



10...9...8...

the voice of UKRA

Javelin Project

by Frank Sharman

volume 6 issue 1

Tyrus Bullet 54

by Paul Timony

Micro Hybrid

by Roy Trzeciak-Hicks

Blitzspear

by Richard Osborne

Italian Scene

by Stefano Figoni

Tiny Pterodactyl

by Paul "shax" Shackleton

Space Modelling 2002

by Stuart Lodge

Editorial

Hybrids

Given the current scarcity of Aerotech solid rocket motors, it's not surprising that more people are becoming interested in Hybrid technology. When the current regulation regarding hybrids were drawn up experience in the UK was limited, and motors such as the micro hybrid were unknown. The UKRA safety & Technical Committee have issued a statement to clarify how the current regulations apply to the flights of rockets powered by Hybrid motors. I urge you to read it. Remember, that following the Safety Code is a condition of your UKRA insurance.

The interest in Hybrids is also reflected in the content of 10...9...8... This issue we have an article on the micro hybrids, and also on Blitzspear, Richard Osborne's hybrid capable vehicle. There's more to come in subsequent issues too. If you would like to see (or write) an article on hybrids or indeed any other aspect of rocketry, please contact us at the submissions email address below.

New Logo

As you have probably noticed from the front cover, UKRA has a new logo. Thanks are due to Ben Jarvis for the application of his artistic talents. The new logo has also appeared on the web site and will appear on all UKRA documentation in due course.

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Cover Photo: Gary Sinclair's night flight at the November EARS launch.
(Photo courtesy of Ben Jarvis)

Contents Scan: The inspiration for Richard Osborne's rocket, Blitzspear!

10...9...8...

page 2

Contents

- 5 **Javelin Project:** *by Frank Sharman*

- 10 **Blitzspear:** *by Richard Osborne*

- 12 **Micro Hybrid:** *by Roy Trzeciak-Hicks*

- 16 **What's happening in Italy:** *by Stefano Figoni*

- 18 **Tyrus Bullet 54:** *by Paul Timony*

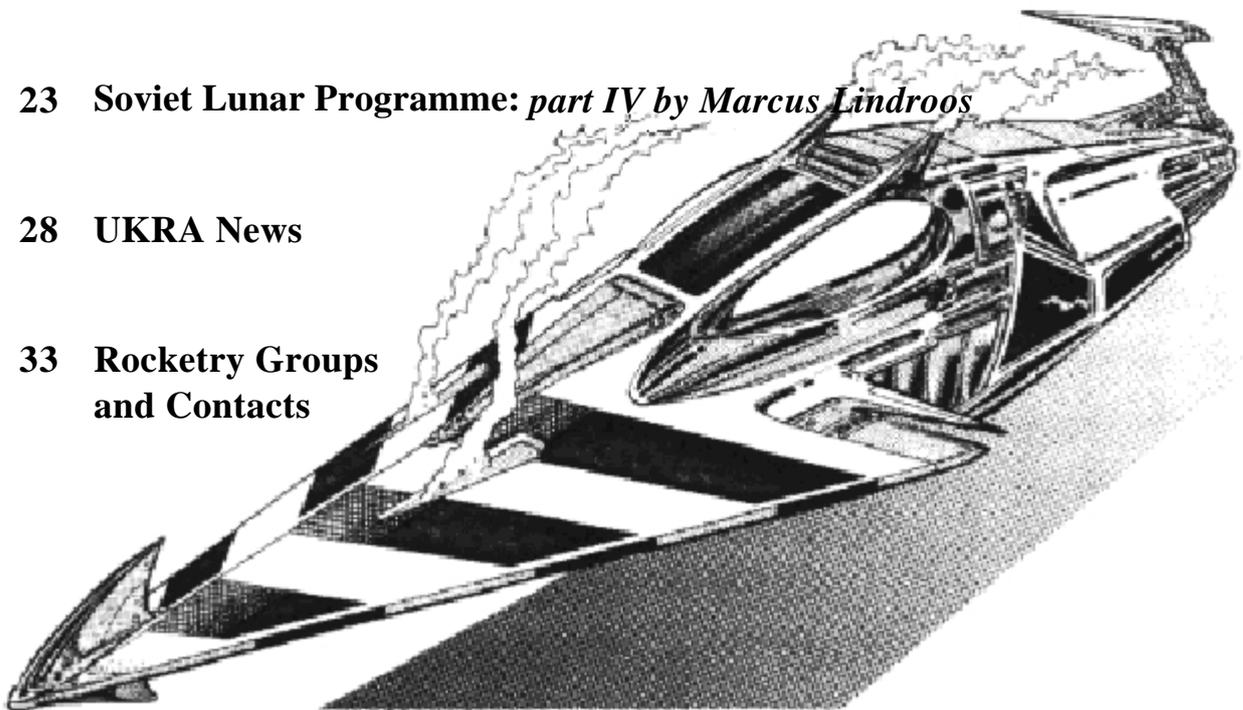
- 20 **PML Tiny Pterodactyl:** *by Paul "shax" Shackleton*

- 22 **Space Modelling 2002:** *by Stuart Lodge*

- 23 **Soviet Lunar Programme: part IV** *by Marcus Lindroos*

- 28 **UKRA News**

- 33 **Rocketry Groups and Contacts**



UKRA 2002

7th / 8th / 9th June



Southview Farm, Heckington, Lincolnshire

	Weekend Pass	Day Pass
Adult Flyer	£15.00	£10.00
Junior Flyer	£10.00	£7.00
Non-Flyer	£5.00/£3.00	£2.50/£1.50
Temporary Membership		£9.00
Prep Benches (Subject to availability)		£5.00
Card Wallet		£0.50
Raffle Tickets		£1.00
Vendors fee		£35.00

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Sheltered prep area
Vendors welcome
On-site food
On-site camping
Local accommodation**

* Possibly Higher By Prior Arrangement



10...9...8...

page 4

Javelin Challenge

by *Frank Sharman*

The Javelin Rocket story, seen and read many times in the local and national press, BBC, ITV and live on Sky. It's a story of annual disaster, one rocket too far and well suited to fit in with the exploits of that modern day Rocketman caricature, who each year pops up to throw ridicule on serious space programs that have had much thought and scientific study spent upon them by responsible members of UKRA.



As designer and operator of the Javelin Rocket Challenge, I have had my moments of farce and failure, last year being the ultimate, when I had the worst launch it must be possible to have. John Bonsor, who joined me on that day, shared in all the trials and error, not helped by faulty motors that put paid to three out of four launches made on 29th July 2001. Everything that could go wrong, did, with not enough going right to give very much comfort. John's supportive help and dry humour was like a mug of hot tea in a winter storm. It got me through a long, long day. Although motor failure en-masse led to the wipe-out of the event, all manner of other things combined to ruin Javelin's credibility that Sunday, from a bad site to bad packing. The press needed details of expected timing of events and we were running late after ferrying equipment and setting up under trying conditions.

After inspection of the site early in the year, I returned with John on Saturday the 29th to find bulldozers had been at work, excavating the launch site for motorcycle scrambling before and after the programme of launches. Mission control was now to operate from within a crater.

10...9...8...

This would make it difficult for people to see the rockets on the launch pad from their limited viewing area. Compacted hard core, steam rolled down, made pinning in the tower a pick-axe job. As we worked under a hot sun, the lunar landscape was plagued by Martian dust storms, that arose with each wave of passing motorcyclists. By the time the bikers were called off site for the start of the rocket launching, white launch crews overalls, were showing a little grey.

The first rocket simply went bang, as it's single Estes D motor catoed. The second rocket made a good straight climb, but from that point on it was all down hill to the depths of despair. A four engined Javelin suffered premature 'chute deployment when one of it's Estes D motors catoed too. Amazingly, the rocket still went up with no nose cone, dragging its parachute all over the sky. Yellow Peril, the big one of the day, proved just not strong enough in it's construction and bent at the tower once a well timed rise in the wind got hold of it. On the grounds of safety, this launch was abandoned, with much disapproval from the crowd. All hopes for saving the day now rested with one of the old, original, twenty foot Javelins of 1998 vintage. The rocket, SA47/B14, shortened down to about twelve feet and powered by nine D motors was quickly made ready. A morale battered crew which, with a change in direction and speed of the wind, managed to raise their spirits and take their places for an optimistic count down. Yet again, however, a cato blew out all eight of the other engines, firmly cementing a humiliating finish.

So, how did the Javelin dream crash so badly, and what worthwhile goal did the project aim for?

Britain's biggest private rocket, was how it was originally announced back in 1998, when one of two experimental Javelins of twenty three feet in length were constructed, and a launch date announced. It was all such a sudden thing, driven by the pressure of a good story, to build to build a twenty foot tall micro-light rocket and launch it by May. In fact just two months from drawing board to launch tower count down. Today, a twenty foot rocket is no longer such a big deal and in fact several other big rockets built by UKRA members are more qualified to hold that title, having actually been successfully launched. Bigger rockets still have been built by private groups and individuals, but not launched from British soil. However, once news of the twenty foot rocket got into print and on the television, a spate of big rocket stories began to come out over the following year, though none of these were seen to blast off.

What made and still makes Javelin different, is that it is first and foremost a display, show rocket. Designed and built to be micro light in weight, low in power and limited in ceiling to remain below one thousand feet, so that it is suitable for simple, public entertainment. The total dry weight of the twenty three foot tall SA47/B class 14 and 17, was just 5 pounds. Or one and a half bags of sugar. Javelin is not going into space, just high enough to raise applause, and, if things go wrong, the ship is light enough not to make a dent in the cricket field turf, even after a parachute failure.

