



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

the voice of UKRA

Winter 2002

volume 6 issue 4

National Space Centre Review

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Fins Are For Fish

by Paul Lavin

Lighting a Micro Hybrid

by Mel Sharpe

Launch Reports

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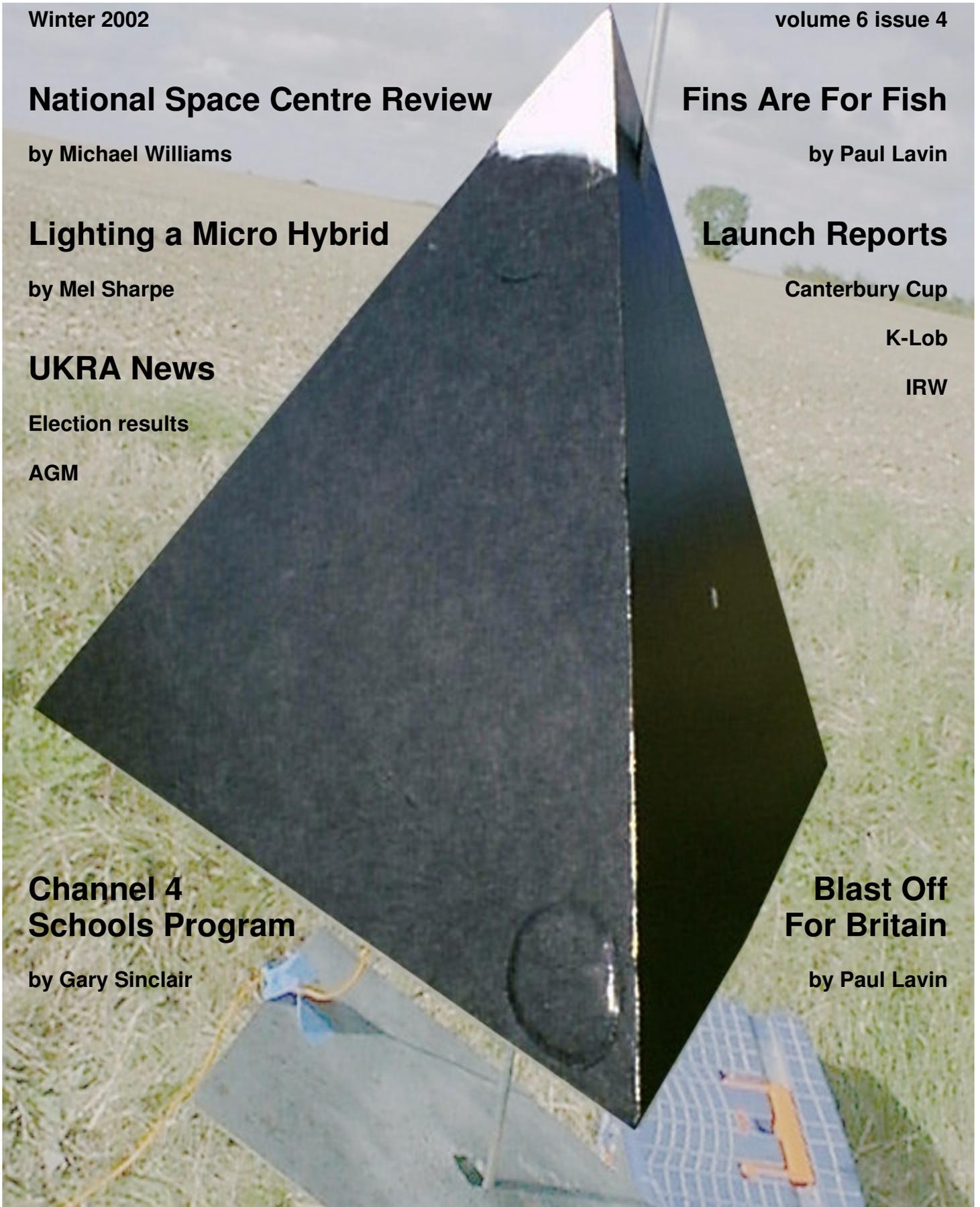
AGM

