

# THE UNOFFICIAL BOONE COUNTY 4H AEROSPACE LEADER'S GUIDE TO BEGINNER WORKSHOP ROCKET KITS

## *What makes a good beginner's kit*

The three main criteria to use in choosing a rocket kit for 4Hers in the beginner's age group in the Aerospace project are:

1. Robustness – Remember, these are third through fifth graders building this. They are not gonna glue on the fins perfectly straight. They are going to oversand and undersand, overglue and underglue. The kit they build should have some degree of forgiveness in its design, such that even if they make these kinds of mistakes, the rocket is still going to manage to have a good flight.
2. Educational – Ready-to-Fly (RTF) kits are the worst. They snap together with very little assembly required so the child learns nothing at all about constructing a rocket kit. They should have to do some sanding and gluing and at least some mental challenge in figuring out how to put the kit together.
3. Cheap – A good beginner kit should be under \$10. This is especially feasible if you buy kits in bulk. Model rocketry can get expensive as kids progress towards more challenging projects. However, when a child is just starting out, you need to keep the cost reasonable so that parents don't object too much. As they get older and progress, if they really love the project, parents usually become more willing to loosen up their pocketbooks a bit more. If not, there are still creative options out there with advanced projects which keep the project cheap without compromising the challenge the project will give to the older 4Her.

## *Why so many different kits?*

A 4Her can stay in the beginner age group for three years. You can cycle through different kits from year to year to keep a child from building the same kit in a workshop twice.

## *Examples*

Some example beginner kits are shown on the next few pages as follows:

1. Astro-1 clone
2. Aerospace Specialty Products "Theta 18"
3. Aerospace Specialty Products "Theta 20"
4. Custom Rockets "Fiesta"

## ***Astro-1 clone***

This is a rocket kit designed by former 4H Aerospace leaders Mark Newton (Boone County) and LaVerle Orme (Tippecanoe County). The Centauri Astro-6 was a rocket kit of their childhood, no longer in production. Mark and LaVerle thought “wouldn’t it be great if today’s 4Hers could build this kit?” and re-invented the design themselves from memory. They then approached Bill Saindon at Balsa Machining to fabricate most of the kit parts for them, and bought the individual parts. There are some other parts that are purchased from alternate sources, like a hardware store. The individual parts must then be assembled into kits for each individual 4Her. Loose parts for kits like this can be sorted and put together in small Ziploc sandwich baggies. What better way to spend a February weekend than sitting in front of the TV in the living room with parts scattered on the floor in front of you, needing to be sorted into individual kits for 4Hers?

The plans for the original kit can be viewed at <http://www.spacemodeling.org/jimz/kb-17.htm>. One difference between Mark & LaVerle’s kit and the original, is that their kit has fin slots in the body tube whereas in the original Centuri design, the fins just glued on the outside of the body tube. The slotted fin tube design makes for an interesting way for 4Hers to learn how to build a rocket.

Here are the parts which are bought for each kit from Balsa Machining at <http://www.balsamachining.com/>.

<b>QTY PER KIT</b>	<b>Part #</b>	<b>Description</b>
1	CENBC107	Centuri Ogive nose cone
1	LL18-125	1/8” launch lug
1	Bmseh275	2.75” motor hook
1		T104 body tube length 9” slots ASTRO-1
1		3/32” balsa (med to high density) set 3 fins ASTRO-1
1		T20-EMT laser marked w/motor hook for ASTRO-1 (motor tube)
1	CR520-P	Centering ring paper (engine block)
2	CR20ST10-W	Special centering ring – wood (motor tube centering rings)

Other parts needed to complete your kit:

Each kit needs a small eyebolt like such, which screws into the nosecone, for attaching the shock cord. These can be bought cheaply at a hardware store. Make sure the eyebolt is a small one.



Each kit needs a streamer. Material to make streamers can also be bought at a hardware store, as such and cut into proper lengths. If you look online, they may call this “flagging tape”. Be sure to get the narrow tape. Wide tape can get stuck in the body tube and may not come out when it is supposed to be ejected.



You will also need some Kevlar shock cord. You can buy spools of this from Balsa Machining or from Aerospace Specialty Products. Each kit should get a length that is twice the length of the body tube. The shock cord will be attached to the rocket body at the motor thrust ring.

You can instruct the kids to use single-use disposable recovery wadding which must be stuffed down in the rocket tube before every launch. However, another option is using Nomex flame-proof cloth as recovery wadding, which gets permanently attached to the shock cord. You take about a 2” X 2” square or cloth, and punch a small hole in it. After the shock cord is attached to the motor thrust ring, but before you attach it to the nose cone, lace the shock cord through the hole in the Nomex patch. Be sure the streamer gets attached to the shock cord nearer to the nose cone than the Nomex. You may be able to buy Nomex patches from model rocket parts suppliers, or you can buy the cloth in bulk from internet distributors.