Making a large rocket strong enough to fly on small clusters of D motors while remaining feather weight is the real challenge. This was achieved by producing a micro light compound airframe, combining three basic materials with a resin. The structure was heat dried to remove all moisture. In order to make transportation to site, and storage in a small room or loft space possible, the whole ship had to be made up from two foot long stages, that could be coupled together on site. Building a rocket that could support itself and withstand the stress of flight was a greater challenge than building a big, heavy one-piece airframe powered by high powered motors. It was like comparing a man powered aircraft to a powerful jet fighter. Seven models in all were constructed this way, and formed a display of craft from five foot in length to the full twenty three foot Challenge rocket.



Frank Sharman with 36 foot Titan

Mixed in with these micro light models were some laminated paper models and between them, these Javelins performed reliably each year until 2001. The plan was to build and launch an even bigger, Titan class Javelin in 2002, once the original twenty three foot rocket had made a successful public lift off. However, what with bad timing on the part of the British weather, which turned up on dates planned months in advance, and further frustrated by nervous officials causing delays, 2001 approached with no launch of a Javelin at the top of the size table at a public event.

The two big rockets, SA47/B14 and SA47/B17 were now getting a little old and battered. SA47/B14 in a shortened form and nine engines achieved a good straight 700 foot climb and, despite 'chute failure, landed with a small bounce sustaining little damage other than a burst seal. One week later, on the 29th July at Newstead, SA47/B17, in full length, blasted off in public, but broke up just thirty feet above the launch tower. With publicity shoots for press and television, in addition to actual launches, these two rockets had been up and down the tower dozens of times, which took its toll on both ship's cardboard fins. What's more, heat damage from two launches had created weak spots in the lower sections of both rockets, placing restrictions on how tall they could now be built and not suffer airframe failure under launch stress.



Cato!

After the 2000 AD launch at Newstead, I took advantage of the use of a factory unit to build two new rockets. The main time was spent building a prototype Titan class ship of a proposed fifty feet. This was to be used for the Ashfields Lawns display. However, due to the late provision of the unit, a thirty six foot Titan finally emerged, only to be scrapped days later when the factory had to be returned to the Estates department, as agreed, once the display date had passed. The second rocket, an SA63 class Javelin named Yellow Peril, was built as a stop gap replacement for the two ageing SA47/B class twenty foot models. This new ship was built entirely of solid polystyrene foam in two foot sections, joined together by cardboard collars.

The wise thing to do would be to practice assembly and mock launch operations, as performed for the old rockets. However, an untimely house move, that dragged on until only one week before the 2001 launch date, saw Yellow Peril arrive at the launch site a totally unknown collection of parts, which had never been fully assembled.

When it came to the crunch of building up the model and getting it upright it became immediately clear to me that the rocket was not only heavier than the old rocket but more bendy than Mr Bandy of Bandy Town, bendy planet. But what to do? people were calling for the big rocket, as they do at these events. Going through the motions of putting the rocket up to the tower, was 50% appeasing the press and crowd. Cancelling the launch was the only end result I could see, once the whole rocket had embarrassed itself and it's crew.

So what now for Javelin?

Well it was not a good idea to go for a quick fix polystyrene rocket. This model was just not up to the standard achieved by the old compound models. A brand new ship of the original design method should be produced (or of a new airframe design altogether) for 2002 and beyond. While all the smaller display rockets are to be replaced, one or both of the original twenty foot SA47/B challenger ships are to be restored, for long term static display, along with cine and news footage of the rockets. Dreams of building a fifty foot Titan class Javelin still inspire my idea of the greatest model rocket launch ever. How far away that dream is, remains a changing distance in time and opportunity.



John Bonsor preps Yellow Peril

Looking beyond broken dreams and the roller coaster ride of the Javelin Challenge, there is another side to the story. For every rocket that proved wanting on the big day, a hard core of twenty models have made sterling launches from Newstead and Blidworth over the years since early 1996. These rockets are responsible for bringing sheer delight to those young and old who followed the missions of pure fun from the village greens and reclaimed Coal Board land of the north Notts. area. How big can a model be before man and materials are at their limit is all part of the adventure. Courting the press means that any failure is put under the spotlight, but you have to learn to be able to laugh at the stories of bent rockets and soot blackened faces. I always explain to reporters that Javelin is a display show rocket, doing a similar job to a display firework rocket, but in broad daylight, as opposed to a serious space shot, and that as well as trying to break my own record for the biggest model, the event is helping to promote a worthy cause such as opening up more reclaimed industrial landscape to the public, raising money for youth projects or encouraging local community activity. Money raised for good causes and making amateurs part of a space crew for a day will perhaps, in the long run, be the full worth of all that effort with glue and paint brush long into the night.

After a very long and awful 2001 Javelin Challenge during which only one rocket performed, I felt totally crushed, despite managing that British stiff upper lip. I felt that I had let down the followers of the Javelin Challenge more than anything else. Then John said "I think I'm beginning to get my teeth into this big rocket of yours, so I think maybe I shall have to come back next year and help you succeed". It was at that moment that I felt part of UKRA, and not just a paying member who turns up and makes polite conversation with people. "Yes, next year" I thought. My mind already working back to the drawing board.



Frank Sharman and John Bonsor prepare a Javelin for launch

BLITZSPEAR

by Richard Osborne

Blitzspear was originally designed as a high performance, high altitude rocket. The rocket is a 54mm, minimum diameter rocket, designed to take 54mm diameter motors up to, and including, an Aerotech K-700W.

The existing UK HPR records for the various motor classes were, on the whole, neither set by, or held by, minimum diameter rockets in most cases, but more often than not, were held by kits. I felt that the envelope needed to be pushed a bit, so a bit more ingenuity than setting an altitude record with a kit or a fat rocket would be required. The obvious solution would be to use a minimum diameter design, with a smooth finish, and minimum of external protuberances. This design would reduce skin drag, parasitic drag and the minimum diameter design would reduce the frontal area too.

The rocket was modelled thoroughly on Rocksim first, to determine the best design compromise for the vehicle.

In order to fly the rocket on the most powerful motors possible, no expense has been spared on the construction. The rocket is constructed almost completely from fibreglass (with the fibreglass airframe tubes and coupler tubes from Giant Leap Rocketry), with aluminium and stainless steel sub-components in non critical areas, a Pete's Rockets 54mm diameter aluminium motor retainer and a Dupont Zytel ACME fin canister (from Pete's Rockets).

Again, because it was to be used for potential altitude record setting flights, and generally for high altitude flights, nothing could be left to chance. The rocket was designed for multiple redundancy, with twin ejection systems for both the drogue and main recovery systems, as well as twin altimeters for recovery system deployment.

Payload Section

For the main payload bay module and the ejection system, I had taken notes from the methods used by a number of other UK rocketeers, most notably, Robin Tomes, Bob Arnott and Pete Davy.

The fibreglass payload bay has one bulkhead permanently fitted in place by Devcon 2-ton epoxy. The other bulkhead is retained by 4 countersunk screws and by M4 bolts attaching to 2 lengths of steel M4 studding which is permanently fitted to one bulkhead by Devcon 2-ton epoxy, and bolted at the other end after the other bulkhead is screwed into position, and the M4 studding is passed through 2 holes in the other bulkhead designed to allow it to pass through for bolting. This system provides tremendous strength for shock loadings at drogue and main parachute deployment, and also allows easy access to the avionics in the payload bay for modification, programming or prepping.

The bulkheads are equipped with twin LES/Safeject holders epoxied to the bulkheads, with hard mounted M3 screws epoxied in place for the use of the Safeject holders. Each bulkhead is fitted with a main M5 U-bolt onto which a Quick-Link can be attached for the recovery system. The positioning of the U-bolt and an attached



Blitzspear schematic

Quick-Link was designed so that the Quick-Link would clear the LES/Safeject holders on either side of the U-bolt.

There are 2 x 5mm diameter aluminium tubes also fitted and epoxied into the bulkhead to enable igniters to be easily threaded into the payload bay, and to prevent gases from the expulsion charges from being directed into the payload bay. The reason for using 2 aluminium tubes is that so each igniter to each separate LES/Safeject holder passes through a separate tube to prevent confusion.

The payload section is 12 inches long, and is designed to accommodate an AED R-DAS flight computer, a G-Wiz LC Deluxe altimeter/accelerometer, a Blacksky Research ALTACC altimeter/accelerometer and a MARS MkII 433 MHz telemetry module.

Recovery System

The recovery system consists of a 2-stage recovery system, with a PML streamer deployed at apogee from a 10 inch long drogue/streamer section (6 inches useable volume), and a main parachute deployed at low altitude from an 18 inch long (14 inches useable volume) main parachute section. 4mm diameter kernmantle climbing cord is used for the shock cord, with a 3 metre length used for the drogue/streamer section and a 4 metre length used for the main parachute section. Both drogue and main sections are also equipped with Nomex flame shields to protect the parachutes.

A Nomex flame shield is a simpler method of parachute protection than either a piston or an exhaust baffle, and provides a simple method of protection (simple is generally good for high performance rockets, where it is often a good idea to reduce the number of things that can go wrong).

The ejection system uses 2 Safeject holders for each parachute or streamer. Each Safeject holder contains an electric match which is wired to an altimeter. Having 2

10...9...8...

Safeject holders for each stage of recovery allows 2 independent altimeters to be used for deployment, with each altimeter wired up to a different electric match and Safeject holder.

Motor Section

The motor section consists of a fibreglass tube section with an ACME fin canister epoxied to it with Devcon 2-ton epoxy, and a bulkhead fitted with an M5 U-Bolt to provide the motor section with an anti-zipper design. The fin canister is faired into the fibreglass tube using P38, and because of the fin canister's greater diameter than the fibreglass tube, a small fibreglass power bulge was constructed at the other end of the fibreglass motor tube, and faired in with P38, this allows accurate placement for rail-guides (a rail launcher is the method of launch for the rocket, since it is more rigid than a rod based launcher). A Pete's Rockets 54mm diameter aluminium motor retainer is epoxied with Devcon 2-ton epoxy onto the end of the motor tube, to prevent the motor from sliding out of the rocket.

