Introduction, Techniques and Tools for Ken Myers' Modifications to the Flite Test Simple Cub
By Ken Myers, April 2020

Flite Test introduced its Simple Cub in early June of 2017. At that time, Josh Bixler called it the Tubby Cubby.

DIY TUBBY CUBBY V1 | VLOG0082
https://youtu.be/eaMMGr7edfc

While the Tubby Cubby was a prototype, it exhibited some of the problematic tendencies that I tried to solve, with my modifications, to make the plane more beginner friendly.

The areas of MY concern still occurred in the final, as well as the updated DIY build plans and the two kit versions of the Simple Cub from Flite Test.

The areas of MY concern, seen in the Tubby Cubby, video included a severe turn to the left on an attempted ground take off, Dutch roll, the center of gravity (CG) too far aft, and flipping onto its nose when landing.

By late June of 2017, the original Tubby Cubby had a name change to the Flite Test Simple Cub.

DIY Beginner RC Plane - FT Simple Cub, June 26, 2017.
https://youtu.be/DMC1UdZNDgk

The build video was posted to YouTube on June 29, 2017.
DIY FT Simple Cub - Build | Flite Test
https://youtu.be/Uw0_9Zmcewc

On March 25, 2020, Josh Bixler held a live video build of the latest version of their Simple Cub via YouTube.
https://youtu.be/cvuU2hrXJxY (3 hours and 10 minutes long)

He demonstrated the construction of the Flite Test Maker Foam kit version of the Simple Cub during the video.
https://store.flitetest.com/flite-test-simple-cub-electric-airplane-kit-956mm-flt-1072/p1194444

In the video, Josh makes some pushrod guides out of some scrap foam board and small diameter plastic tubing for the extremely light, and flexible, pushrod wire that is supplied in the MakerFoam kit from Flite Test.
https://youtu.be/cvuU2hrXJxY?t=4960

There are no notes about the pushrod guides on the v1.1 DIY plans, nor in the original build video from three years ago. The guides are necessary to keep the tiny diameter wire, used for the elevator and rudder pushrods, from flexing too much if the servo attachment, shown by Josh in the videos, is used.

I chronicled the areas of MY concern, and MY solutions, in a series of articles in *the Ampeer* electric flight newsletter. I demonstrated, in the articles, that I was NOT the only one who noted and tried to fix the areas of MY concern to make the plane fly "better", especially for first time pilots, as Flite Test noted the plane as being a "DIY Beginner RC Plane" in its earliest videos.

My *Ampeer Articles*:

Ken Myers' Modifications to FliteTests' Simple Cub - Part 1 - December 2019
http://theampeer.org/ampeer/ampdec19/ampdec19.htm#CUB1

Modifications to FliteTest's Simple Cub - Part 2 - January 2020
http://theampeer.org/ampeer/ampjan20/ampjan20.htm#CUB

Modifications to FliteTest's Simple Cub - Part 3 - February 2020
http://theampeer.org/ampeer/ampfeb20/ampfeb20.htm#CUB

Modifications to FliteTest's Simple Cub - Part 4 - March 2020
http://theampeer.org/ampeer/ampmar20/ampmar20.htm#CUB

Modifications to FliteTest's Simple Cub - Part 5 - April 2020
http://theampeer.org/ampeer/ampapr20/ampapr20.htm#CUB

I also created a continually updated Web page, with links to YouTube videos, that show some of the problems that others have had with this design and which I corrected through a series of 5 different prototypes for my modified version.
http://theampeer.org/ampeer/ampsep18/FT-Cub-Videos.html

I am not sure when Flite Test updated the DIY plans, but the current version of the plans is named "2-FT Simple Cub v1.1 Full-Size Plans.pdf"
https://images.amain.com/images/resources/FLT-1053/Build%20Plans/2-%20FT%20Simple%20Cub%20v1.1%20Full-Size%20Plans.pdf

The plans now include the optional float parts and templates for the windows and lightning bolts.
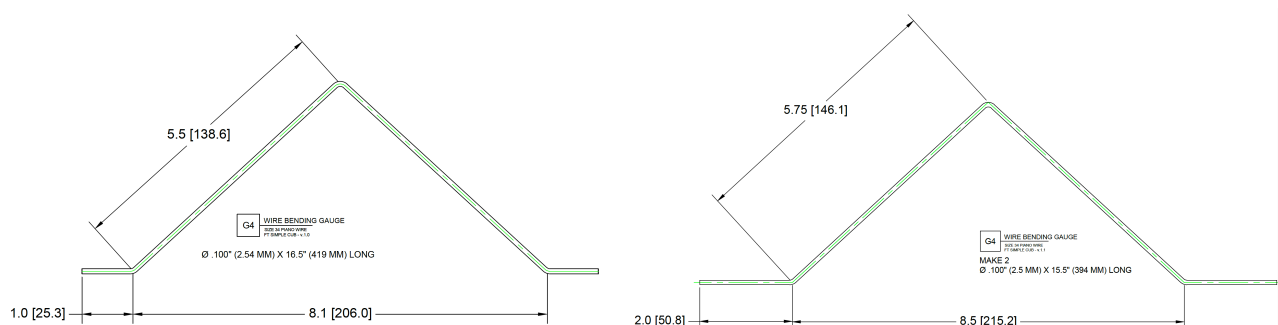
The only part that was modified, by Flite Test, was the landing gear wire, which they made slightly longer. That increased its height and width slightly, but they did not modify its forward position.

The kit, as now offered on the Flite Test store site, uses Flite Test's Maker Foam White.
https://store.flitetest.com/flite-test-simple-cub-electric-airplane-kit-956mm-flt-1072/p1194444

Information About Maker Foam White is found here.
https://store.flitetest.com/flite-test-maker-foam-white-30x40-bifold-25-pack-flt-2104/p1141409

Maker Foam is produced for Flite Test by R.L. Adams Plastics, Inc. That is the same company that produces the standard Readi-Board sold at Dollar Tree stores. The big difference between standard Readi-Board and Maker Foam is that the Maker Foam is water resistant.
https://youtu.be/WysKOasvGDk?t=73

Ordering Parts

My version of the Simple Cub uses several radio control (RC) specific parts, supplies and equipment that need to be purchased. They need to be purchased, as soon as possible, even before the build begins. They may be purchased from a local hobby store or from an online RC hobby parts supplier.

Flite Test (FT) makes it simple, and convenient, to purchase some of the required RC specific items in their online store.

