

APOGEE

PEAK OF FLIGHT

NEWSLETTER

Measuring Your Skill Level

By Tim Van Milligan

Occasionally, I'm asked what the different skill levels mean:

Skill Level 1: Easy to Construct and Fly

Skill Level 2: Previous Rocket Experience Suggested

Skill Level 3: Average Skills Needed

Skill Level 4: Slightly Challenging

Skill Level 5: Extremely Challenging

In this article, I'll tell you how I define them. But please note, I don't speak for other manufacturers, so I can't say if they use the same system to describe skill levels as I do.

Categorizing a kit into one of the existing skill levels is a fuzzy process. And to be honest, there is some pressure to put kits into lower skill levels. The higher a skill level on a kit, the worse it sells. Since we don't want that, sometimes if a kit is right on the boarder-line, it will be classified as a lower skill level kit. For example, if it is mostly a skill level two kit, and has just one step that would be classified as skill level three; then overall it would probably be put into the skill level two product line. The reason is that the likelihood of the modeler achieving success is relatively high.

The way I look at the categories is this: "what craftsmanship capacities (ability, aptitude, inclinations) does the modeler need to have in order to build this type of kit?" Below are some basic guidelines that I try to use for the Apogee Components' kits.

As you will notice, the "size" of the rocket has nothing to do with skill level in my definitions. Also, they have nothing to do with the age or gender of the person. I've seen many NAR competitors in the lower age groups doing items in the Skill Level 5 category.

Skill Level 1: Easy to Construct and Fly

1.) Limited knowledge of rocketry -- knows what a nose cone is; and which end of the motor is the nozzle.

2.) Able to distinguish dissimilar parts (body tube from the engine mount tube).

3.) Able to glue balsa fins to a rocket tube.

4.) Able to cut paper using a scissors.

5.) Able to make somewhat "straight" cuts with a hobby knife in balsa wood.

6.) Able to sand parts to make them smooth.

7.) Able to use wood glue and plastic model cement only. Not yet to be trusted with CyA because they may need the extra setting time to reposition parts.

8.) Able to paint the rocket using a paintbrush, or a single color of spray paint (but with lots of runs).

9.) Able to fly a two-stage rocket, but is likely to lose it on the first launch because they put the most powerful motors into it the first time.

Skill Level 2: Previous Rocket Experience Suggested

1.) Able to glue fins onto a rocket so the root edge is parallel to the tube.

2.) Able to use CyA glue without getting themselves stuck to the rocket.

3.) Able to cut some simple curves in balsa wood using a hobby knife.

4.) Able to sand airfoils and to otherwise "shape" balsa parts with sandpaper.

5.) Able to glue fins to a curved surface; like a boattail.

6.) Some knowledge of rocketry: why the various components are necessary.

7.) Able to use spray paint without causing runs.

8.) Able to apply water-transfer decals without ripping them.

9.) Able to glue two pieces of balsa together to make a compound fin shape.

10.) Knows to apply fillets to fins and that sealing balsa wood parts makes them better in appearance and performance.

11.) Understands the engine code designation.



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12.) Able to distinguish between composite motors and black-powder varieties.

13.) Can assemble a plastic parachute.

14.) Will more likely angle the launch rod based on wind conditions. They are much better at "not" losing rockets on the first flight.

Skill Level 3: Average Skills Needed

1.) Good knowledge of rocketry: what factors affect the rocket's flight, and how to improve the performance of a rocket. What's an ogive shape versus elliptical shape nose cone.

2.) Familiar with rocket parts enough to tell a 10.5mm centering ring from a 13mm centering ring.

3.) Able to glue fins to a rocket so that they are symmetrically placed around the tube, straight, and extend straight radially from the tube (not tilted to one side). So a Phoenix missile (with its multiple in-line fins) will look good, instead of all the fins being at crazy angles.

4.) Able to do multi-color painting with spray paint (knowledge of how to mask colors).

5.) Able to cut body tubes to length.

6.) Able to design a simple rocket like the Apogee Blue Streak.