Finishing

The rocket was first spray painted with 4 coats of car primer sprayed on from a spray gun fitted to a compressor system. In between each layer, the airframe was sanded down lightly with 240 grit wet n dry. The rocket was then spray painted with the gloss colours. Again, the airframe was lightly sanded between each layer sprayed on. The main colour used was gloss orange for easy visibility. The payload section was painted with gloss black and white tracking stripes, and the nose cone was painted gloss black.

Avionics

One, or more of the following:

- R-DAS Flight Computer
- ALTACC altimeter/accelerometer
- G-Wiz LC Deluxe altimeter/accelerometer
- Mk II MARS 433 MHz Telemetry System

Specifications

Diameter	54mm
Length	2000mm
Motor Mount	54mm
Airframe Material	Pure fibreglass
Number of fins and fin geometry	3 Clipped diamond
Recovery System	2-stage PML Streamer at apogee PML 4 foot diameter Main Parachute at low altitude

Launches

Blitzspear has now made 5 launches - all on hybrid motors. On its last flight, powered by a Hypertek J-200 hybrid rocket motor, the exterior of the fuel grain had burned as well as the interior. the result of this was that part of the motor tube was rendered useless for anything other than launches on 29mm diameter motors, so Blitzspear is destined to live out its days flying on smaller hybrid motors.

Launch	Avionics	Motor	Recovery
1	ALTACC	I-80H	Rocketman R3C Pro-XP
2	ALTACC	I-80H	Rocketman R3C Pro-XP
3	G-Wiz LC Deluxe	I-80H	Rocketman R3C Pro-XP
4	R-DAS & ALTACC	I-80H	Rocketman R3C Pro-XP
5	R-DAS & ALTACC	J-200	PML Streamer & Rocketman R3C Pro-XP

Editor's note: You can read more about Blitzspear and Richard's other rockets on his web site:

www.ukrocketman.com/rocketry/

Micro Hybrid

by Roy Trzeciak-Hicks

While surfing the web about a year ago I bumped into Rene Caldera's web site which went into detail about a small hybrid motor that needed no ground support equipment, this sounded good to me. I read on to find that Rene was marketing a kit of this tiny hybrid that uses NOX bulbs similar to the CO2 sparklet bulbs in Soda Siphons. I ordered my kit for a micro hybrid, at this point I had no idea as to how I was going to make it, as it needed access to a lathe to turn the parts and I had not touched a lathe since school! Having ordered the kit I started to look for a supplier of the NOX bulbs here in the UK. Initial attempts came up empty, so I contacted the manufacturer, ISI, in Germany and asked where I could get them. They in turn put me in touch with the importer, who gave me the details of my local stockist. One right here only 5 mins from my work and the other about 30 miles away. As it turned out the one 30 miles away was a lot cheaper than the local supplier so off I went to get some bulbs.



Micro Hybrid kit

Now I had the bulbs, no kit as yet, next I looked up a supplier of the o-rings used in the hybrid and ordered a minimum qty of

each size used in the hybrid, little did I realise how long the life of an o-ring can be, you don't have to throw them away each firing like an Aerotech reload, I still have not thrown one away!

My kit arrived in the post and I opened it immediately, there were all of these bits of metal it looked nothing like an engine and the nozzle was still a solid bar of graphite, now I had to find out where I could get it turned up. I looked up a few engineering companies that did prototyping and small project work but the cost of getting them to turn it up was way too high, so I thought about asking an electronic and mechanical college in Milton Keynes that I went to after I left school.

I contacted Milton Keynes Training and asked to speak to the teacher who deals with the lathes, I was put onto Duncan Stampe (now a UKRA and EARS member) Duncan said he could get it turned up for me I met up with Duncan and handed him the parts and the diagrams of how each bit should look. I had modified the injector and nozzle diagrams to give me several nozzles and injectors of differing sizes, these would give me the ability to have a short fast burn engine, a longer lower thrust burning engine, or something in between.

During the time Duncan was making tools to make the motor and then making it, I was thinking about testing it. I looked at designs of test stands that I had found on the internet, Looking at A to D converters Pressure/strain gauges etc to measure the thrust from the different nozzles and injectors.

10...9...8...

I never did build anything though as the sensors that I could find were expensive and I was unsure about the computer interface and interpreting the results. So I gave this up as just a dream; I would just have to fly the motor in its different configurations and visualise the results.

After a few months Duncan got in touch and said he had completed the motor. I picked up the motor and that day set about making pre-heater grains so I could test it. Rene said to use Blue Thunder reloads cut out to fit the pre-heater well. I had not got any BT reloads and wanted to test it the next day so set about gluing black powder together to form the grains. I moulded them in the well but to ensure they did not stick to the well I lined the well with paper, different glues were tried and the best found to be watered down PVA wood working glue.

Test day I modified some Estes igniters to fit through the nozzle to ignite the pre-heater grain, I cut the burst disks out of an empty fizzy drink bottle and assembled the motor. It was clamped into the Black and Decker work mate set up at the entrance to the garage, the Video camera was set up to film the first firing. The old Estes launch controller was hooked up to the rewired Estes igniter and a count down began. 5..4..3..2..1.. Whoosh! The little hybrid burst into life and it was a short clean burn. The hybrid burnt for just under a second and gave off no noticeable smoke. Looking back at the video (this was a dusk firing) all that can be seen is darkness then a bright yellow flame with red sparks. The Micro Hybrid was static fired a further 4 times all as successful as the first.



Assembled Micro Hybrid

The performance of these small hybrids is reported to be in the upper band of a D class engine.

The best thing about this little hybrid is it burns paper, a paper fuel grain rolled out of brown paper, the pre-heater grain an originally and the NOX bulb are all that is to be replaced between flights giving a flight cost of under a pound.

Having completed static testing I flew one of these in a purpose designed and built rocket, using a magnetic apogee sensor to deploy the parachute, the first flight of the micro hybrid was at the EARS launch back in November, The rocket shot off the pad so fast that I lost sight of it. We all heard the ejection charge go off, then there was a whistle and a thud. I saw the tail section come in ballistic and stick into the mud the Hybrid survived but the magnetic apogee sensor was lost. In my haste to test this engine I forgot to secure the parachute compartment to the payload section and the rocket had separated at the wrong point hence the parachute section and motor/fin section came in ballistically but the nose cone and payload section complete with electronics was lost.

The rocket was rebuilt and, with a new magnetic apogee sensor obtained, the rocket was ready for the next EARS launch. Unfortunately I over did the ejection charge and blew the parachute off, but the engine performed flawlessly. Several more flights were had by the engine and magnetic apogee sensor, all performing perfectly.

My first failed launch of the micro hybrid occurred when I forgot to peel off the paper from my home made pre-heater grains this insulated the burst disk so much that it did not rupture. My mistake was immediately identified and has never happened again.

My second failed launch was at UKRA2001 when the engine was placed into a rocket made of 2 Pringles' tubes, one on top of the other. This rocket was built the night before at UKRA2001 and all I had for bulkhead and centring rings was balsa sheet. Well when the engine lit it ripped the motor mount from the balsa centring rings and went through the rocket, the rocket managed to climb to about 50ft before crashing.

10...9...8...

Needless to say the track record for rockets flown on my first Micro hybrid may not be too good but most of these failures are down to recovery. The boost of this engine is fantastic as most who have seen it fly will vouch.

I liked this little hybrid so much I bought the company... Not ...but I did get rights to manufacture the hybrid under licence of Rene and sell them as pre-built engines, so those that don't have access to a lathe can still fly one of these little hybrids. If anyone is interested these will be ready soon and will come with all aluminium parts anodised. I can also sell you under licence the plans and kit so you can make your own.



Micro hybrid flight

Editor's note: You can find out more about micro hybrids at: www.hpr.org.uk/mhybrid/

BAE SYSTEMS

ROCKET CHALLENGE

Hosted by
Black Knights – West Midlands Rocket Club

To be held at
Brookhouse Farm, Ham Green, Redditch

On
Sunday 16th June 2002

The Competition

There are three classes:-

Egg lofting for 11-14 year olds. Max engine size "D", Single motor only.

Egg lofting for 15-18 year olds. Max engine size "D", Single motor only.

Pollen Survey above 300m. Max engine size "D", Two motors allowed.

Open to - Any school or youth group

For an application form and copy of the rules contact

BAE SYSTEMS

**RO Defence
Rocket Motors
Summerfield
Kidderminster
Worcs.
DY11 7RZ**

**Mr I Johnston
Tel. 01562 82 8147
E-mail ian.johnston2@baesystems.com**

(Last entry 2nd April 2002)

For additional details and to view a copy of the rules you can visit the Black Knights web site
www.blackknights.org.uk

Due to last year's outbreak of Foot and Mouth the venue for this event may change full details will be posted on the website.

What's happening in Italy?

by Stefano Figoni

Model rocketry in Italy has gone through many ups and downs during the last 20 years. Although the interest for this hobby has always been quite big, the main problem for Italian enthusiasts has been the limited availability of rocketry material. Kits and motors appeared on the retailers shelves from time to time, only to be banned or retired due to their supposedly dangerous use. The reason for this is the application of fireworks rules to model rocketry, which calls for special licences both for importers and retailers. In the early '90s one of the main Italian hobby distributors started selling Estes kits through the common hobby retailers, with good success. They also kept the retailers informed about the hobby, thus showing an uncommon seriousness about this issue. Following another retirement of the kits by the authorities, for the usual reasons, the distributor went through a legal battle to legalize motors selling, and won. Since then, motors were no longer included in fireworks' classes and no longer considered explosives. Nevertheless, the cold acceptance of the hobby by the traditional retailers, with them considering it only a game, was the main reason for these products to almost disappear from the market. It wasn't until 1997 that model rocketry started again in our country, thanks to the huge development of the internet.



Flyer's line up at MIR2001

When the first Italian model rocketry website (RocketsItaly) had been made, it attracted immediately a group of enthusiasts who started to exchange their ideas via e-mail messages. As the group grew, the need of a common name and some sort of association was seen as obvious, therefore 'ACME' was founded, the name taken from the famous Wile E. Coyote 'supplier'.