Radio Control (RC) System Basics for the Beginner

Note: If you already have an RC transmitter and receiver, you may wish to skip this section.

Flite Test has a series of videos for beginners.
https://www.youtube.com/watch?v=dOziFzntXq4&list=PL6IuSFWz4ktvupu_gxw1vn-sjBGOkJFHV

If you are unfamiliar with radio control (RC) systems and electric power systems for model airplanes, I highly recommend that you view the following videos. The videos can be selected from the link to the playlist above.

Flite Test: RC Planes for Beginners: R/C Control System - Beginner Series - Ep. 3
Flite Test - Flite Test : RC Planes for Beginners: Power System - Beginner Series - Ep. 6
Flite Test : RC Planes for Beginners: Batteries and Safety - Beginner Series - Ep. 7

The RC system consists of a handheld unit, the **transmitter**, with moveable sticks, for inputs to the movable surfaces and throttle on the plane. Onboard the plane is a **receiver** that sends the transmitter inputs to **servos** and the **electronic speed control** (ESC). The flight function servos are physically connected to the movable surfaces on the airplane.

The FT Simple Cub requires only the simplest of RC systems.

In the March 25, 2020 build video, Josh Bixler recommends the Spektrum brand DXe RC system.
https://youtu.be/cvuU2hrXJxY?t=9133

Spektrum RC DXe 6-Channel Full Range DSMX Transmitter & Receiver Bundle ($109.98 on April 4, 2020)
https://store.flitetest.com/spektrum-rc-dxe-6channel-full-range-dsmx-transmitter-receiver-bundle-spmr1000-bdl/p1011055

Important: For the most part, the transmitter or receiver of one brand of RC system **will not work** with another brand's transmitter or receiver.

I **do not recommend** a "computer" radio, with a lot of settings and model memories, as a first RC system. There are too many other things to learn as a beginner.

The Futaba (a well known brand for decades) 6L Sport 6-Channel T-FHSS Mono Radio System is a good, simple alternative to the Spektrum brand DXe. ($89.99 on April 4, 2020)
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXGPTG&P=ML
or
https://store.flitetest.com/futaba-t6l-sport-2.4ghz-tfhss-6-channel-radio-system-airplane-futk5000/p663676

Servos: About (this symbol ~ means about) 9 gram micro servos are recommended for the Simple Cub. Almost all ~ 9 gram micro servo brands ARE compatible with all brands of receivers.

The Flite Test ES08AII 9g Analog Servo is recommended and available from Flite Test.
https://store.flitetest.com/flite-test-es08aii-9g-analog-servo-flt-3032/p785288

I recommend the Hitec HS-53 Budget Feather servos.
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXDEAX&P=ML

Other RC specific parts used in MY modifications:

DuBro Nylon Control Horn Set (Large) (1 pair for 3ch or 2 pairs for 4ch Simple Cub) They are sold in pairs.
https://store.flitetest.com/dubro-nylon-control-horn-set-large-dub105/p74448
or
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXD933&P=ML

Dubro Rod w/Nylon Kwik Link 12" (5) (1 pkg)
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXD884&P=7
or
https://store.flitetest.com/dubro-12-256-rod-w-nylon-kwiklink-5-dub184/p25509

Dubro Dura-Collars 3/32" (1 pkg)
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXD832&P=7
or
https://store.flitetest.com/dubro-3-32-duracollar-4-dub138/p29268

Dubro Heavy-Duty E/Z Connector 2-56 (6) (1 pkg for 3-ch and 2 pkg for 4-ch)
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXD929&P=ML
or
https://store.flitetest.com/dubro-e-z-connectors256-rod-dub489/p74929

DU-BRO 2.5" Micro Sport Wheels
https://www.amainhobbies.com/dubro-2.50-micro-sport-wheels-2-dub250ms/p68034

or
https://store.flitetest.com/dubro-2.50-micro-sport-wheels-2-dub250ms/p68034

A Word About Lithium Polymer (LiPo) Battery Chargers and LiPo Batteries

It is beyond the scope of this construction article to discuss the pros and cons of various LiPo battery chargers, LiPo batteries, and the various connectors that they come with, as well as safe LiPo charging and storage practices.

Flite Test does not recommend an specific LiPo battery charger for their DIY planes.

A 3S 1300mAh LiPo battery is recommended by Flite Test. At least two batteries should be ordered.

If you stay in the RC hobby, you will purchase more than one battery charger. Choose one that is either AC/DC or DC only, as you will want to charge batteries while at the flying field from a DC source like a deep cycle Marine/RV 12V battery.

The Flite Test M8 DC Charger W/XT-60 Charge Pigtail Cable (8S/15A/300W), at about $56 on April 4, 2020, would work and allow any brand of 3S 1300mAh battery to be charged.
https://store.flitetest.com/flite-test-m8-dc-charger-w-xt60-charge-pigtail-cable-8s-15a-300w-flt-3067-bdl/p1058577

The manual for this charger is located here.
https://images.amain.com/images/resources/TLK-M8S-B/Manuals/1-M8S%20Manual%20V1.1.pdf

If you choose to purchase this charger, download the manual and read it several times before you receive this charger.

Joshua Bardwell reviews the M8 300W charger here.
ToolkitRC M8 Great Value LiPo Charger DOES IT ALL
https://youtu.be/K_tyb8NVMlk

Otherwise, download the user manual for the charger of your choice. Read it several times while waiting for the charger to arrive.

The Power System

The original recommended motors and electronic speed controls (ESC), noted in the original build video, are no longer available from Flite Test.
https://youtu.be/Uw0_9Zmcewc

Flite Test offers power packs that include the motor, electronic speed control (ESC), servos and other accessories.

FT originally recommended their Power Pack B or Power Pack C for the Simple Cub. Josh talks about both interchangeably in the original build video. The motor from original Power Pack C is the one most often shown during the original construction video.

The most notable difference between the power packs was that both the motor and ESC in the Power Pack C could handle more power. The Power Pack C motor and ESC were heavier than those provided in the Power Pack B.

In the most recent, live, build video, Josh shows the "new" Power Pack B motor already attached to the power pod.
https://youtu.be/cvuU2hrXJxY?t=163

After testing and comparing the FT Radial 2212-1050kV and the Cobra brand motors and ESCs that I personally use, I really wanted to recommend the FT Radial 2212-1050kV and Flite Test FT 35A ESC w/XT-60 Connector, as I used those components in my version 5 3-channel.

