections.

Feather	Controller
3V3	PWR+
12	IN1
11	IN2
6	IN3
5	IN4

Motor	Controller
Turret Motor +	Motor A +
Turret Motor -	Motor A -
Side Gun Motor +	Motor B +
Side Gun Motor -	Motor B -

Feather	LED
A0	LED1
A1	LED2
A2	LED3
A3	LED4
A4	LED5
A5	LED6

When completed it should look similar to this photo.



Step 2 Prepare and Install LEDs

For each of the six LEDs, solder one of the hookup wires on the Adafruit Feather to the anode (positive) wire on the LED. Solder a hookup wire to the cathode (negative) wire and solder the other end to the ground bus. Insert each LED into a launch tube.

Step 3 Mount Components

Secure the 32u45 Bluefruit LE, motor breakout board and battery to the lower body top using double sided tape, placing them as shown.

Section 6 Final Assembly

Follow the instructions provided in the kit to complete the assembly of the model. You may want to modify the parts that go under the turret and under and over the motors for future access in case there is a problem with the drive belts.

Section 7 Operation

Download the Adafruit Bluefruit LE Connect app for iOS from the Apple App Store or for the Android from the Google Play Store. Download the instructions on how to use the app from www.adafruit.com (https://cdn-learn.adafruit.com/downloads/pdf/bluefruit-le-connect.pdf). The sections of interest are Scan for Devices and Controller. You will use the Controller Pad found in the Controller section to control the AAT. See the diagram below for control pad commands.