10...9...8...

At the moment ACME controls all the model rocketry activity in Italy, with about 200 enthusiasts scattered across the whole country who keep in contact through the mailing list. The main internet source for rocketry information in Italy is RocketsItaly (at the moment undergoing a complete restyle) at www.razzimodellismo.org. The ACME website is at www.razzimodellismo.it, and the mailing list razzimodellismo is hosted by yahoo.com. All these sources are written in Italian, although a translation in English is provided for those events which could attract modelers from other countries. The mailing list is the best way for ACME to give advice to newcomers, keep people informed about the activities in Italy and abroad, and to stress the importance of the safety rules. This has worked very well so far, as the retailers of rocketry material are still almost non-existent.

There is only one supplier of rocketry items in Italy which offers a comprehensive selection of kits and engines imported from the USA or other European distributors. It serves almost every modeler in Italy as well as many in the rest of Europe and even in the USA. It's Sierra Fox Hobbies www.sierrafoxhobbies.com, founded by one of the ACME founders. ACME members follow NAR and Tripoli safety codes for their activities. In our country this is particularly important because the hobby is still young and there is always someone tempted to make motors himself without the required knowledge.

ACME activities consists of regional launches, organized locally by groups of members on a random basis, and a national meeting which is held usually at the end of April or beginning of May. The national meeting is named MIR,

page 16

which stands for Italian Rocketry Meeting in our language, beside being the name of the former Russian Space Station. We had two national meetings so far, the first being held in year 2000, and both saw the participation of members from all over the country and modelers from neighbouring countries.

The meeting is open to any size of rocket, from typical model rockets to HPR, which follows Tripoli and NAR safety codes. At these meetings we have usually six launch pads, with rods of the most common diameters, and two rails. Some ACME members attend meetings abroad quite regularly (Switzerland, Slovenia). HPR is in its infancy here, as there are only seven L1 certified people in our country. Not having a Tripoli prefecture here, we have to attend the launches of Tripoli Switzerland which is convenient only for those of us that live in the north.

The absence of an Italian Tripoli prefecture is one of the main reason for the slow development of HPR in our country, other reasons being the relative difficulty in obtaining the motors and the high costs.

It is worth noting that model rocketry (and HPR) in Italy is not regulated at all, as well as other hobbies like RC airplanes or cars. With motor sales being allowed the government agencies pay little or no attention to these activities, as long as they are run in a safe manner. However, our meetings always take place in small airports or private fields to avoid occasional undesired visits from any misinformed people. We have just made an agreement with an airfield near Bologna (northern Italy) where we have small meetings once every 6 weeks, and we will have our national meeting there next spring. Having a fixed base is a good way to attract people from the surrounding areas.



Flyer's line up at MIR2000



Stefani Figoni supervises L1 certification of Paolo Cosetti & Stefano Innocenti



Stefano assists with Paolo's L1 launch

One of the main problem we face regarding import of motors, is that although they are excluded from being classified as fireworks, this exemption cannot be used when they are shipped with the common 1.4 label on the boxes, as happens for international shipments coming from countries outside EC. It's one of our usual nonsensical rules. For this reason we can ship motors abroad without restrictions, as well as import them from EC countries, but things become very hard when motors come from USA or Switzerland.

To summarize, model rocketry and HPR in Italy are growing at a steady rate. The ACME association is working hard to promote the hobby and it is obtaining very good results through the local and national meetings, where the organization is always very efficient. Connections with modelers of other countries is very good and we are always glad to have guest modelers from abroad to attend our launches. The good climate, friendly people and lovely food makes Italy one of the best places to have a rocketry meeting in a relaxed atmosphere.

Tyrus Bullet 54

by Paul Timoney

The idea of building rockets that were capable of achieving higher altitudes and faster velocities first came to me early in 2001. My basic theory was that the rockets that I had been building were fairly inefficient. The main reason for this was that I was using large diameter air frames (4 inches) with small diameter motors (29/38mm). I had the idea of building a rocket that I could fly at most launch sites on my small existing 38mm casings but could up the power for other sites ("Bog lob"). The final solution was to be the "Tyrus Bullet 54" or the TB54 for short.

Description

The rocket was constructed from PML 54mm phenolic tubing, a PML nose cone and G10 60/30 supersonic fins. The rocket is equipped with a back up ejection system. This is a timer set for 1 second after apogee which ejects the 54 inch home made 'chute rearward. However the motor ejection is used for primary ejection ("I" class flights and under). The rocket has been reinforced with 2 layers of 4oz fibreglass and epoxy resin.



TB54 parts

10...9...8...

Construction

The initial construction started at the start of May 2001, however things were soon stopped as my exams were starting. I only had time to fill and sand the tubes. Once the exams were over and done with it was time to get cracking.



TB54 layout

Firstly I set about cutting 3 slots in the booster section for the fins. Once that was done I epoxied the 4 centring rings to the 22 inch long 38mm motor tube. I had mounted 2 M3 bolts on the aft. centring ring for motor retention. I also epoxied on a 25mm piece of tubular nylon, which was reinforced with fibreglass. I now epoxied this whole assembly in to the 24 inch long booster tube. The next task was to attach the fins. They were applied using the through the wall mounting method, for maximum strength. The fin joints were filleted with epoxy. The complete booster section now gained 2 layers of 4oz fibreglass and epoxy resin and a lot of sanding. The parachute section was made from a 54mm tubing, 18 inches long. In one end it had a 4 inch long 38mm tube which had 2 centring rings (one notched) and a piece of 25mm tubular nylon. Again the strap was fixed with epoxy and fibreglass. This was to be used as a recovery hard point. The tube was recessed 2 inches into the parachute tube. The parachute was protected with Nomex heat shields. This section received 2 layers of 4oz fibreglass and resin.

Next I went about making the coupler bulk plate that would house the BP ejection charge. This was done by epoxying the bulk plate onto a coupler tube and the epoxying a LES holder onto the bulk plate. I was to use a LES for housing the actual ejection charge. The recovery electronics section was made from a 54mm tube, 12 inches long. And of course it was given 2 layers of 4oz fibreglass and resin. This was capped off by the 54mm PML nose cone. The rocket uses 2 ACME 3/8 inch launch lugs.

IRW 2001

I planned to fly the rocket at this event, the motor of choice was to be a I357-10T. It was simulated to 2357 feet, would have a maximum velocity of 133 m/s and an acceleration of almost 19G! I stayed up until 1 a.m. on Saturday night finishing the timer mount. The next morning I prepped the motor and headed up Ward Hill for the launch. The timer was borrowed from Jim Mac (thanks for that). It used a toggle switch for arming and a pull pin for activation. After Darren and Jim helped me set it up on the pad there was a count from 5. The TB54 roared off the pad and had a short 1 second burn. It then coasted and reached what seemed to be the predicted altitude, deploying its 'chute perfectly. I was well pleased. It then floated off in to the distance and was recovered by me and my Dad 10 minutes later.



Motor Prep



Paul, Jim and Darren ready the TB54 for flight on the pad



Paul and his Dad recover the TB54

Level 2

I now plan to carry out a few modifications so that it will be capable of 2 stage recovery. I will hopefully fly it on a J350 at Bog lob 2002 for level 2 certification (as stated in the "Nike J" article). You can check out the pictures (in full size and colour) at the SARA website: www.sarauk.btinternet.co.uk, click on projects then Tyrus Bullet 54.

First UK flight -

PML Tiny Pterodactyl

by Paul "shax" Shackleton

Taking a nose around Pete's shop at K-Lob 2001, waiting for a break in the obligatory rain, I noticed a new addition to the PML range of mid / high power kits. The PML Tiny Pterodactyl. The kit was propping up the Ostrich egg holder! I have since learned that it was the prize for the egg loft compo... Pete was busy with other punters, so I took the info sheet and had a quick read. Hmmmm, looks promising, think I'll buy one...

Wandered back to the marquee, and finished prepping motors, rockets etc. After launching, watching etc, I returned to pay my "tab", and plucked the kit from the rack. It looked TINY, but having built PML stuff previously, I reckoned it was worth a try, especially as it flies on F to H power!

The kit contents were checked, and found to be correct, all parts dry fitted, and sanded, filed and hacked to ensure a perfect fit. Took all of 5 minutes to complete this arduous task, with most of that being used to remove the shine from the fins! Time for the glue. The motor mount and piston strap were glued up as per the instructions, and left to cure for an hour. While waiting for the epoxy to "go off", I took the 'chute out of its bag. The kit ships with what must be the smallest "proper" 'chute made. Only an 18 incher, I've got bigger drogues in the drawer! I had doubts as to the descent rate, but if PML say it will be suitable, then who am I to argue? I had expected the long fins to be a problem to align, but after wrapping tape round the body tube ahead of the fins, and marking the centre line of each, I fitted the motor mount, and tested the fins again for fit and alignment. No adjustments were needed, the fins were "tacked" in place with small amounts of 5 minute epoxy. The epoxy was left for 20 minutes or so, and the joints were internally filleted with 30 minute epoxy, letting the glue "bleed" through the fin slots. The whole motor mount / fin fitting taking no more than a couple of hours, including time for epoxy curing. The only addition to the design was the fitting of three 5mm Tee nuts to the rear centring ring to hold the homebrew engine retaining plate, and Acme 1/4" launch lugs. That done, the rear ring was epoxied in place, and the whole assembly was consigned to the airing / boiler cupboard for 24 hours. As the average temp in there is around 45 ° Celsius, I have found this really makes the joints set!