Channel 4 Schools Program

by Gary Sinclair

Blast Off For Britain

by Paul Lavin



Editorial

Old year / New year

A frustrating year for some of us, what with the scarcity of Aerotech motors and the temporary loss of RATTworks flying. I Still most of us made the best of it with what Aerotech reloads we had in our ammo boxes and some of us went Pro38 or Hypertek. Without the introduction of Pro38s it would have been a much bleaker year. Still I think we can be confident that, next year, Aerotech will be back and the Pro range will be extended (up to Pro150 I hear). There are also rumours of motors from other manufacturers becoming available. All in all plenty to look forward to.

Use of UKRA Hut

One new feature of this year was the UKRA Hut. We used it three times this year for the main flying event, K-Lob and the AGM. Remember that it's available for use by members for other rocketry related uses too. Chris Eilbeck contacted me recently with an excellent idea - rocketry master classes. The basic idea is that someone does a presentation of one of their specialist subjects followed by a hands on session. Ideas so far include fibre glassing, getting the most out of Rocksim, video from rockets, finishing and painting, vacuum bagging, building radio trackers and how to use them. If you have any more suggestions as to what presentations you would be interested in attending, or want to volunteer to run a session, please let either Chris or myself know.

Disclaimer

As we've said before, we like to publish interesting technical articles such as Mel's in this issue, but as Mel himself states in the article it's more of a "what I did" than a "how to". Neither he nor UKRA can take responsibility if it doesn't work out for you.

The Editor

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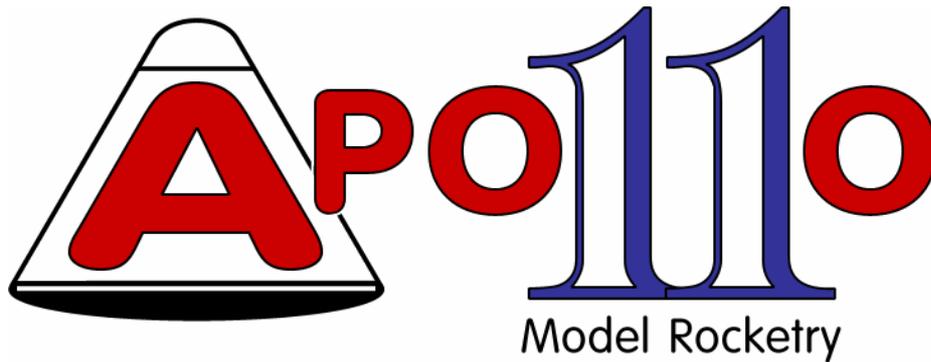
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Cover Photo: Paul Lavin's tetrahedron, BBBB. *(Photo courtesy of Paul Lavin)*



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Lighting a Micro Hybrid

by Mel Sharpe

This is simply a description of how I tried to solve a rocketry problem. It is not to be taken as a set of instructions for others to copy and neither I nor UKRA accept any responsibility for the results of anyone attempting to develop or use a similar type of system.

The problem

My cheque for a Roy T-Hicks micro-hybrid had just gone into the post when the announcement was made that to use part of an AP fuel grain as pre-heater was against regulations in this country. Okay, so it was inconvenient. However, as ignorance of the law is no excuse, I am grateful that someone informed us of the situation in time. So, how could I get the micro-hybrid into the air "legally"? The problem was how to generate enough heat to:

- Light and sustain combustion of an oxidiser-free fuel grain;
- Melt the plastic burst disk;
- Bring about thermal decomposition of the nitrous oxide;

all without "manufacturing" an explosive.

The solution?

My first idea was to use magnesium ribbon as an internal heat source, but static tests showed that there was insufficient atmospheric oxygen in the motor to sustain the ribbon's burning, even with very thin pieces.

How could I keep the magnesium alight? The obvious answer was to put in an oxidising agent with the metal. However, this simply brought me back to the "manufacturing explosives" problem.