Flite Test "Radial" 2212B 1050kV Brushless Motor
https://store.flitetest.com/flite-test-radial-2212b-1050kv-brushless-motor-flt-3034/p846360

Flite Test FT 35A ESC w/XT-60 Connector
https://store.flitetest.com/flite-test-ft-35a-esc-w-xt60-connector-flt-3038/p846364

The nice thing about using the FT recommended components is that the FT 35A ESC has the power connector already attached, so no power connector needs to be soldered onto the ESC power leads to put the ESC into service.

Unfortunately, **I can ONLY recommend the FT 2212B motor and 35A linear BEC ESC for use with the 3-channel version**.
See the reviews by Snedigar, Jay Dubay and John Hooks in the reviews for the Power Pack "B".
https://store.flitetest.com/flite-test-power-pack-b-radial-edition-flt-3059/p983485/reviews

Specifications:

KV: 1050kv
Weight: Approx. 56g with wires and bullets
Wire AWG: 20AWG
Stator Diameter: 22mm
Stator Height: 12mm
Shaft Diameter: 6mm
Configuration: 12N14P
Motor Diameter: 27.7mm
Motor Height (Minus Shaft): 26.50mm
Prop Adapter Shaft Thread: M5
Input voltage: 3S-4S (12.6 - 16.8v)
Bullets: 3.5mm - Preinstalled

I did find some discrepancies between the FT "Radial" 2212B 1050kV motor and the specifications listed on their store Website for this motor.
https://store.flitetest.com/flite-test-radial-2212b-1050kv-brushless-motor-flt-3034/p846360

The tested K_v was 1030. That is close enough to call good.

The motor weight, with wires and bullets, measured 55.35g. Again, that information is accurate enough.

There is no way to measure the shaft diameter without disassembling the motor, but I am pretty sure that it is NOT 6mm.

Because this motor is designed for multi-rotor use, the threaded prop shaft is actually affixed to the outside of the rotating housing. There is no prop adapter. The exposed 6mm threaded prop shaft on the motor that I received measured 13.5mm in length, not the stated 18mm on the FT Store Web page. The Prop Adapter Shaft Thread is NOT M5 (5mm) in diameter. The shaft is a threaded 6mm in diameter and comes with a locknut with a nylon insert in it.

The statement on the Store's Web page, "18mm Extended Prop Shaft allows virtually any prop with 5mm hole" is definitely not true for the version that I received.

The threaded shaft length of 13.5mm was barely long enough to accommodate the prop hub thickness for the four different props that I used during my testing. All four of the props, 3 APCs and a FT FQProp Multi-Rotor 9x4.5, provided in the Power Pack "B", have 6mm adapters provided with them, so they did fit the shaft diameter.

Trying to tighten a nylon insert locknut onto a motor that is not fully exposed, as on a multi-rotor, is more difficult than it should be.

The prop that I recommend for the the FT motor and FT 35A ESC is the APC 8x4E thin electric. That prop comes with a 6mm adapter ring and will work well.

Hopefully, if you are building the 4-channel version, with ailerons, you have acquired some soldering skills and will be able to add the connector of your choice to the ESC to match the connector on the 3S 1300mAh LiPo that you have, or plan, to purchase. Again, I remind you that the **4-channel version** with ailerons, is only **for experienced fliers**.

An Alternate Power System for the 4-Channel Version, which is also highly recommended for the 3-channel version if you have soldering skills and the right soldering iron and solder.

I use the Cobra brand of motors and ESCs in the majority of my builds today. They are available from Innov8tive Designs as well as RC Dude Hobbies.
https://innov8tivedesigns.com/
or
https://rcdude.com/?SID=f9718478518f2bc01481a54665e3b950

Two different Cobra motors and a Cobra 33A ESC with switching BEC were used during the prototyping of my modified versions of the FT Simple Cub.

At first, because I had quite a few of them on hand, 3S 1000mAh LiPos were used. Josh also used a 3S 1000mAh LiPo in the version he built during the live build. 3S 1000mAh LiPos will be just fine, and hardly reduce the flight time at all.

I purchased two Tattu 3S 1300mAh LiPos for use in the version 5 prototypes.
https://store.flitetest.com/tattu-3s-lipo-battery-45c-11.1v-1300mah-jstxh-tat-45c-1300-3s1p-xt60/p450620

After bench testing and flight testing the FT "Radial" 2212 and two Cobra motors, I recommend the Cobra 2213/26, Cobra 33A ESC, APC 9x4.5E thin electric and a 3S1300mAh LiPo for the 4-channel version, or the 3 channel version if you have soldering skills and tools.

Cobra C-2213/26 Brushless Motor, Kv=950
https://innov8tivedesigns.com/cobra-c-2213-26-brushless-motor-kv-950.html

Cobra 33A ESC with 3A Switching BEC
https://innov8tivedesigns.com/cobra-33a-esc-with-3a-switching-bec.html

BadAss 45C 1300mah 3S LiPo Battery
https://innov8tivedesigns.com/badass-45c-1300mah-3s-lipo-battery.html
Note: I did not use this one, but since it can be purchased from Innov8tive designs at the same time the motor and ESC are purchased, it should be fine. At least 2 of these are required.

APC 9x4.5E Propeller
https://innov8tivedesigns.com/apc-9x4-5e-propeller.html
Note: Order at least 2.

Is the FT Power Pack B "Radial Edition" a good value for the 3-channel version of the Simple Cub?

What was, and is, in the FT Power Pack B?

Original Flite Test Power Pack B (Fixed Wing Small) $62.95 Aug. 9, 2017
https://www.hobbytown.com/flite-test-power-pack-b-fixed-wing-small-flt-3002/p674263
(**Note:** The link was active at the beginning of June 2020.)