The piston assembly needed a new length of 54mm coupler, as I had inadvertently busted the original, after standing on it... It had rolled off the table, and cleverly hid under the table in just the right spot for stomping on! The new piston was treated to a reinforcing ring made from an off cut of 54mm Quantum Tube. I have had pistons damaged from over sized ejection charges (a la EconoJet) and from piston rebound at ejection. The mod only weighs about 5 grams, so is fairly insignificant. The piston was epoxied to the piston strap, and the fins were filleted on the outside using 5 minute epoxy. (Tip get a Wickes silicone sealant spreader, makes great fillets!) The rocket was once again consigned to the airing cupboard and left overnight.

Painting the model took about 45 minutes as I hate waiting the recommended times on spray cans! A light sand with 120 grit wet and dry, followed by a wipe over with isopropyl alcohol to remove grease and dust, quickly followed by several light coats of white primer, and red top coat. Drying was accelerated by hairdryer! Total time for priming, painting and drying was a tad over 45 minutes. Took the rocket in the house, and left for the paint to fully harden for all of a day and a half. When everything had set and hardened, the recovery system was packed into the body, and I do mean PACKED, there ain't a lot of space, and the rocket was successfully swing tested.

Tick tock, doesn't time fly?

Sunday 7th October dawned bright but windy, and after loading the car with several

rockets, and associated hardware, drove the 39 miles to the EARS launch site. I thought I was the only one to venture out that day, as I was first on the scene. Oh well, it was nice to watch the clouds roll in... NOT! The usual convoy of cars was soon seen, and after Pete had set up "shop" I decided (cheers for the input Pete and Roy!) to fly the Tiny Pterodactyl on a G34-7W EconoJet, this turned out to be a slight error in judgment...

Off to the pad I trolled. Got the missile ready. Waited for others to do the same. Cleared by the RSO, gave a count and pressed the button.



First UK flight of PML Tiny Pterodactyl

(Photo courtesy of Bob Arnott)

The rocket screamed into the sky, weather cocking due to the wind. Damn, those Econojets have a long burn! Being such a small rocket, I nearly lost sight, but just after apogee, the ejection charge fired, and the 'chute was seen to deploy. BUT..... The wind up high was taking the rocket at quite a rate. Several people saw the rocket land what was assumed to be "just behind the hedge". But after over 2 hours searching (thanks Roy), yielded no sign of the missile. First flight of a PML Tiny Pterodactyl in the UK, and the first missile I had lost. Maybe I should have used a G34-4W, which would have deployed earlier, but may have resulted in successful recovery. Went home in a strop, and even forgot to pay my flight fees (sorry Bob).

Every cloud has a silver lining, and at the November 2001 EARS launch, I was summoned by Bob Arnott. The farmer had found my rocket yards away from his house. It must have landed in his private garden, the only place not searched. Gave it a good clean inside to remove the residue from the ejection charge, and prepped it for the second UK flight of a Tiny Pterodactyl. The motor was once again a G34-7W. It screamed skyward, coasted for ages, popped the 'chute at apogee, and landed about 150 yards away! Nice flight.

I then wanted to try it on a smaller motor, and having had a 29mm 60ns casing for over a year without even so much as showing it some AP, I popped in the single F62-T fuel grain, and used a medium delay. Trotted off to the pads, and lobbed it. Once again a very nice flight to about 1000 feet, chute deployed just after apogee, and the rocket landed no more than 15 yards from the pad.

As soon as the weather is kind enough, I am going to try an H238-T... but the wind must be nonexistent, as this small kit is simulated to go out of sight real quick, and I don't want to lose it again!

All in all, the PML Tiny Pterodactyl is a superbly versatile kit, that is capable of nice flights on an F motor, and truly neck snapping on a H238-T! Equally suitable as a decent sport flier, or as a serious Level 1 certification rocket, although a slight mod, detailed in the kit, would be needed. The Quantum Tube construction lends itself well to relative newcomers to the sport, and the extreme range of motor sizes must make it attractive to those on a budget. Or as a high power kit for the brats to lob while Mum or Dad lob the rest of the fleet! Building the kit posed no problems, and construction could have been completed easily in a weekend. I like this kit, and have just ordered another so I can have drag races with myself using H238-T's, now that's got to be interesting!

The Soviet Manned Lunar Program

(Part 4)

*edited & compiled by
Marcus Lindroos*

Explosion On The N1 Pad

The Soviets were now ready to test their various lunar-landing spacecraft for the first time. The first to go was an unmanned Ye-8 lunar rover which would have landed on the Moon and relayed back TV pictures of the landing site. But its UR-500 rocket exploded 40 seconds after launch on 19 February 1969.

On 21 February the first N1 booster (number 3L) roared to life and the giant rocket began to rise skyward. However, at 12:19:12 Moscow time (66s after launch) a leaking oxidizer pipe started a fire at the rear of the first stage and the unmanned L1 payload's escape system activated, pulling it away from the booster. The N1 was destroyed by range safety while the L1 landed safely. Heat and vibrations from the first stage's 30 engines had damaged the rocket, it was later determined. The launch went virtually undetected in the West with only a British observation team reporting it, although CIA dismissed the report (Vick,1996).

The Soviets were now running out of time. The Apollo 9 astronauts successfully tested the Lunar Module in Earth orbit one month after the N1 launch failure, and in May the crew of Apollo 10 ventured to within 15 kilometers of the lunar surface in a dress rehearsal of the Apollo 11 mission. Only a miracle could save the Soviets, who nevertheless pressed ahead. The first two Ye-8-5 'Moonscoopers' failed to reach Earth orbit in April and June, respectively.

10...9...8...

After some changes, a second N1 launch attempt using rocket number 5L was made on July 3 at 23:18:32 Moscow time. Nine seconds after liftoff at an altitude of 200 meters, disaster struck. A piece of debris entered the oxidizer pump of one of the engines, causing it to explode. The explosion wiped out other engines and vital control systems, and the N1 engine control/thrust coordination system shut down the remaining engines. The launch escape tower then activated and pulled the payload (an unmanned L1 spacecraft) away from the booster, which fell back towards the pad. The resulting giant explosion completely destroyed pad 2 and also did significant damage to pad 1 and an N1 mockup 500 meters away (Lebedev,1992). CIA quickly discovered the damage when scrutinizing spy satellite photos of the Baikonur Cosmodrome a few weeks later.

The last Soviet hope was now the Ye-8-5 program and on 13 July 1969, an UR-500 booster finally hurtled Luna 15 towards the Moon. Three days later, Neil Armstrong, Edwin Aldrin and Michael Collins entered their Apollo 11 spacecraft as millions of people all over the world were watching the event on TV. But the Soviet probe's landing systems failed and it impacted on the Moon as the Western media was trying to figure out what its mission was. The same day, on 21 July 1969, Neil Armstrong became the first man to walk on the Moon. The Soviets had lost.

Picking Up The Pieces

The triumphant return of Apollo 11 on 24 July marked the ultimate humiliation for the Soviet space planners. Frustrated by one failure after another, the past two years had been marked by one misfortune after another. Beaten in the around-the-Moon race, beaten in the on-the-Moon race; even the Ye-8-5 Moonscooper had failed. Nothing seemed to go right. It was a dramatic contrast to the early 1960s when the Americans could do no right and the Soviets could not go wrong.

When it was found out that it would take two years to repair the N1 launch pads, rumors started to fly that the project might have to be cancelled altogether (Newkirk,1993). But Mishin still enjoyed enough support in the Politburo to keep the N1 alive. While the launch complex was being rebuilt, the N1 first stage engines were tested vigorously. Mishin was also ordered to begin work a more advanced manned lunar-landing project called L3M. If they could not be first, the Soviets reasoned, they could still be best. The program would eventually be reorganized around the concept of extended stays on the Moon that would be longer than the brief visits made by the American Apollo astronauts (Logsdon,1994). Meanwhile the triple flight of the Soyuz 6,7 & 8 spacecraft in November 1969 gave the Soviets something to cheer about, although that mission was part of the forthcoming Almaz space station program.

Unmanned Tests And Lunar Exploration



Ye-8 Rover

The Ye Luna program finally began to yield results. After three more launch failures, Luna 16 finally became the first successful Ye-8-5 craft on 12 September 1970, returning a few grams of soil from the Sea of Fertility. It was a remarkable achievement by any standard. In October 1970, Luna 17 landed the first successful Ye-8 rover on the Moon. The vehicle, called 'Lunokhod 1' by the Soviets, lasted nine months on the lunar surface and travelled almost 11 kilometers. The USSR now claimed the Lunas were ten times cheaper than Apollo and far less risky than a manned mission.

Meanwhile the L3 spacecraft were finally ready for launch. The LOK propulsion systems were to be tested in orbit using a prototype named T1K while the LK lander systems would be tested on another vehicle named T2K. Lack of funds (and available Proton boosters-?) meant the T1K was never launched. But the T2K flew three times in Earth orbit because Mikhail Yangel insisted that his propulsion module be tested thoroughly before a manned landing was attempted (Pirard,1993).

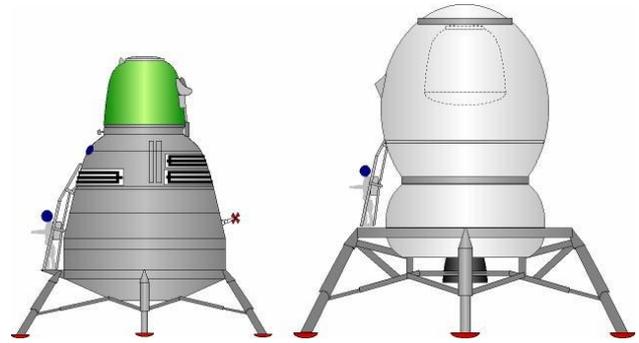
The vehicles were tested secretly under the Cosmos label, but Western observers monitoring them still suspected a link to the manned space program (Harvey,1996).

