The Joy of Free Flight

Dave Lonergan's 50" span Rookie. powered by eight strands of 1/4" rubber. Photo by Craig Limber

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Many current MAAC members have joined in the fun only after R/C began to dominate the activity. The vast majority of current members have never seen a free-flight model perform, some have never even heard that such an activity exists, and some believe that it is an activity exclusive to 'expert builders.'

The purpose of this article is to introduce this aspect of aero-modelling to those people who are unaware of its existence and to dispel some of the popular myths.

So, what is free-flight?

It is the flying of model aircraft which have no control applied to them from the ground or from within the model after they have been launched. I know that to some this idea is almost unimaginable. It is done, however, and in fact it is where our hobby started.

'Alright,' you may say, 'so it's interesting history, but what is the relevance today – we have sophisticated, programmable radios that enable us to fly almost anything. Why would we want to fly model aircraft without such control.'

Daniel Chu's FAC Moth . Daniel is in his teens and is enjoying Free Flight in Alberta. Photo by Craig Limber

Well, it may be ancient history, but it is also a vibrant and challenging part of the hobby that a small number of us continue to enjoy today. I would like to suggest that many more MAAC members would find free-flight, in its many aspects, an absorbing, joyful, and fulfilling activity if they were aware of what it is and what it offers.

Eric Grigg is a pilot of light aircraft and has recently come to our hobby, starting out with R/C, as so many do. He learned of the existence of free-flight and began to investigate it. In a recent email he said "I only wish I had known about free-flight in my earlier years. I now wonder if part of pilot training shouldn't include the building and flying of a free-flight model in order to generate a good understanding of the characteristics of flight?"

Many think of free flight as the solid balsa 'chuck glider' – whose wings and tail were pushed into slots in the fuselage – or the rubber-powered scale model, both of which items have been sold in model shops since the hobby began and which many of us attempted to fly as children. I am convinced that these types have 'put off' more neophytes than they have encouraged. The chuck gliders because they really didn't fly very well, being aerodynamically unsound, and the scale models because it takes a very great deal of skill to get them to fly, because they are barely stable.

Experts could get these things to fly but a beginner was soon discouraged. I find it sad that many people have that experience as their only exposure to free-flight whereas the reality is far more diverse, satisfying and pleasurable. The joy of watching your creation soar in a thermal, on its own, is an experience many of us simply cannot get enough of.

The most basic challenge in designing, building, and flying any free-flight model is that it has to be inherently stable once it leaves the hands of the flier. It must be designed and trimmed such that when air currents upset its equilibrium it will right itself and continue flying safely, without intervention from a pilot or control system – either on-board or in telecommunication from the ground. Luckily, there are many designs available, for models that are extremely stable - and easy to build - so that novices can get started on this adventure without fear that it will be beyond their skill level.

Unfortunately, in the past, most such models were not available in kit form - nowadays, however, there is a host of cottage industries that supply this market - so getting started successfully has never been easier.

Grant Sauerberg launches his Ray Smith Wakefield. Photo by Craig Limber

Any free-flight model aircraft is really a glider (with the exception of some indoor models which we will discuss later). The differences between the genres of free-flight models are in the way in which they achieve a useful height from which to glide. The 'pure' gliders – those that have no power source carried on board to get them airborne – can achieve an altitude from which to fly by several means. Small ones can be hand-launched, usually requiring an arm like a pitcher to get very high. They can be discus-launched, where the launcher spins around while holding the tip of one wing in his/her outstretched hand and then releases, throwing the model to a considerable height. They can be catapult-launched, where the model is literally fired upwards from an elastic catapult, or they can be towed up, like a kite, and released once the model is at a satisfactory height. The latter method, towing, has been the most popular technique for larger gliders for many years, but discus launching has become fairly popular lately, perhaps because of the smaller fields that we have available to fly on, and catapult launching has always had a devoted group of followers.

Roy Smith retrieves his 1/2A Country Boy with a trail bike. Photo by Sally Smith

Moving on to the types that carry a power source to get them airborne – the power source is usually limited in some way and, after it has run out and got the model to altitude, the model becomes a glider, and it is as a glider that its performance is measured. The power can be an internal combustion engine, turning a propeller. In this case the time of the engine run is usually limited to a few seconds and the model must glide thereafter. A modern power model can achieve a height of several hundred feet in a few seconds and the model must then transition into a glide without any assistance from the ground.

An alternative source of power is a rubber motor driving a propeller. In this case the power is delivered as a rapid burst at first, gradually declining as the motor unwinds. This presents its own challenges of gaining maximum altitude while allowing the aircraft to glide once the power has run down. In some cases the weight of the rubber motor is limited, in other cases there is no limit on the motor but the heavier the motor is, of course, the more weight has to be carried during the glide phase. It is a wonderful thing to see a rubber-powered model climb to several hundred feet under its own power and then glide magnificently.

Electric power is slowly becoming more popular these days. In this case the capacity of the batteries is usually limited, and the motor run time is also limited. Once the motor has timed out (usually 5 – 15 seconds) the model must glide.

I alluded to a type of free-flight model that does not become a glider at any point in its flight – the rubber-powered indoor model. These are flown in large indoor spaces, such as dirigible hangars, underground salt mines, etc. It is an almost incredible fact that these models can achieve 45 minute flights (yes, minutes not seconds) and some have been known to remain aloft for an hour, in an enclosed space with no thermal activity.

The rubber motor, however, is running for the whole duration of the flight – when it runs down the model lands. The patience and skill that it takes to build and fly one of these jewels is something very rare.