# Astro-1

Centuri

## SPORT FLYING ROCKET

Catalog No. KB-17

While building this kit, please keep one thought in mind . . . DON'T HURRY!! Take your time and do a neat job of assembling and finishing your ASTRO-1. If you do, you'll end up with an impressive, good looking, top performing model which you'll be proud to display and fly for your friends.

This rocket is designed to be launched only from standard remote controlled electrical launch systems. Always use the recommended engines and recovery wadding. Check with local authorities for possible restrictions before launching model rockets in your community.

Model rocketry, like any outdoor activity such as football or swimming, has its safety precautions. Following the Model Rocketeer's Safety Code, common to all manufacturers, will let you get the most out of model rocketry!

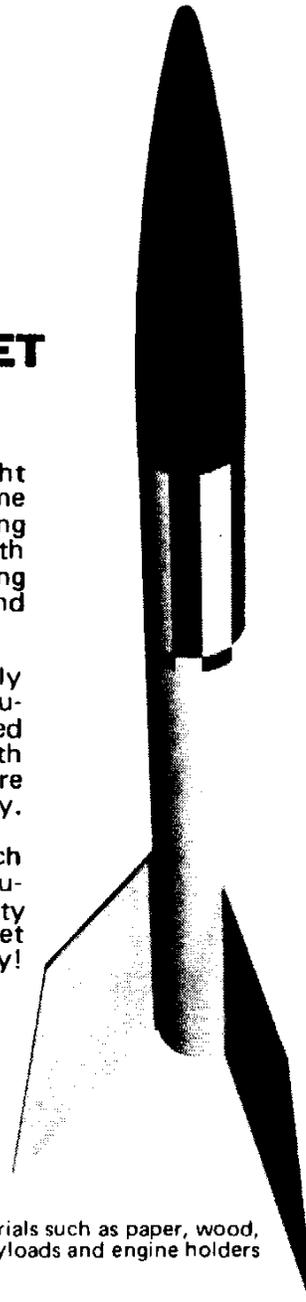
## MODEL ROCKETEER'S SAFETY CODE

### CONSTRUCTION

My model rockets will be made of only lightweight materials such as paper, wood, plastic, and thin metallic foils, with the exception of payloads and engine holders made of wirelike material.

### ENGINES

I will use only pre-loaded factory made model rocket engines in the manner recommended by the manufacturer. I will not change in any way nor attempt to reload these engines.





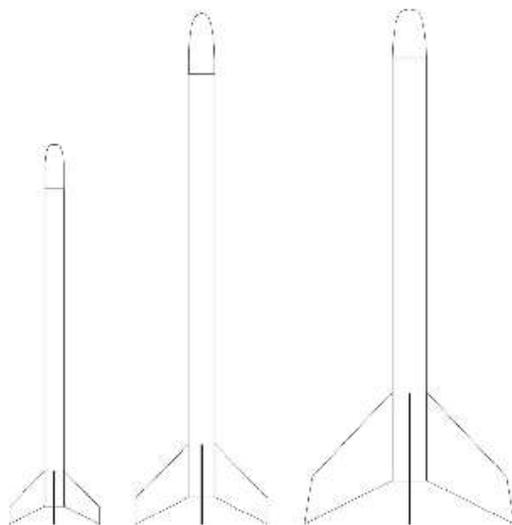
## ***Aerospace Specialty Products***

<http://www.asp-rocketry.com/>

There are two very nice beginner kits that can be bought from this company. One is the “Theta 18” and the other is the “Theta 20”. “Theta” stands for “The EducaTors Asked”. These are nice little kits that have balsa nose cones, and laser cut balsa fins which glue on the outside of the body tube.

Both kits can be bought in bulk, meaning you will get one set of building instructions and a box of parts that must be sorted out into individual kits.

There are a few “after market” modifications that should be made to the kit when it is bought. One thing is that sometimes the safety tape used for the streamer is too wide, so it must be replaced with thinner streamer ribbon (refer back to the section on the Astro-1). Also, even though spools of Kevlar shock cord are part of the bulk kit shipment, it is often not enough, so extra Kevlar shock cord should be purchased with the kits. Lastly, the kit does not come with a Nomex recovery wadding patch, so that is a nice addition.



### **Theta 20 Model Rocket Kit**

**Product number:** EKT20

A simple, minimum diameter (18 mm) model that uses easily found A - C motors. The kit features Aerospace Speciality Product's usual top-quality components, outstanding instructions, balsa wood nose cone, laser-cut balsa fins and streamer recovery. The Theta 20 can be built with multiple fin configurations, allowing each modeler to easily customize their models.