The T2K tests took place in November 1970 (Cosmos 379), February 1971 (Cosmos 398) and August 1971 (Cosmos 434). Various contingency modes and the ascent from lunar orbit were simulated successfully and the LK lander was declared ready for manned flight following the Cosmos 434 tests (Pirard,1993). In December 1970, Cosmos 382 successfully tested the operation of the Block-D rocket stage in space, which would be used by the L3 complex during lunar orbit insertion and descent to the surface. Cosmos 382 consisted of a modified L1 spacecraft with instruments installed to monitor the behavior of the Block-D propellants under weightless conditions. A second launch in November failed to reach orbit.

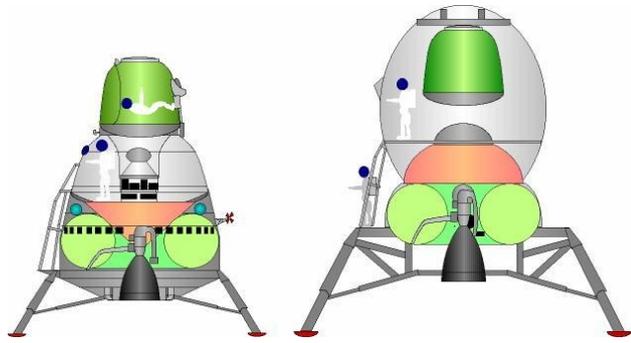
At the same time, a manned test of the LOK/LK docking system in Earth orbit was planned. Two Soyuz craft would be outfitted with the 'Kontakt' docking adaptor - a rather primitive system that permitted successful dockings with poor precision (van den Abeelen, 1994). The active crew, simulating the LOK, would be Anatoli Filipchenko and Georgi Grechko; the passive crew was Georgi Dobrovolski and Vitaly Sevastianov. However, it was eventually decided to replace the 'Kontakt' system with a new one called 'Igla' and the mission was cancelled in January 1971 (Harvey,1996).

Planning The Advanced L-3M Program

The Soviets were now ready to fly the N1 again two years later. Perhaps in order to conceal the true purpose of the launch, the new N1 (number 6L) was not aimed at the Moon. The goal was simply to launch a dummy LOK into Earth orbit. This launch took place from pad number two on 27 June 1971 at 02:15:07 Moscow time as three cosmonauts flew overhead in the new Salyut 1 space station. Soon after liftoff at an altitude of about 250 meters an unplanned rotation caused breakup of the support structure between the second and third stages. Moments later the third stage and lunar complex toppled over, falling near the launch pad and causing damage. The rest of the N1 impacted 20km downrange.



L3M 1970 (left) & 1972 (right) both show GB-1 & GB-2 in landing configuration



L3M 1970 (left) & 1972 (right) cutaways

Despite the failure the Soviets continued the N1 program, but it appears as if plans for (L3-) lunar expeditions were abandoned for some time due to the success of Apollo. (Lebedev,1992). Instead, Mishin presented his now complete plan for the L-3M project to the Council of Chief Designers, which formally approved it in the spring of 1972. The L-3M envisioned a manned lunar mission of two N1 rockets with new high-energy cryogenic upper stages to boost performance.

The first N1 would place a large 25t lunar lander descent stage (GB-1) in lunar orbit. The second N1 would deliver a three-man GB-2 lunar lander/Earth return vehicle weighing 24t. Both payloads would dock in lunar orbit and then descent together to the lunar surface.

The GB-2 would permit 2-3 cosmonauts to spend up to a month on the lunar surface, using a Soyuz capsule for the return to Earth (Vick 1996). Mishin envisaged the dual N1 mission taking place in the late 1970s (Harvey,1996). But it appears as if the Soviet government never funded the construction of actual L-3M hardware and the remaining unmanned test flights had to use existing L3 spacecraft in the end.

More N1 Failures

The fourth and, as it turned out, final N1 rocket blasted off from pad number two early in the morning on 23 November 1972 at 09:11:52 Moscow time. The rocket had been extensively designed since the last failure. The 1st stage engine bay had been redesigned and its diameter (originally 16.8 meters) was reduced to 15.8 meters. Another visible change was that the kerosene pipeline covers on the first three stages were sharpened at the top. The fourth N1 booster (number 7L) was heavier than its predecessors but also designed to be more reliable (Yasinsky,1993).

This time all went well until the 90s mark, when there was a failure of a 250mm line from the liquid oxygen tank. A fire broke out, engines started to explode and the entire 1st stage was shut down 107 seconds into the flight a mere six seconds before second stage separation . . . The escape rocket pulled the payload (an unmanned real LOK orbiter) away from the rocket, which was then destroyed by range safety. Close, but still no cigar.

End Of The Road

The lunar programs of both superpowers tapered off in 1973. Apollo 17 had successfully concluded the American man-on-the-Moon program in December 1972; future missions would be restricted to Earth orbit. The Soviet Luna program was scaled back as well. In January 1973 Luna 21 landed another Ye-8 rover (Lunokhod 2). In May the following year the last Ye-8LS lunar orbiter, Luna 22, was launched (Luna 19 had carried out a similar observation program from lunar orbit in 1971). Luna 19 managed to return soil samples to Earth in February 1971 but two more Ye-8-5 probes had failed by the end of 1974.

Mishin still pressed on. Two new N1s were constructed (vehicle no. 8L and 9L), the first set for launch in August 1974 and the second later that year. The purpose was now to fly the entire L3 mission in an unmanned mode, including a lunar landing. Engineers said that by 1976 the N1 may have become operational (Lebedev,1992). If the missions had gone well, there were plans to use the 10L vehicle to land the first Soviet cosmonaut on the Moon. An alternative plan was to fly an Apollo 10 type dress rehearsal mission, practising spacewalks between the LK and LOK in lunar orbit before the LK made an automatic landing and return to the manned LOK. The first manned landing would have been performed by the 11L vehicle in that case. At least four to five follow-up lunar expeditions (up to N1-15L or 16L) were originally planned (Hendrickx,1995). It would seem that the manned LK/backup LK launch scenario proposed in 1965 was considered for the first manned landing only.

That day never arrived, however. Mishin had come increasingly under fire not only for the failures of the L1/L3 programs but also for the problems of the Salyut space station program. In May 1974, Mishin was dismissed and replaced by Valentin Glushko - Korolev's old enemy. Within days, Glushko suspended the lunar program, instead presenting his own plans for a lunar colony.

During 1974-76 he worked on an entirely new heavy-lift rocket called Vulkan that would have used oxygen and hydrogen fuel just like Korolev had wanted in 1962! Drawings were made of a large manned lunar rover that would have carried cosmonauts across the lunar surface. His plans were opposed by Mstislav Keldysh and the Academy of Sciences, who regarded them as both expensive and premature. Neither the government nor the military were interested. Both regarded the new American Space Shuttle as a bigger (military-) threat so Glushko was ordered to plan a similar Soviet system. The N1 was finally terminated in March 1976 when Glushko began work the Soviet shuttle project. His Vulkan booster became the Energia booster and would instead be used to launch the Shuttle. The remaining six N1s were destroyed (Mishin, 1990; Harvey,1996). The last Soviet lunar probe (Luna 24) departed from the Moon in October 1976.

Epilogue

Had the N1 succeeded, it would have been called the 'Lenin' or 'Kommunism' booster. Instead it disappeared almost without a trace. Scavenged pieces of the superbooster were used as makeshift hangars and storage sheds at the Baikonur Cosmodrome (Landis,1992). The launch pads and vehicle integration buildings were converted to support Glushko's Energia program instead, and the first of the new superboosters took off from the old N1's second pad in 1987. Only the N1's NK-33 engines survived, being perfected by Kuznetsov at his own expense after the N1 program ended. In 1996 they were sold to two American companies to be used on the first stage of new reusable spacecraft! Four surviving LK landers and one LOK ended up in museums or space engineering institutes, where they are used for study today. Mishin was also sent to lecture at the Moscow Aviation Institute and, following Glushko's death in 1989 and *glasnost*, emerged to tell the story of the Soviet lunar program.

Writing about the N1 and L3/L1 projects

years later, Mishin blamed underinvestment (only \$4.5 billion compared to Apollo's \$24 billion), lack of cooperation between design bureaus, failure to grasp the significance of President Kennedy's challenge as well as the technical difficulties of sending humans to the Moon. They should also have done ground testing. Poor management of the 500 enterprises and 26 government bureaus involved was also a major problem (Harvey,1996).

The direct technical reason for the N1's failure was its inability to achieve reliability and thrust stability across the 30 NK-33 first stage engines (Landis,1992). But the real, principal reasons were that (1) the Soviets entered the Moon race far too late; (2) the lack of cooperation between the leading personalities such as Korolev/Mishin vs. Glushko/Chelomei. The resulting duplication of effort was something the Soviets could afford even less than the Americans. In the end, the USSR lost the race to the Moon because it misjudged American intentions and resources, mobilized its own resources far too late, and failed to control its competing schools of rocket/spacecraft designers (Harvey,1996).

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- *Personal correspondence with Phil Clark, Bart Hendrickx (late 1996,1997).*

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- Hybrid Clarification
- 2001 AGM
- Council Meeting 13/01/02
- Competitions
- UKRA 2002 Help

Hybrid Clarification

Hybrids in general, and micro hybrids in particular have recently become very popular. To avoid any doubt as to how the Safety Code (Version 3.0) applies to micro hybrids we would bring your attention to the following excerpts:

"Section 2.02 Motors

(ii) Hybrid Motors

To fly hybrids, the following criteria must be met :-

- 1. The flyer must have passed the examination part of the standard level II certification process.*
- 2. The flyer may only fly hybrids of the equivalent power to his current certification level. (For example - To fly an "H" powered hybrid, the flyer must be UKRA level I certified and have passed the written part of the level II certification. If the flyer then wanted to fly a "J" powered hybrid, they would have to have passed both the written part and flight test of the level II certification.)*
- 3. The flyer, may, at the discretion of the RSO / Certifying Officer, use a hybrid to complete certification flight tests. The hybrid must also conform to the following specifications :-*
 - i. All hybrid motors must have the ability to fill and dump remotely from the safe distance specified.*

This distance shall not, under any circumstances, be less than 100ft or 30m for both the operator, RSO and spectators. For hybrid motors of "I" and greater power, the established UKRA safe distances chart should be used in respect of anyone other than the operator and RSO. It is permissible for the operator and RSO to remain at the 100ft or 33m distance when the safe distances chart specifies otherwise.