'But how do you get the outdoor models back?' I can hear many ask. The methods of doing so are varied. The most basic element is that the model must be watched all the way to the ground and a 'line' must be established, using a landmark (tree, building, etc.). The landmark should preferably be further from the launch site than the model is believed to have landed. Binoculars and a compass are very useful for this part of the pro-

Dave Lonergan prepares his 59" Banana Fritter for flight. Power is from 20 strands of 1/4" rubber flying weight of 426 grams. Photo by Craig Limber.

cess. That line should then be followed, as closely as possible, to retrieve the model. Nowadays, as many of us approach and pass our 'best by' dates, some extra help with the retrieval is welcomed. Radio trackers have been a great boon in this regard – as have wheeled off-road transportation. Many people use small trail motorbikes, others rent or own golf carts to get across the field and retrieve their models.

So what is the point of all this?

We have made a model aircraft that will fly autonomously, and we can retrieve it – what then? I have mentioned the joy of witnessing your free-flight model do what it does best. This could get repetitive, however, were it not for the fact that now we introduce the element of competition.

A free-flight model aircraft's performance depends not only on its design, and the skill with which it has been built, but also on the atmospheric conditions into which it is launched. Full-size gliders, and the R/C variety, are piloted into thermals or other up-currents in order to achieve a good flight time and a skilled pilot, on a good day, can stay airborne almost indefinitely.

Free-flight model aircraft are the same, except that they do not have the aid of a pilot, after launch, to get them there. And, whenever there is a rising current of air somewhere, there will be a descending current of air associated with it to fill in the space it would otherwise leave. For a long flight it is necessary to launch the free-flight model into rising air – launching into descending air will result in a disappointingly short flight. In free-flight competition the challenge is to launch your model into rising air and achieve a long flight, and to do this consistently. If the models were allowed to fly indefinitely, however, once in a thermal they could very easily be lost. For an expert free-flight modeller this would happen on almost every flight – a rather impractical scenario. To prevent this from happening the models are fitted with a de-thermalizing device (or D/T) which destroys their gliding capability but brings them down safely. The D/T is operated either by a mechanical timer or else by a burning fuse which causes a mechanism to be released after a certain time.

Roy Smith starting an 'A' Nostalgia Dixielander. photo by Sally Smith

The object of free-flight competition then is to consistently achieve a flight of a specific duration (the 'max'). A time is set which is such that it will be a challenge to achieve within the limits of the model type and, if applicable, the motor run, without the aid of good 'air'.

The D/T device is then set to trigger shortly after that time has been achieved, bringing the aircraft down safely and within a reasonable distance from the launch point. Consistently achieving the 'max' is a challenge. The builder/flier must not only have the skills necessary to build a light, accurate, and strong model aircraft, he/she must 'trim' the aircraft to fly at its optimum both during the power run and then in the subsequent glide, and then he/she must be able to pick the conditions in which to launch so that the model will fly into, and stay in, 'lift'

There are some terms in the preceding paragraph that might mystify the uninitiated so let me explain. First, why builder/flyer? In most free-flight events the model must have been

A mass launch of twin pusher models. Same type competitions are common in free-flight and add to the camaraderie. Photo by Craig Limber.

built primarily by the fliers themselves. Some items, such as engines, timers, propellers, etc., can be purchased, of course, but the structure must have been primarily built by the flier. Certain other items, such as the main fuselage boom, for instance, can be purchased, but the builder/flier must assemble this into a fuselage, adding things like engine mounts, wing and tail mounts, timer mechanisms, etc. The next term is 'trim' – what does 'trimming' a model aircraft mean? There are many aspects of the model that must be adjusted so that it will have that desirable inherent stability, as well as the desired performance level. This process is called 'trimming' the model.

The most usual things to be adjusted are the CG position, the wing/tail decalage, the rudder offset, the propeller thrust line (side and/or down-thrust), and the wing twist (wash-in/washout). Many of these things can be set, at least approximately, in the workshop, especially if the design is one for which there is a history of experience, but final adjustments can only be made on the flying field. Very short power runs must be used to begin with, increasing in time as the model nears its correct trim.

'But I like to fly for fun,' you might say. 'I don't want the pressure of competition!'

For many people in free-flight the main purpose of competition is simply to give them a measure of how well they are doing against previous performance. In a free-flight contest the fliers choose when they will fly and their times are recorded. No-one is forced to fly at any time or pace, you simply go out to the flight line, fly when you are ready, and record your scores. You don't actually have to record your scores if you don't want to – but it does increase the fun if you have a goal to aim at and you can see yourself getting better with practice.

Most free-flight contests include many spontaneous 'gabfests' and are as much a social occasion, in which you reunite with old friends, as they are a flying affair. Nearly all free-flighters are more than eager to assist newcomers with the intricacies of trimming and flying a model.

All of that said – there are, of course, some exceptions to the outline I have given above. The most notable exception, I would have to say, is International Competition as sanctioned by the FAI. In FAI-style competition there is no builder-of-the-model rule. As a result, there are now a relatively small number of people producing for sale almost all of the models used in International competition, and at this level of competition the pressure to perform can be very intense. The flights must also take place within certain windows (or 'rounds') throughout the day, increasing the pressure. Hundreds of people turn up at the World Championship competition every two years – a testament to the vibrance and relevance of free-flight in our hobby. It is not necessary, however, to participate at such an intensely competitive level in order to enjoy the ever-changing challenges that free-flight presents fliers with on a daily basis.

George Parry holds his Cloud Tramp. This simple design is easy to build and flies extremely well. It is a far cry from the drug store models many tried in their youth. Photo by Richard Barlow

Les Sayer launches a Senator: Those who find this model familiar will remember that it was used as the 2012 Early Bird patch for MAAC membership. Simple to build with outstanding performance.
Photo by Vic Nippert