Pack Includes:
(1) Motor - EMAX 2213-935
(1) ESC - EMax BLHeli 20A (XT60 connector) 2A linear BEC
(6) Servos - EMax ES08AII 9 Gram
(1) Y-Lead
(4) Extensions - 20 cm
(6) Linkage Stoppers
(2) Propellers (9x4.5 Slow Fly and 10x4.5 Slow Fly)
(1) 2.5mm Allen Wrench
(1) Phillips Screwdriver

New Flite Test "New" Power Pack B "Radial Edition" $79.99 on June 1, 2020
https://store.flitetest.com/flite-test-power-pack-b-radial-edition-flt-3059/p983485

Pack Includes:
(1) Motor - Radial 2212-1050kV
(1) ESC - Flite Test 35A ESC w/XT-60 connector
(4) Servos - Flite Test ES08AII 9g Servos
(1) Y-Lead cannot find it listed but it LONG! The cardboard around plastic box noted the Y-lead as 30cm
(4) Extensions - 30 cm Flite Test 30cm (11.8") Servo Extension, cardboard around plastic box noted the extensions as 20cm but they measured 30cm.
(4) Linkage Stoppers for small diameter wire, smaller than a 2-56 control rod
(2) Propellers (9x4.5) HQ Prop noted as Multi-Rotor Prop 9x4.5 on package, not available on the Website, weird
(1) 2mm Allen Wrench - I don't know why it is included except that it fits the unexplained machine screws
(1) Phillips Screwdriver - that really doesn't work with supplied servo arm screws

The items that I received in my new FT power pack B "Radial Edition" that were **not listed** included; a plastic box to hold the items for shipping, (5) ~ 3/8" long screws, possible "wood" type, with a pointed tip and washer attached Phillips type head, (5) ~ 7/32" long machine screw w/2mm hex head, (5) ~ 1/4" long machine screw w/2mm hex head

A feature of the FT power packs is that the motor and electronic speed control (ESC) are provided with all of the required connectors already soldered onto them.

FT can also provide the recommended Lithium Polymer (LiPo) 3S 1300mAh battery, with a matching power connector to the ESC. This eliminates the need to solder the power connector on the battery.

Is the FT Power Pack B "Radial Edition" a good value for the 3-channel version of the Simple Cub?

The only items that I used for the 3-channel version 5 from the Power Pack B that I purchased were the motor ($24.99), the 35A ESC ($25.99) and two of the 9g servos ($6.49 each) for a total of $63.96. If purchased separately, that is $16.03 less than the current Pack B.

I did use the two other servos and the "Y" connector in my 4-channel version 5. I could not find the 30cm servo "Y" harness on the FT Web store Web site. With a Google search, I was able to find a lot of 30cm servo "Y" harnesses for about $5.00. Using $5.00 for the price of the "Y" harness, the individual cost would total $17.98, so I broke about even by purchasing the Power Pack B. I believe that most people building the 3-channel version would be better off to purchase the individual FT components, if that is what they want.

MOST NOTICEABLY MISSING FROM THE POWER PACK B was a #000 Phillips screwdriver. The FT servos do not come with the servo arms attached. The tiny servo arm screw requires a #000 Phillips screwdriver. That is NOT a tool that most people already have.

Electronics Testing, Very Important:

As soon as possible, after receiving **ALL** of the electronics, put them together on the bench and see that they all are working.

The battery, or batteries, should have come at what is called a storage charge. They should be between 3.7 volts per cell and 3.8 volts per cell. For a three cell 3S LiPo pack that is about 11.1 volts to 11.4 volts or so.

To familiarize yourself with your charger, set up the LiPo battery charger to charge one battery. (You should have already researched safe LiPo battery charging and storage practices.)

DO NOT FULLY CHARGE THE BATTERY. This is only being done to familiarizer yourself with charging. The battery should only be charged for about 5 minutes, to test whether the charger is working correctly. If you have a 3S 1300mAh battery, charge it at 1.3 amps, if it is a 3S 1000mAh pack, charge it at 1 amp.

LiPo batteries should be fully charged only when you are ready to go flying. They should be stored at the noted storage charge when they won't be used for awhile.

First, check to see if the transmitter was bound to the receiver that it was shipped with.

Attach the motor, with no prop or prop nut on it, to the ESC. Plug the ESC's radio connector, noting the polarity, into the channel noted by the receiver manufacture. You will be using the battery eliminator circuit (BEC) of the ESC to provide power to the receiver. If you plug the ESC into the receiver plug backwards, nothing awful will happen, it just won't work.

Turn on the transmitter. Plug the slightly charged battery into the power connector on the ESC. Usually there is a "light" on the receiver to show that it is bound to the receiver.

If the light on the receiver does not come on. Unplug the power battery. Check to see that the ESC's connector to the receiver is plugged in with the correct polarity. If it wasn't, turn the connector around. If it was plugged in correctly, the receiver might not have been bound to the transmitter at the factory. Follow the directions for binding, provide by the transmitter/receiver manufacturer and try again.

Remove the power battery.

Connect **everything** you received to see that all of the electronic components are working. Be sure to check all servo extensions, including a "Y" extension, if one was purchased.

Everything can be hooked up at one time.

The photo may look like a "rats nest", but it shows all of the electronic components received in FT's power pack B.

With the transmitter bound to the receiver, turn on the transmitter and plug the power battery into its connector on the ESC.

Hold the cross-mount on the motor, and then just nudge the throttle enough to know that the motor is working. Try the rudder, elevator and aileron sticks and be sure everything is working.

If something is not working, try to determine why; plugged in wrong, no power to the receiver, etc.

Personal Example:

Aileron servos not working - I forgot to plug in the servo extension and "Y" harness combination into the receiver. I plugged it in and the servos connected to the "Y" harness for ailerons worked.

Throttle not working - When I plugged the power battery into its connector on the ESC, the light came on on the receiver, showing that the transmitter was bound to the receiver and that power was being supplied by the battery eliminator circuit (BEC) to the receiver and servos, but no "tune" was played by the ESC.

Some transmitter brands require the throttle channel to be reversed to work the throttle with the ESC.

If the throttle does not work, and you don't know whether the throttle channel needs to be reversed, unplug the power battery. Turn on the transmitter and move the throttle stick all the way to the top. Plug in the power battery. If a "tune" is heard, the throttle channel needs reversing. Follow the transmitters instruction manual on how to reverse a channel.

Unfortunately, my problem was not that the throttle channel needed reversing.

Sometimes, the the throttle channel trim needs to be lowered on the transmitter for the ESC to detect the proper signal that it is off and in the arming position.

Try moving the throttle trim down several "click" and then test to see if the ESC will arm.

If all of the components checked out okay, set them aside and continue preparing to build the Simple Cub.

If some of the components appear to be defective, contact the supplier about a replacement.