- ii. All hybrid motors used at UKRA events must be commercially available units and should only be assembled and flown in accordance with the manufacturers instructions. It is not permissible to alter the rocket motor, its parts or its constituents in any way.*

From the above it can be seen that micro hybrid flights fall into the category of experimental, because of the fill regime. For the avoidance of doubt, the regulations governing experimental flights are given below:

"Section 5 Experimental Flying

Any rocket that has been classed as Experimental (by a Safety Officer, the Safety & Technical Committee or it falls into a class listed below) may be allowed to fly under UKRA insurance. To qualify for such insurance this Safety Code has to be adhered to in full. The flight has also to be fully documented to the Safety & Technical Committee for their review at least thirty days before the flight and approval granted. Any flight involving any of the following will automatically be classified as experimental:

- Powered by a Liquid propellant engine*
- Powered by any motor(s) above O Class Total Impulse*
- Power by any motor that is not UKRA recommended*
- Employing active stabilisation techniques*
- Any home designed / built rocket of non-proven design specified as experimental by the Safety Committee or the Range Safety Officer*

The UKRA Safety & Technical Committee / Safety Officers have no obligation to give a member prior notice that a flight being undertaken by a member may be classified as an Experimental flight. It is the obligation of a member to check their proposed flight

Jennings, James Longhorn. Tony Williams arrived at the close of the AGM.

Apologies

John Bonsor, Pete and Angela Waddington, Liz and Mark Perman and Brian Best.

Agenda

- Chairman's Remarks
- Minutes of the previous AGM
- Annual report of the council
- Financial and Membership Report
- Results of the election to council
- Appointment of Auditors
- Appointment of Solicitor
- Consider alterations to the Constitution
- General Business
 - 1. A permanent UKRA building
- A.O.B.
- Date and Venue for 2002 AGM

Chairman's Remarks

Charles closed the voting, read out the agenda and thanked everyone for coming.

Minutes of the previous AGM

Steve Randall read the previous AGM minutes.

Annual report of the council

10..9..8.. was being produced with increasing regularity, in colour - and said he thought that he felt it was excellent for an organisation of UKRA's size. The web-site improved and kept up-to-date. Three main flying events - roaring success - Charles thanked Pete for allowing UKRA to use his site with increasing frequency. He said there had been some hiccups - in particular the aborted SGM - although Charles thought this had been dealt with in a professional manner.

Financial and Membership Report

Hugh Gemmell gave the financial report. The headline figures were:

with the Safety & Technical Committee (giving at least thirty days notice). The decision of the Safety & Technical Committee must be considered as final in this matter. As the guidelines above cover such diverse and potentially complex vehicles and techniques no specific safety or technical rules can be made. It is the responsibility of the member to provide the Safety & Technical Committee with sufficient documentation and relevant research material to enable the committee to decide on the safety of the proposed flight. The Safety & Technical Committee may allow the flight to go ahead, may insist on changes before allowing the flight or may prevent the flight from taking place. The decision of the Safety & Technical Committee must be considered as final in this matter."

It is understood that the current regulations were not drafted with micro hybrids in mind. As a result, the Safety & Technical Committee has undertaken to produce a revised Safety Code for the consideration of our insurers, via the BMFA. Until such time as any new revision is approved, all flights must comply with Version 3.0 of the Safety Code.

For more information, contact the UKRA Safety & Technical committee at: sat@ukra.org.uk

AGM 16/12/01

Location

Cherry Willingham Community School, Lincoln

Attendees

(Council) Jim MacFarlane, Hugh Gemmell, Mark Turner, Mike Crewe, Pete Davy, Darren Longhorn, Richard Osborne, Steve Randall (minutes), Charles Simpson, Ziggy Kklynoski and Michael Williams

(Members) Malcolm Jennings, Michael

Total Income £6701.02
Total Expenditure £6445.21
Activity Balance £262.81
Income was up 48%
Expenditure up by 67%
Balance down by 72%

Hugh said the biggest expenditure had been BMFA insurance. Spending on stamps & stationary were bigger than usual - with increased mail shots due to the SGM and new constitution. 10..9..8.. printing costs had risen due to the increase in quality. Hugh said he thought the surplus last year was exceptional - and that this years balance was more normal. Membership now stood at 156 - up 25% from last year.

Results of the election to council

Hugh read the results:

Pete Davy 40
Hugh Gemmell 37
Charles Simpson 24
Mike Crewe 24
Mike Williams 22
Ben Jarvis 22
Darren Longhorn 21
Richard Osborne 21
Jim McFarlane 21
Steve Randall 20
Ziggi Kklynoski 20
Bob Arnott 18
Cath Bashford 18
Liz Perman 17
Malcolm Ingram 16
Mark Perman 9 (not elected)

The council then elected the executive:

Chairman:	Charles Simpson	unanimous
Treasurer:	Hugh Gemmell	unanimous
Vice Chairman:	Mike Crewe	unanimous
Secretary:	Pete Davy	3 votes
	Darren Longhorn	10 votes (elected)

Appointment of Auditors & Solicitor

10...9...8...

After a bried discussion, no apponitments were made, it was agreed to discuss again at the next AGM.

Constitution

Charles express thanks to Mike Crewe for his patience and perseverance in producing the revised constitution. The thanks were echoed by many of the people present. Hugh read the results of the constitution ballot. Of the 72 ballot papers received:

votes for: 68

votes against: 3

blank vote: 1

Charles then declared that with immediate effect UKRA was operating under the new constitution (Version 3.1.4). It was agreed that the new constitution would be mailed to members with their renewals and that the new constitution should be published on the UKRA web-site and members emailed.

General Business

A permanent UKRA building

Pete presented his proposal for a permanent UKRA building. Pete said that the cost would be in line with projected marquee costs (£1000 - £1200) - but with the advantage that the hut would be larger and available all year. UKRA could hire the hut out to members & groups. Would require a yearly undertaking with payment monthly. Included in the cost was buildings insurance. Pete said he realised that the hut might be seen as a conflict of interest - particularly by the other vendors who might see it as UKRA endorsing Pete's Rockets. Later in the meeting two other UK rocketry vendors were present and said they did not see a problem. It was agreed that council would consider the proposal.

A.O.B.

Air Navigation order

Pete explained the impact of the new air navigation order. The ANO applies to UK airspace. The order would be published early next year most likely mid February. Rockets would be defined as:

Small (below H) no regulation

(H to M) self regulation

Large (over M)

Military

CAA must be notified 6 weeks prior to launch for large rockets. A review would be done by a third party. The CAA have accepted that UKRA S&T may perform this function for UKRA members.

Safety Code below H

Darren Longhorn queried the BMFA documentation which states: BSMA safety code should be followed below H. He suggested that UKRA should request that the UKRA safety code apply to all flights for UKRA members. Hugh said that the ultimate goal should be a unified safety code.

Same Day re-attempt of certification.

A member had asked about the rules regarding certification re-attempts. After much discussion it was agreed to let the current rules stand. Hugh made the point that the rules should be made clearer to members making the attempt.

Date and Venue for 2002 AGM

It was agreed to hold this the first weekend after the BMFA AGM. The location would be Cherry Willingham School Lincoln.

Council Meeting 13/01/02

Location

Cherry Willingham Community School,
Lincoln

Attendees

Charles Simpson (CS), Mike Crewe (MC), Darren Longhorn (DL, minutes), Bob Arnott (BA), Liz Perman (LP), Cath Bashford (CB), Ben Jarvis (BJ), Zigi Kklynossikki (ZK), Richard Osborne (RO), Pete Davy (PD), Mike Williams (MW).

10...9...8...

Agenda

- Apologies
- Minutes of previous meeting
- Safety Code below H
- Cross certification
 - TRA/NAR/new Euro group
 - Can Euro group use our documentation?
- Definition of an amateur rocket
- Pete's Permanent Premises Proposal
- President
 - Should we have one?
- IRW
- Micro-hybrids
 - Certification level for flying
- AOB
- DVNM

Apologies

Malcolm Ingram, Jim MacFarlane, Steve Randall, Hugh Gemmell.

Minutes of previous meeting

The minutes of the previous meeting (including those of the Constitution Consultation meeting) were read and approved. The list of action points was worked through, and progress noted:

Safety Code below H

Current situation is that UKRA members should be required to use BSMA safety code for G and under. It was generally felt that UKRA members should be able to use UKRA safety code for M and under.

Cross certification

PD reported that he was still pursuing TRA cross certification. CS reported that Mark Bundick (NAR) had suggested closer ties with NAR, and that we should pursue cross certification with them. DL reported that we had been asked to cross certify with a new European association. They had asked if they could base their documentation on ours. It was agreed that we would allow them to do so if they provided written assurance that UKRA would incur no liability.

Definition of an amateur rocket

Should we modify the definition used by UKRA from "nonprofessional rocketry" to "non professional rocketry conducted within the UKRA safety code"? It was decided to retain the status quo, because UKRA should be limited to the activities that are currently insurable.

Pete's Permanent Premises Proposal

PD reported that the premises would be covered by BMFA third party insurance, plus his landlords' public liability insurance. Contents were not covered. PD was asked to investigate this. LP asked if other options had been considered. It was decided that they had. It was agreed to continue pursuing the proposal.

President

MW had suggested that UKRA should make John Bonsor Honorary President. DL pointed out that the constitution did not currently allow for such a position. It was subsequently suggested that John be made Scottish Liaison, and this was agreed.

IRW

The dates for IRW 2002 were queried, as they were not currently known. It was agreed that we should find out, and advertise the event.