**Specifications:**

**Length:** 14.25"/36.2 cm

**Diameter:** 0.736"/18.7 mm

**Weight:** 0.53 oz/15 gm

**Streamer Recovery**

**Skill Level:** Beginner

**Recommended Engines:** 1/2A6-2; A6-4; A8-3; B6-4; C6-5.

The Theta 20 comes with design options to build it with three or four fins. It is a good idea to give the kids four fins but build it with three fins. The fourth fin can serve as a spare.

Kits YOU Build!

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**Theta 18 Model Rocket kit**

**Product number:** EKTH-18

Ideal beginner's kit! Easy to build & fly - designed for use in school & other group settings. Makes a great first or second rocket kit! Designed with the beginner in mind, but it's also a great sport flier for the more experienced modeler.

Features laser-cut balsa fins and balsa nose cone & streamer recovery. Designed to fly on easy to find 18 mm A, B or C engines.

Great model to learn basic rocketry modeling. Perfect for school or scout groups - bulk packaging available.

Specifications:

Length: 15.5"/39.4 cm

Diameter: 0.98"/24.9 mm

Weight: 1.1 oz/30 gm

Streamer Recovery

Skill Level: Beginner

Recommended Engines: 1/2A6-2; A6-4; A8-3; B6-4; C6-5 or 7

What you'll need to build this model:

Required: Adhesive (A wood glue, such as Elmer's Carpenters Glue or Titebond can be used for all steps and is recommended); sandpaper (medium - 220 or 280 grit); pencil or ball point pen; scissors or hobby knife; cotton swab ("Q-Tip", or piece of scrap balsa wood); tape (cellophane or masking).

Optional: sandpaper (fine - 320 or 400 grit, extra fine - 500 or 600 grit); filler material (such as Elmer's Fill & Finish, Elmer's Professional Carpenter's Wood Filler or interior spackling paste); sanding sealer (or balsa fillercoat); thinner (appropriate type for the sanding sealer); small paint brush; paint (Spray paint, such as Krylon, Pactra or Testors is recommended. Be sure not to mix different types or brands of paint without testing.) - primer, colors as desired & clear; sanding block; tack cloth.

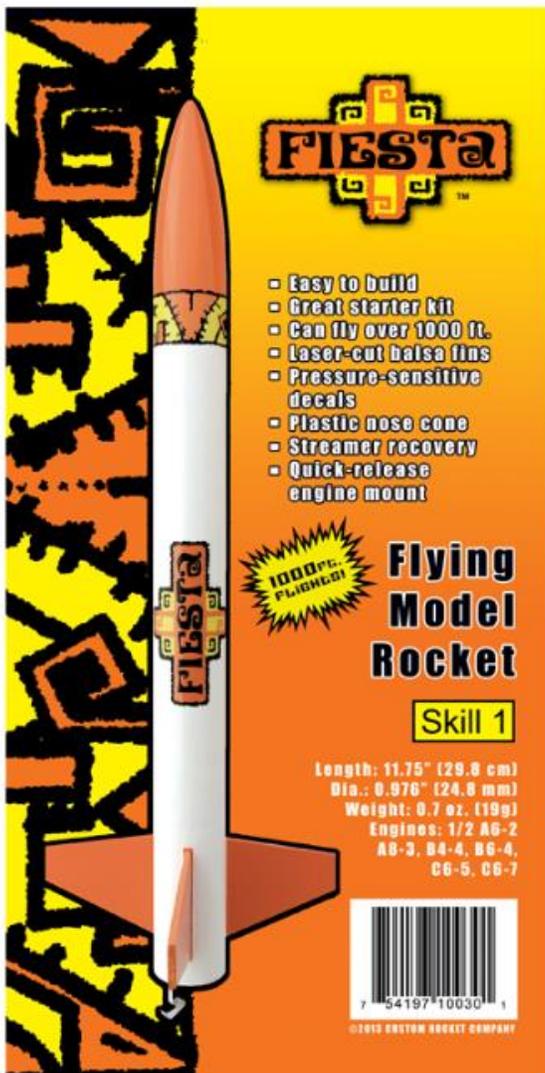
For either Theta design, the body tubes do not come with fin and launch lug alignment marks. The leader should add the marks to the body tubes in advance of the workshops. It will take too long to build in the workshop if the kids have to add the alignment marks themselves.



**Theta 20 (left) and Theta 18 (right)**

## Custom Rockets "Fiesta"

If you are going to buy a mass-produced commercial kit from one of the big model rocket companies, Custom Rockets has some better, more affordable options than Estes. One of the best of those options is the Fiesta kit. It comes with a plastic nose cone, water slide decal set, balsa fins, streamer and elastic band shock cord. It might be a good idea to build this kit every once in awhile, since the construction methods and materials are very similar to the Estes kits that many of the kids will obtain at some point if they stay interested in model rocketry. You could easily modify this kit to use a Kevlar shock cord and Nomex recovery wadding patch if you wanted. It is a good idea again to add fin and launch lug alignment marks to the body tube before the workshop.



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