**Some Interesting Area and Weight Calculations and Measurements:**

Wing Area Calculations:
Each completed wing panel was traced onto some Dollar Tree Foam Board (DTFB) measured rectangles.
The measurements for the rectangles:
Readi-board rectangle A - measured 19.75 x 9 = 177.75 <u>sq.in</u>. Weight: 32.9g
32.9g/ 177.75 sq.in. = 0.185g per <u>sq.in</u>.
Readi-Board rectangle B - measured19.75 x 9 = 177.75 <u>sq.in</u>. Weight: 33.0g
33.0g/ 177.75 sq.in. = 0.186g per <u>sq.in</u>.
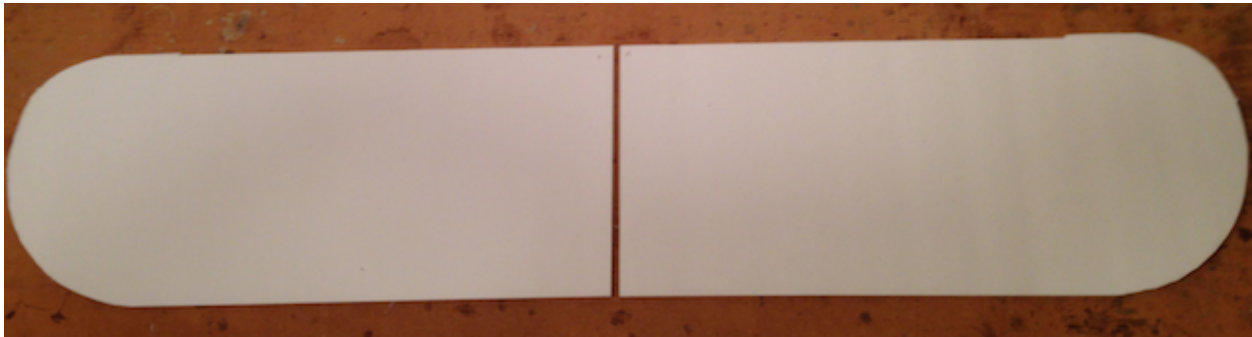
Plan form wing panels made from DTFB.

Weight of wing panel from rectangle A 27.45g
27.45g / 0.185g = 148.38 sq.in.
Weight of wing panel from rectangle B 27.65g
27.65g / 0.186g = 148.66 <u>sq.in</u>.
Total plan form wing area: 148.38 sq.in. + 148.66 sq.in. = **297.04** <u>sq.in</u>**.**
(I had previously calculated 293 sq./in. Using the same method on a different wing.)

Plan Form Span: 38-3/8" or maybe 38-7/16"
Plan Form Chord: 8-1/16"

How much weight did two light coats of paint add?

The following weights include the total airframe weight including the four 3/16" wooden dowels in the fuselage and the craft stick rear rubber band protectors on the wing but not the graphics nor the wheel fairings, which were not used.

3 -channel version
Pre-painting weights
Fuselage: 137.1g or 4.84 oz.
3-channel Wing: 119.6g or 4.22 oz.
Total: 256.7g or 9.05 oz.

After painting weights 3-channel
Fuselage: 138.3g or 4.88 oz.
3-channel Wing: 125.5g or 4.43 oz.
Total: 263.8g or 9.31 oz.
The paint added 7.1g or 0.25 oz.

The following is the final weight before adding the radio and power system components. The weight includes the weight of the graphics and six #33 rubber bands, as would be used when the plane is ready to fly.

Fuselage: 146.15g or 5.16 oz.
3-channel Wing with 6 #33 rubber bands: 129.2g or 4.56 oz.
Total: 275.35g or 9.71 oz.

4-channel version
Pre-painting weights
Fuselage: 137.8g or 4.86 oz.
4-channel Wing: 119.0g or 4.20 oz.
Total: 256.8g or 9.06 oz.

After painting weights 4-channel
Fuselage: 143.3g or 5.05 oz.
4-channel Wing: 124.3g or 4.38 oz.
Total: 267.6g or 9.44 oz.
The paint added 10.8g or 0.38 oz.

The following is the final weight before adding the radio and power system components. The weight includes the weight of the graphics and six #33 rubber bands, as would be used when the plane is ready to fly.

Fuselage: 147.5g or 5.20 oz.
4-channel Wing with 6 #33 rubber bands: 127.9g or 4.51 oz.
Total: 275.4g or 9.71 oz.

Maker Foam Features:
- White color is much easier to add a simple trim scheme using stickers or pinstripes
- Translucent allowing models to be creatively lit from within
- Takes paint or decals extremely well
- More durable than previous Flite Test foam products

Specifications:
Weight: 10 Oz (Fully assembled; without battery)
Wingspan: 38 Inches (956mm)
Center of Gravity: 1.75 Inches (45mm) from the leading edge of the wing (Recommend
Control Surface Throws: 12-16 Degrees
Expo Suggestions: 30%

Kit Includes:
- Laser-cut Foam Airframe
- Firewall
- Push Rods
- Control Horns
- Popsicle Sticks
- Throw Gauge
- BarBQ Skewers
- Velcro
- Rubber Bands
- Specification Sheet

Needed to Complete:
- **(1) Brushless Motor:** Flite Test B Radial or 370 Size, 1200kV Minimum
- **(1+) Propellers:** 8x4.5
- **(1) ESC:** 20-30 Amp
- **(1+) Battery:** 3S 11.1V LiPo 1300mAh
- **(4) Servos:** ~9 Gram Micro Servos
- **(1) 2.75" Wheels** (FLT-2054)
- **(1)** 2.4GHZ Radio System (Radio & Receiver)
  - **Spektrum:** DX6e Radio System
  - **Futaba:** 6J Radio System
- **Misc. Building Supplies.**

This product was added to our catalog on February 25, 2020

All of the weights were presented because, just like the FT 2212 motor, I found several errors on the FT Store Simple Cub homepage.
https://store.flitetest.com/flite-test-simple-cub-electric-airplane-kit-956mm-flt-1072/p1194444

A screen capture was made on May 24, 2020, as Web pages can come and go and change.

FT notes that the weight, fully assembled and without the battery as 10 oz. After painting, and with no radio, power system, wheels or battery installed, they each weighed 9.71 oz. (~275g)

FT recommends Control Surface Throws as between 12 and 16 degrees, which is good for this model. Unfortunately, it is physically impossible to achieve with the control horns note on their DIY plans and provided in the their Simple Cub kit.

FT notes a "1200kv Minimum" for the motor. At no time did they ever recommend a motor with this high of a K_v on the motor for this plane. I BELIEVE that they meant maximum, not minimum.

The two radio systems recommended, at this time, are both in the $200 range.

The "Misc. Building Supplies" contains a lot of items. It is too bad that they did not list them.

The "Flite Test Crafty Kit", $99, on May 30, 2020, does contain a lot of the items needed, but not all them.
https://store.flitetest.com/flite-test-crafty-kit-flt-5010/p791877

The wheels must also be ordered if the plane is to take off from the ground.