Micro-hybrids

PD queried the certification level required for flying micro hybrids. This generated a huge discussion on hybrids in general. Finally, it was felt that the rules regarding micro hybrids and hybrids generally were clear but unsatisfactory. It was agreed that the current regulations should be advertised more widely, but at the same time we should carry out an investigation with a view to modifying the regulations. It was agreed that in general UKRA's approach was to work with manufacturers.

10...9...8...

AOB

Southern Fliers

ZK reported that there was as yet no site for the Canterbury Cup. He received approval to photocopy application materials for distribution at events in the south.

Aqua jets

Enquiries have been received into the status of Aqua jets within UKRA, such as if it was insured, and were we generally interested. It was decided that we should look into the matter. It was further agreed that an extension to the Model Achievement Programme to encompass aqua jets was a possibility.

Charterhouse

LP asked if UKRA wished to "sponsor" a speaker at the BROHP conference at Charterhouse in April. It was agreed that if we could see a summary of the proposed presentation, we would almost certainly agree to this.

UKRA 2002 Event

PD reported that there were lots of things to do such as advertising and asking the membership for volunteers. LP stated that it was the council's duty to run the event, not the members. DL suggested that some members did a lot over the course of the year and did not wish to be heavily involved in the organisation of the event. Much discussion ensued. PD Outlined the layout of the event, including the range head, camping and car parking, especially with regard to security as he wished it to be a public event. It was agreed that the general public would be limited to Saturday, noon until close of flying.

Big EARS

BA asked if Big EARS could be a UKRA event, perhaps over two days, and could organisational and perhaps financial

assistance be given. It was agreed that unless UKRA was to finance the event and take any profits, we would not provide money for hire of marquees etc, but that we would help with the running of it.

Non-exec positions

The following non executive positions were elected:

Safety & Technical Chair: CS

BMFA Liaison: MW

Newsletter Editor: DL

CAA/HSE Liaison: PD

All votes were unanimous.

ANO

PD reported that the changes to the Air Navigation Orders were expected some time between the end of January and the middle of March. It was pointed out that there may be some modification to the Safety Code required. LP queried the enhanced role of UKRA in the new ANO with regard to flights above M. It while the CAA would allow UKRA to assist members' preparation of flight documentation, we are under no obligation to do so.

Promotion

MC suggested that UKRA could produce a promotional leaflet for distribution via mail order and other outlets. Another idea raised was the production of stickers and other promotional materials.

DVNM

Much discussion about alternative venues. In the end it was agreed that the next meeting would be at the same location, on the last Sunday in February (24/02/02). Proposals were invited for future meetings.

10...9...8...

Competition

There was no winner for last issue's competition, so it rolls over into this issue too.

UKRA 2002: Help required!

by Liz Perman

Position: Dedicated, fun loving people required to help with various tasks at the Annual UKRA Flying event.

Dates 7-9th June 2002

Required:

Salary: Sheer pleasure and self fulfilment!

As we all know, the annual UKRA event is drawing near and should be visible on your activities radar for June! I'm sure you will have all heard the old saying "Your country needs you!", well guess what? It's the same type of thing, but this time from your rocketry organisation...

If our gut feelings are correct, this will be largest UKRA annual event to date and to ensure that we offer you a safe and fun event we could do with some extra volunteers.

This is an excellent opportunity, not only for suitably qualified RSOs to increase their RSO experience but also for anyone who is thinking about running their own event. Believe me, you get a different perspective when you're on the "inside"! There are lots of different jobs to do, some which are really good fun and others that may well fit into the mundane category but important never the less! I've personally been involved in helping at lots of UKRA events and I can promise you never a dull moment. The thing that I most like about being on the team is that you meet everyone and feel part of something.

What do you think? Could you spare some time during the event? Do you fancy taking responsibility for an RSO session or helping out as a steward?

Please contact us at 2002@ukra.org.uk and let us know. We look forward to hearing from you.

Rocketry Groups and Contacts

Perhaps the most common question asked by relative newcomers to rocketry is "Where is my nearest club?". Here is a list of all rocketry clubs known to UKRA, both UKRA affiliated and others. Also there is a list of regional UKRA contacts who are happy to be contacted with questions.

If you would like to be listed here, or have your details modified, please let us know.

Groups

AspireSpace

AspireSpace run the NRC (National Rocketry Challenge) a national competition for University teams.

Web site: www.aspirespace.org.uk

BSMA

The British Space Modelling Alliance is the BMFA specialist body for space modelling.

Contact: Stuart Lodge

Email: stuart.lodge1@ntlworld.com

Black Knights

Black Knights are based in the West Midlands. They fly model and HPR rockets and have regular flying events.

Email: blackknights@cs.com

Web site: ourworld.compuserve.co.uk/blackknights/

CROCK

Crock hold regular flying events. Details of events can be found on the Rockets & Things web site.

Contact: Tony Betts

Email: y2ksoftware@btinternet.com

Web site: <http://www.rockets-things.co.uk/>

DSC

The Discovery Space Club are primarily a "space watch" group though they do carry out occasional model rocket flying activities, sometimes in association with STAAR.

Contact: Robert Law

Tel: 01505 815100

EARS

The East Anglian Rocketry Society have a flying site near Cambridge, and regular flying event. See their website for details.

Contact: Steve Randall

Tel: 01473 649454

Email: steve@btinternet.com

Web site: www.spackington.com/

HART

Hornchurch Airfield Rocket Team hold regular flying events. See their website for details.

Contact: Peter Barrett

Address: 22 Grey Towers Gardens,
Hornchurch, Essex, RM11 1JH

Tel: 01708 458463 or 07866 314371
(mobile)

Email: pete@hartrockets.co.uk

Web site: www.hartrockets.co.uk/

MARS

Over it's 10 year history, MARS Advanced Rocketry Society has grown into a national group of rocketeers committed to pushing the limits of non-professional rocketry, developing new rocketry technologies, breaking records and above all having fun!

Contact: Ben Jarvis

Email: info@mars.org.uk

Web site: www.mars.org.uk

North West Rockets

North West Rockets are a small, informal group of rocketry nuts who do it for fun! We are not out to break any records, but do like to make rockets and fly 'em.

Contact: Dave Thompson

Email: DATSCOPE@aol.com

Web site: www.angelfire.com/on/DATSCOPE/nwr.html

NSRG

The North Star Rocketry Group are based in West Yorkshire. They hold model rocket launches locally, and attend HPR launches around the UK.

Contact: Darren J Longhorn

Email: info@northstarrocketry.org.uk

Web site: www.northstarrocketry.org.uk

PRS

The Paisley Rocketeers' Society, founded in 1936, are the oldest continuously operating rocketry group in the world. Involved in almost every aspect of rocketry. Since 1965 the PRS has concentrated on the development of aqua jet rocketry.

Contact: John D Stewart, PRS Honorary Secretary

Address: 15 Bushes Avenue, Paisley, PA2 6JR, Scotland, UK

SARA

Scottish Aeronautics and Rocketry Association. Based in the West of Scotland.

Contact: Paul Timoney

Email: sarauk@rocket-science.co.uk

Web site: www.sarauk.btinternet.co.uk

SERFS

Southern England Rocket Fliers.

Web site: www.serfs.co.uk

SRA

Sheffield Rocketry Association.

Contact: Hugh Gemmell

Email: hugh@cruiserd.demon.co.uk

Web site: www.cruiserd.demon.co.uk

STAAR Research

Space Technology Applications, Astronomy and Rocket Research have three main activities:

- Public and educational rocketry workshops.
- Scale flight research, particularly the Waverider aerospaceplane concept.
- Organisation and development of the annual International Rocket Week flying event, one of the main national events of the UK rocket flying calendar. See website for details.

Contact: John Bonsor

Address: 48 Longbar Avenue, Glengarnock, Beith, Ayrshire, KA14 3BW, Scotland, UK

Tel: 0141 8842008

Email: c/o Bobby Wark

bob@scotroc.force9.co.uk

Web site: www.gbnet.net/orgs/staar/

Thrust

Contact: Mike Williams

Tel: Tel:01283 533848

Email: 100306.20@compuserve.com

Web site: [ourworld.compuserve.com/
homepages/thrust_for_space/](http://ourworld.compuserve.com/homepages/thrust_for_space/)

UKRA

United Kingdom Rocketry Association.
See [page 2](#) for contact details.

WLRS

West Lincs Rocketry Society are based in the design and technology dept. in Edge Hill College in Ormskirk. We hold meetings roughly once a month although it really depends upon the weather.

Contact: Rob O'Brien

Email: club@wlrs.org.uk

Web site: www.wlrs.org.uk

WRS

Wirral Rocketry Society have launch sites in the Wirral and fly mainly A - D power Model Rockets.

Contact: Martin Sweeney

Tel: 0151 335 5415

Email: WRS@i12.com

Web site: www.WRS.i12.com/

UKRA Regional Rocketry Contacts

The following people have offered their contact details to UKRA in order to provide a more local point of contact for any rocketry related questions you may have. Feel free to contact them for advice about rocketry in their regions.

Ayrshire

Contact: Bobby Wark

Email: bob@scotroc.force9.co.uk

Cambridgeshire

Contact: Bob Arnott

Email: bob@fatboab.org

Lincolnshire

Contact: Charles Simpson

Email: chas@helix.ukf.net

London

Contact: Ben Jarvis

Email: rocketandroll@hotmail.com

Merseyside

Contact: Dave Thompson

Email: DATSCOPE@aol.com

South Yorkshire

Contact: Hugh Gemmell

Email: hugh@cruiserd.demon.co.uk

Southern Area

Contact: Zigi Kklynossikki

Email: zigi@ukonline.co.uk

Staffordshire

Contact: Mike Williams

Email: lawn_dart@yahoo.com

Sussex

Contact: Rick Newlands

Email: mewlands@aol.com

West Yorkshire

Contact: Darren J longhorn

Email: darrenlonghorn@yahoo.com

Worcestershire

Contact: Mark Perman

Email: liz.mark@virgin.net