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APOGEE

PEAK OF FLIGHT

NEWSLETTER

Contest Flying Preparations

By Tim Van Milligan

You've made the team. You are now going to travel to the furthest reaches of the globe as a representative on the United States Model Rocket Team. The competition is going to be stiff. Everyone is going out to win —- second place is for losers. The pressure is so much more than winning at NARAM, because there is so much more at stake. The whole concept of model rocketry was born in America, and it is a truly American sport; so the entire world is waiting to see if you will bring that elusive first place trophy back to the USA.

Your models are all set, they are a marvel of engineering genius, and were crafted with more care that only a Swiss watch maker could give a similar project. Now it is time to fly them. All variables up to this point are locked in. You approach the launch pad with your prepped model in hand. Your sleek piston launcher/tower arrangement has been tuned to near frictionless perfection. You know the model will blast-off on a true coarse.

The launch director begins the terminal countdown sequence — 5, 4, 3, 2, 1, IGNITION! Your fingers are already white from the pressure that you have applied to them while you stand there with them crossed. You utter a small prayer, and hope to anyone whom you think cares that everything will go perfectly.

Wait a second! You don't think you will trust your flight to luck. This is the Internats. You need every edge over the competition you can get. Remember, you traveled half way around the globe, and spent a lot of other peoples' money for one objective: FIRST PLACE. Turn your brain on, this is a scientific hobby, so apply some logic to the situation.

The first thing to do to for the launch is to familiarize yourself with the field, and the surrounding area. Take note of trees, bushes, lakes, ponds, rivers, power lines, as well as fences, roads and buildings. Plan a route ahead of time which direction you will take to detour around those objects as you chase the rocket. Once outside the immediate flying field, it is helpful to have a map of the area. There are different types of maps, so you'll want to plan to get them before you leave for your trip abroad. Some maps will show only roads and rivers, others like geological survey maps will show elevations and may show some vegetation. You'll probably want one with accurate compass directions to say the least.

If you can plan to go all out, and money is no object, you may supplement your maps with the latest satellite images. American LANDSAT images can give a resolution well below 20 meters, which is much more accurate than any of the details you will get on maps. These pictures will cost anywhere between $50 and $500 depending on what you request. For greater detail (5 to 10 meters), SPOT images can be also be purchased.

If you have access to the internet, you may want to download some free satellite images off the web site: http://terraserver.microsoft.com

Wind is the reason for the maps. The prevailing wind of the day needs to be accounted for when aiming the rocket, and for predicting where the rocket will land. To make the most of the maps, you will need to know the direction of the wind. You will need a compass, and some device to indicate the direction of the wind. Such a device might be a wind sock, or weather vane. It is also nice to know the speed of the wind. This is were wind gages and annonometers are used. The combined use of the annonometer and wind vane will be allow you to estimate where the rocket will land. Of course, you will have to make the necessary calculations on how high the model went; so use your copy of the RockSim program. Also calculate in advance the typical rate of descent.

So before you leave on your trip, brush up on your trigonometry, you will be using it for nearly every flight.

There are two things that make it hard to predict where the model will land. The first is varying winds. Wind gusts

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and variations of the wind with altitude are not readily predictable. Wind gusts can be detected with the annonometer, but by then it is too late. It is best to launch your rocket just after the gust passes by the launcher. You can detect the wind variation with altitude with a helium-filled balloon (call a "pea ball" by hot air balloonists). When you release the balloon, it will float up, and its direction will change depending upon the wind speed changes as it rises. You may notice that the wind speed may be faster at certain altitude levels than it is on the ground. It may also change direction as it rises, but it will only be by a few degrees, but every little bit of information helps.

Watching the direction of moving clouds may also give you some idea of the velocity of the wind at higher altitudes. Another tell-tale sign of nature as to the conditions of the wind are soaring birds (see the related article at: http://www.apogeerockets.com/education/Soaring_methods.asp). These natural gliders constantly seek out thermals to gain altitude. You will notice that when they enter a thermal, one of the wings will tip slightly, and then the bird will begin a turn to center itself in the column of rising air. So aim for the birds.

Another method of detecting thermals is with a thermal pole. This consists of a very long thin mylar streamer attached to the top of a long pole. Set up the pole up-wind of the launcher, and watch for the arrival of a thermal. When a thermal drifts by the pole, the streamer will rise, and then you know that it is time to launch. This works well on calm days.

Similarly, you can use soap bubbles to detect a thermal. The lazily drifting bubbles are easily lifted and redirected by a thermal; and are an excellent visual clue to the location of a thermal.

On windy days, you will have to get a little more technical. A digital thermometer mounted on the top of the thermal pole works in a similar manner. When the thermal core drifts by, the thermometer will show a slight temperature rise. That will be your sign to launch. As you might expect, proper positioning of the pole (or poles) will have a lot to do with your chances of hitting the thermal core.

One more thing to mention about thermals it that the air tends to rotate in a clockwise direction as it rises. This is caused by the coriolis effect. In southern latitudes (South America, Australia) the direction of rotation will be in a counter-clockwise direction. So trim you gliders to rotate with the direction of the thermal, and keep the turn radius fairly tight (but keep a good glide). Otherwise, you'll fly right out of the thermal.

Once the model is airborne, you will have to track it yourself, so make sure you bring your binoculars. Every member of your tracking and recovery team should also have a pair too. You might also consider taking an off-road bicycle with you on your trip. It may help you catch up to your drifting model. To further increase your recovery range, an automobile will be very helpful. If you are using a team approach to recovery, you should have one member track it, while the other drive the vehicle, and plan the best route with the aid of your maps.

If you are flying larger models, you might consider putting in a radio beacon in the rocket to help you locate the model once it lands. It will make recovery that much easier, which will make your day so much more enjoyable.

OK... So you're not currently on the US Space Modeling Team and aren't on your way to compete in a foreign country. But even so, you may get use the strategies in your local contest. And the tips above are certainly not the last word on launching and recovery of your model, but they can give you a good starting point. If you are going out to win, every little advantage will help. Remember, your competition will most likely be using the same methods, so don't go unprepared.

Note: There is a free demo version of the RockSim software on the Apogee Components web site. After you download it, you can design rockets, and run them through simulations to see how it will behave under different motors and flight conditions.

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