Prototype Specifications:

Kens-Simple-Cub-v5/Construction/All component weights.xls			
Simple Cub v5 3-ch weights			
No radio & pwr sys	**grams**	**ounces**	Inc. graphics & rubber bands
Fuselage	146.15	5.2	
Wing	129.2	4.6	
Total:	275.4	9.7	
With radio & pwr sys	**grams**	**ounces**	
Fuselage	307	10.8	
Wing	130	4.6	
Total:	437	15.4	
	grams	**ounces**	
Battery:	114	4.0	
RTF Flying Weight:	**551**	**19.4**	
	sq.in.	**sq.ft.**	
Wing Area:	297	2.06	
Plan Form Wing Span:	38 3/8"		
Wing Loading:	9.4	ounces per/sq.ft.	
Wing Cube Loading:	6.56	High end of park flyer range	

Simple Cub v5 4-ch weights			
No radio & pwr sys	**grams**	**ounces**	Inc. graphics & rubber bands
Fuselage	147.5	5.2	
Wing	127.9	4.5	
Total:	275.4	9.7	
With radio & pwr sys	**grams**	**ounces**	
Fuselage	334	11.8	
Wing	155.6	5.5	
Total:	489.6	17.3	
	grams	**ounces**	
Battery:	114	4.0	
Flying Weight:	603.6	21.3	
	sq.in.	**sq.ft.**	
Wing Area:	297	2.06	
Plan Form Wing Span:	38 3/8"		
Wing Loading:	10.3	ounces per/sq.ft.	
Wing Cube Loading:	7.19	Low End Typical sport/trainer type	

A Tools and Supplies List with Notes appears at the end of this document.
The link to the step-by-step construction notes is also included in that section.

Working with Ken's Version of the Plans

The terms plan and plans are used loosely. The words plan or plans include the individual templates for cutting the foam board parts of the plane, special tools and other templates that are used during construction.

The term sheet refers to one single sheet of 8.5" x 11" printer paper.

The individual plans need to be printed and assembled first into what are called plan sections.

The individual plans are printed in sections containing various parts' templates on several sheets of paper.

Print the plans that use three sheets of paper first. This allows for practice cutting the cutline marks and aligning the pages to form a single plan section. The individual sheets can be cut, on the cut lines, on a kitchen cutting board. If a mistake is made, a new single sheet can be printed to replace the one that was incorrectly cut.

Once a complete section of plans is printed, join the individual sheets together to form the complete plan section created from that PDF file.

Joining the Pages to Form a Complete Plan Section for Each PDF File

Tools: single edge razor blades, 4' (48") metal ruler, painters tape, a cutting surface large enough to hold a sheet of printer paper
Note 1: A 4' metal ruler is better than a 3' (36") metal ruler because it is usually heavier, thicker, easier to pull a single edge razor blade along, and less likely to move.
Note 2: blue painters' tape is fine and inexpensive, but regular, tan, masking tape can also be used..

An Example of How to Assemble a Plans Section Using the The Doubler.PDF file
(This can actually be done at this time, as it is the recommended first plan section to create.)

Download, print and assemble the Doubler.PDF
http://www.theampeer.org/Kens-Simple-Cub-v5/Construction/All-PDF-files/Doubler.pdf

Note: The directions say to download, print and assemble the section.

I tested printing directly from my browser, Google Chrome, on my MacBook Pro. It produced a PDF file with the landing gear tab measuring 2" wide and 1-3/4" tall. Those measurements were identical to the same part printed using the Adobe Acrobat Reader and the Mac's Preview program on my computer after downloading the file.

While the PDF files can be printed directly from the browser, I'd recommend creating a file folder on your computer and putting all of the PDF plan section files in it for future reference.

The Doubler.pdf plan section contains the front fuselage doublers (foam board), window templates, my middle landing gear tab template (3/32" plywood), the battery protector (foam board), and Ken's fuselage front bottom (foam board).
This plan section contains 3 sheets or paper and 2 cuts are involved.
http://www.theampeer.org/Kens-Simple-Cub-v5/Construction/All-PDF-files/Doubler.pdf
See below to learn how to assemble the plan section created from the Doubler.PDF file and then set it aside.

The Procedure for Joining the Plan Section Sheets.

If necessary, use painters tape, or tan masking tape, to hold the printed sheet to the cutting surface to keep it from moving while the cut is being made.

Use a metal ruler and a single edge razor blade to cut off the right edge of the first sheet of the printed sheets from the PDF file. Use the vertical cut marks A and D.

When satisfied with the alignment, make the cut using a single edge razor blade along the metal ruler.

Cut off the right edge of the second sheet using the vertical cut marks B and D.

Align the metal ruler for the cut.

When satisfied with the alignment, make the cut using a single edge razor blade along the metal ruler.

No cut is required on the third sheet of the printed pages.

Align the right side of the first printed sheet over the left side of the second printed sheet.

Use small pieces of painters tape, or tan masking, to hold the two sheets in alignment.

Align the right side of the second printed sheet over the left side of the third sheet and hold in place with small pieces of painters tape.
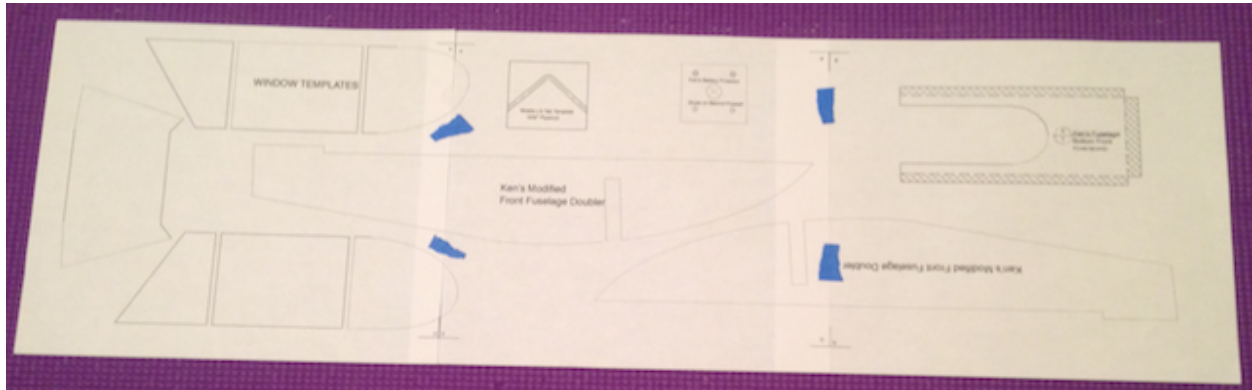
The photo shows the Doubler.pdf file plan section aligned and joined after making the cuts to the right side of printed sheet 1 and printed sheet 2. Small pieces of tape hold the printed sheets in alignment.