7.) Able to build and fly a simple boost glider or helicopter recovery design from a kit.

8.) Ability to roll a paper transition section.

9.) Able to assemble rockets with vacuum-form nose cones.

10.) Able to cut out flat centering rings from cardboard using a hobby knife.

11.) Able to make uniform fin fillets.

12.) Can determine -- based on previous experience -- what size parachute to use with most models.

13.) Able to repair moderately damaged models.

14.) Just starting to gain the confidence to build kits that transform during flight; like "rocket gliders," or other models that have hinges, flaps, or moving pistons.

Skill Level 4: Slightly Challenging

1.) Very good knowledge of rocketry, and has been dabbling into mathematics of flight, and drag coefficients, etc...

2.) Able to select motors for rockets without looking for a "recommended motor" list on the package.

3.) Able to start making judgments about the causes of flight failures.

4.) In a group building session, this person could be an assistant to the leader.

5.) Willing to build and fly cluster engine models.

6.) Able to glue fins onto tubes at odd angles and asymmetrically if necessary.

7.) Able to trim a glider for stable flight.

8.) Able to cut slots into body tubes for through-the-wall fins.

9.) Able to assemble built-up fins or wings (those with spars, skins, ribs, stringers, etc).

10.) Able to create complex paint patterns on a rocket (like a checker-board roll pattern with sharp edges).

11.) Able to adequately change the shape of balsa nose cones (from ogive to something rounded).

12.) Able to design a complex vehicle: like a 2-stage rocket, a model with forward-mounted fins, a cluster-engine model, or glider.

13.) Able to apply vacuum-form wraps without ruining them.

14.) Ability to form paper cones with sharp points.

15.) Able to cut out cluster-pattern centering rings from cardboard.

16.) Proficient in the use of multiple types of adhesives and solvents.

17.) Able to use fiberglass and epoxy to strengthen parts.

18.) Proficient enough with power tools to shape some parts (like cutting centering rings from plywood).

19.) Able to write specifications for components so that they can be assembled with little sloppyness. For example, nose cone shapes from vendors like BMS.

20.) Able to sand a concave-curved edge into the root edge of a fin.

Skill Level 5: Extremely Challenging

1.) Excellent knowledge of rocketry. Able to advise others as to the flight-worthiness of their own designs. Able to lead group building sessions. Smart enough to know that RockSim is the only software worth using.

2.) Ability to design their own complex rockets, including gliders and helicopters.

3.) Ability to make their own parts from non-traditional

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sources: vacuum-form, cast resin, lathe turning, and carving blocks of wood or foam.

- 4.) Able to cut fin slots into curved boattails.
- 5.) Able to trim flex-wing gliders.
- 6.) To have the confidence to attempt painting a straight line on a corrugated transition (like the transition of a Saturn V).
- 7.) Able to form complex paper shapes -- like the circle-to-square transition on a Nike-Hercules rocket.
- 8.) Willing to use electronics in their projects to control various flight functions.
- 9.) Ability to assemble delicate parts that require holding them with tweezers.
- 10.) Knows that extreme precision in assembly requires using building fixtures and jigs. They also know how to design and use these items.
- 11.) Ability to use an air-brush for painting.

Conclusion:

If you want to try to judge what skill level you are currently at, I would say you need to possess at least 3/4 of the qualifications to be proficient at that level of kit construction. So before attempting a Skill Level 5 kit, take your time and get most of the Skill Level 4 items done first.

Of course, these are my opinions only, and you may not agree with them...

About the Author:

Tim Van Milligan is the owner of Apogee Components (<http://www.apogeerockets.com>) and the curator of the rock-

etry education web site: <http://www.apogeerockets.com/education>. He is also the author of the books: "Model Rocket Design and Construction," "69 Simple Science Fair Projects with Model Rockets: Aeronautics" and publisher of the FREE e-zine newsletter about model rockets. You can subscribe to the e-zine at the Apogee Components web site, or sending an email to: ezine@apogeerockets.com with "SUBSCRIBE" as the subject line of the message.

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