The three sheets are turned over and tape is applied to the joints between the sheets of paper.

The plan section is set aside.
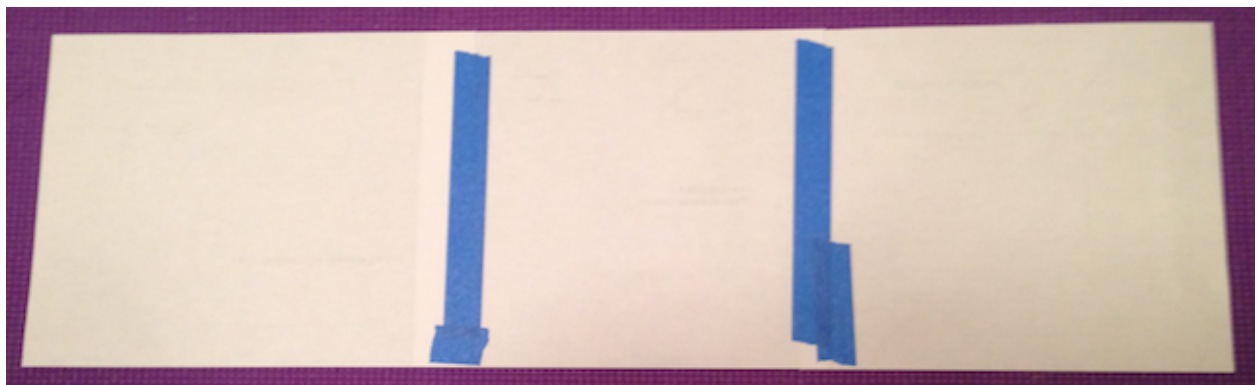
Tools and Supplies List with Notes:

Supplies:

_____ Construction Notes for Ken's Modified Simple Cub
The construction notes include step-by-step instructions and the recommended build order.
http://theampeer.org/Kens-Simple-Cub-v5/Construction/Construction.pdf

_____ 3 Sheets of Dollar Tree Readi-Board (3 will do all of the parts. An extra sheet is always a good idea.)

_____ Printed Layout PDF file (The three pages of this file show the layout of the parts templates on the three sheets of Readi-board.)
http://theampeer.org/Kens-Simple-Cub-v5/Construction/All-PDF-files/Layouts.pdf

_____ Cutting surface for cutting the printed "plan" sheets to be joined. (A large kitchen cutting board works well.)

_____ Cutting surface for cutting out the foam board parts. (When actually cutting the foam board parts, I use an inexpensive Yoga mat. It is much cheaper than large, self-healing, cutting mats and mine has lasted a long time.)

_____ Fine line Sharpie marker

_____ Two sharpened #2 pencils (Used to determine the Center of Gravity (CG))

_____ Pencil sharpener (optional, if pencils do not have good "points")

_____ Fine sandpaper

_____ Elmer's Disappearing Purple Washable School Glue (Use to attach template parts to the foam board for cutting out the parts.

Adhesive Note:
I prefer not to use a hot melt glue gun and hot melt glue. I used the following two glues during construction. A good hot melt glue gun and hot melt glue is available from Flite Test. Use hot melt glue where I note Tacky Glue and 5 Minute Epoxy.

_____ **Aleene's ORIGINAL TACKY GLUE** (Tacky Glue dries clear and adheres well to foam board. Titebond ORIGINAL Wood Glue also works well, but does not dry clear. If painting the finished airframe, it is an okay alternative.) (Optional if a hot melt glue gun is not used)

_____ 5 Minute Epoxy glue (5-minute, meaning 5 minutes of working time, can be used.) (Optional if a hot melt glue gun is not used)

_____ Locktite Spray Adhesive HIGH PERFORMANCE MIDDLEWEIGHT BONDING 200 (Any similar spray adhesive may be used.)

_____ Straight pins (I like the ones with the little ball-shaped heads on them.)

_____ Full 12-can pack of beverages (Any fairly heavy, easy to move weight can be used to hold the foam board in place so that it does not shift when cutting out the parts.)

_____ Full condensed soup cans (This is another form of weight(s) and other types of canned goods may also be used.)

_____ Rag(s) and/or Paper towel (Used to wipe fingers after spreading Tacky Glue with a finger)

_____ An all white, or extremely all light colored, hand or bath towel (It is NOT used as a rag. It is placed on the work surface to create a non-bounce drop cloth when working with small screws in the power and radio system.

_____ Container to hold water (Used to clean fingers after spreading Tacky Glue with a finger.)

_____ Small plastic container or bag (to hold small parts during construction so that they don't get "lost")

_____ Construction type wood that is flat and straight (I used what is called 2x2 wood for the 3-channel version or what is called 1x2 for 4-channel version. The wood is used for setting the wing dihedral instead of the foam board dihedral gauges. It really is a "better" method and worth getting and cutting the wood, although the foam board dihedral gauges can for used for the 3-channel version.
I used 2x2 wood to set the dihedral, but 2x4 can also be used. The first 2 in the designation 2x2 is 2", which is actually about 1.5". The first 1 in the designation 1x2 is 1", which is actually about 3/4". It doesn't matter if 2x2 or 2x4 wood is used or 1x2, 1x3 or 1x4 wood is used. It is only the thickness of the wood that matters.)

_____ Toothpicks

_____ Staples 4 mil. Filament Tape, 0.9"W x 60 Yds. Ln (or similar)

_____ Scotch Packing Tape -1.88" x 38.2 yds.

_____ Blue Painters tape (low tack type)

_____ Regular tan masking tape

_____ Scotch Transparent Tape

_____ (4) 1/2" by 4-40 socket head bolts and blind nuts (typically found where RC hardware is sold, also can be found online. Home Depot seems to have the 1/2" length 4-40 socket head bolts and 4-40 blind nuts can be purchased separately.)
Note: I buy these items in bulk and they may be hard to find separately. I found some plain end 1/2" 4-40 bolts and blind nuts package together. They will work.
https://brodak.com/catalog/product/view/id/1113/s/4-40-x/category/1038/

_____ 1 piece of 3/32" piano/music wire (The wire is typically called either piano or music wire. It is sold at some hobby shops, hardware stores and online. If you can't source it at the places noted, FT has Flite Test 2.6mm Medium Landing Gear Wire (4), which can be used.)
https://store.flitetest.com/flite-test-2.6mm-medium-landing-gear-wire-4-flt-2065/p785011

_____ 1 piece of 3/16" wooden dowel rod (Can be found in craft stores, hobby shops, Walmart, etc.)

_____ 1 craft stick (These are sometimes called popsicle sticks. Probably cheapest to purchase a single ice cream treat on a stick.)

_____ Wax paper

_____ 3/4" wide VELCRO Brand Sticky Back with Adhesive (or similar)

_____ 3/4" wide Velcro with NO Sticky Back (many times used for sewing)

_____ 1/8" birch plywood (Used for firewall & outside pieces of my landing gear tab.)

_____ 3/32" birch plywood (Use for inner part of my landing gear tab.)

Firewall and landing gear tab note:
If 1/8" and 3/32" birch plywood cannot be sourced and, more importantly, cut by tools that you have available, the firewall can be made from 2 of the Flite Test Swappable Firewalls laminated together and a piece of foam board placed on the top of the firewall to achieve the proper height. If need be, the Flite Test foam board landing gear tab can be used. The landing gear tab will not be as good as mine, but it works, sort of, the landing gear will tear out the fuselage side over time.
Flite Test Swappable Firewalls (5)
https://store.flitetest.com/flite-test-swappable-firewalls-5-flt-2026/p674236

_____ Black MonoKote trim sheet or black self-sticking shelf liner (Optional for windows and lightning bolt. MonoKote black trim sheet can be found in hobby stores and online.)

_____ Patch-N-Paint LIGHTWEIGHT SPACKLING (optional)

_____ KRYLON COLORMAXX PAINT + PRIMER GLOSS BAUHAUS GOLD (optional)

Radio and Power System Supplies

_____ At least 4-ch transmitter and receiver of the same brand
Futaba 6L Sport 6-Channel T-FHSS Mono Radio System
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXGPTG&P=ML
or
https://store.flitetest.com/futaba-t6l-sport-2.4ghz-tfhss-6-channel-radio-system-airplane-futk5000/p663676

_____ About 9 gram servos (2 for 3-ch and 4 for 4-ch)
Flite Test ES08AII 9g Analog Servo
https://store.flitetest.com/flite-test-es08aii-9g-analog-servo-flt-3032/p785288
or
Hitec HS-53 Budget Feather servos.
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXDEAX&P=ML

_____ **DuBro Nylon Control Horn Set (Large)** (1 pair for 3ch or 2 pairs for 4ch Simple Cub)
They are sold in pairs.
https://store.flitetest.com/dubro-nylon-control-horn-set-large-dub105/p74448
or
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXD933&P=ML

_____ **Dubro Rod w/Nylon Kwik Link 12" (5)** (1 pkg)
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXD884&P=7
or
https://store.flitetest.com/dubro-12-256-rod-w-nylon-kwiklink-5-dub184/p25509

_____ **Dubro Dura-Collars 3/32"** (1 pkg)
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXD832&P=7
or
https://store.flitetest.com/dubro-3-32-duracollar-4-dub138/p29268

_____ **Dubro Heavy-Duty E/Z Connector 2-56 (6)** (1 pkg for 3-ch and 2 pkg for 4-ch)
https://www.towerhobbies.com/cgi-bin/wti0001p?I=LXD929&P=ML
or
https://store.flitetest.com/dubro-e-z-connectors256-rod-dub489/p74929

_____ **DU-BRO 2.5"** Micro Sport Wheels
https://www.amainhobbies.com/dubro-2.50-micro-sport-wheels-2-dub250ms/p68034
or
https://store.flitetest.com/dubro-2.50-micro-sport-wheels-2-dub250ms/p68034

_____ **Cobra C-2213/26 Brushless Motor**, Kv=950
https://innov8tivedesigns.com/cobra-c-2213-26-brushless-motor-kv-950.html

_____ **Cobra 33A ESC with 3A Switching BEC**
https://innov8tivedesigns.com/cobra-33a-esc-with-3a-switching-bec.html

_____ **BadAss 45C 1300mah 3S LiPo Battery** (Qty 2)
https://innov8tivedesigns.com/badass-45c-1300mah-3s-lipo-battery.html
Note: I did not use this one, but since it can be purchased from Innov8tive designs at the same time the motor and ESC are purchased, it should be fine. At least 2 of these are required.

_____ **APC 9x4.5E Propeller** (Qty. 2)
https://innov8tivedesigns.com/apc-9x4-5e-propeller.html
Note: Order at least 2.

_____ **Servo Y-Harness, JR/Hitec Connectors, 28ga 6 inch** (Optional for 4-Channel version)
https://innov8tivedesigns.com/servo-y-harness-jr-hitec-connectors-28ga-6-inch.html
Note that various length servo extensions (optional, only if needed)

Tools:

_____ Single edge razor blades

_____ 4' (48") metal ruler

_____ Phillips #000 Screwdriver

_____ Scissors

_____ Hobby knife with a #11 pointed blade (AKA X-ACTO knife)

_____ Drill bits: 1/16", 3/32", 1/8", 5/32", 1/4", 3/8"

_____ Sanding block for the fine sandpaper from above

_____ Frearson screwdriver
https://en.wikipedia.org/wiki/List_of_screw_drives#Frearson
(Any tool with a sharp point on it will work. It is used to groove lines on certain parts.)

_____ Wood cutting saw for plywood (any saw that can cut straight lines in 1/8" and 3/32" plywood)
Firewall and landing gear tab note:
If 1/8" and 3/32" birch plywood cannot be sourced and, more importantly, cut by tools that you have available, the firewall can be made from 2 of the Flite Test Swappable Firewalls laminated together and a piece of foam board placed on the top of the firewall to achieve the proper height. The Flite Test landing gear tab can be used. The landing gear tab will not be as good as mine, but it works, sort of.

Flite Test Swappable Firewalls (5)
https://store.flitetest.com/flite-test-swappable-firewalls-5-flt-2026/p674236

_____ 1 pkg. #33 rubber bands

_____ Electric drill

_____ 8" slip joint pliers

_____ Needle nose pliers

_____ Workbench vice - small

_____ Device or saw for cutting 3/32" music/piano wire

_____ Saw that can cut 3/16" wooden dowel rod and craft sticks

_____ 4-40 hex driver

_____ Saw for cutting 2x2 and/or 1x2 lumber (optional)

_____ Pin vice (optional)