Then the idea struck. Why bother with the

magnesium? Just give the combustion chamber a supply of pure oxygen sufficient to get the fuel burning. This should produce enough heat to melt the burst disk and decompose the nitrous oxide from the injector.

Getting the hardware

What I needed then was:

An oxygen supply

I already had a small two-tank oxygen/propane welding kit. The oxygen tank has its own control valve.



Oxygen Supply

A way to control the supply remotely

A solenoid valve purchased from a Liquid Petroleum Gas conversion workshop together with a 12v relay circuit at the end of 120 feet of cable gave me the remote control.

A way to get the oxygen into the motor

The only entry point was the nozzle and this would already have an igniter. So the oxygen input would have to be thin. Mark Perman suggested a hypodermic needle. After twenty minutes with my Thomson local directory a pack of serum needles, perfect for the job, were in my hand by next day delivery. The needle and supply tube are on a sliding mount to accommodate different diameter rockets.

By this time I had discussed the idea with several people and some had mentioned the possible need for a “flashback” arrester. I made one and bought another from BOC.

The rest of the hardware I made from copper or brass tubing and LPG gas tubing.



Fill Stem Assembly

How well does it work?

The solenoid valve is operated by a button on the launch controller.

To date I have attempted five launches:

1. At a Black Knights meeting. On the five of the countdown the “oxygen” button was pressed and held until the rocket launched about two seconds after the ignition button was pressed at zero. Successful launch.
2. As 1 but the oxygen button was released as the igniter fired. No launch. Although the burst disk had melted, the nitrous oxide was not decomposing. More oxygen was applied and the rocket managed two feet.
3. As 1 (at K-Lob 2002). Perfect launch.
4. As 1 (at K-Lob 2002) but with a long delay between setting up the motor and attempted launch. No launch. Inspection showed that the disk had melted and O ring had been pushed past of the nylon grain on one side. My fault, the grain was one that I had turned, too small, myself.
5. As 1 but with a paper grain. Perfect launch.

Three successes out of five, with known reasons for the failures, is a good record for any project.

After each launch the needle has to be re-ground as the heat and blast from the motor give it a definite flared look.



This is as far as it got on launch attempt 2, at this stage about £50 per foot

I am lucky in having a large shed with a good collection of recyclable components and materials. However, total cost of the system, starting from scratch, would be about £200.

Because of this I would not suggest that others try to produce their own versions. Oxygen is a substance to be treated with great respect; especially with regard to contact with aluminium and organic materials such as oil or grease. At present UKRA regulations classify the micro-hybrid as an “experimental” motor. As such, permission from the Safety and Technical “committee” has to be obtained in writing for a launch and 30 days notice is required. Due to the above it is not possible to offer the use of the system to other micro-hybrid owners at this stage. However, if the requirements for insurance cover could be met, I would be happy to share the system’s use at an appropriate launch session.

Fins are for fish

by Paul Lavin

It was a yin and yang thing, really, that got me started on flying tetrahedrons. My daughter Genni and I built a long and lithe “normal” rocket called Back2Mars that was a comprehensively bashed version of the faithful Loc/Precision Lil Nuke kit. After a picture perfect flight on a G at the Canterbury Cup she looked set to get her Level 1 at KLOB with it. I couldn’t let the kid wander off into uncharted HPR realms by herself so I had to have something quickish.

To keep the universe in balance I needed something to counter a long and lovely rocket. Short and squat would suffice with the added qualifiers of fast-to-build and cheap added. Originality would be a nice touch if it didn’t compromise the first four prime requisites.

Having been an admirer of the Rocket Team Vatsaas’ Birthday Party Napkin Rocket of the Apocalypse and familiar with other flying oddities they had built, I took inspiration from RTV member Cory McCormick who did his Level 1 with a tetrahedron. He and I are of one mind on the subject now.

Tetrahedrons are elegant. They derive tremendous strength from their geometry and are aerodynamically stable as long as you keep the CG in front of the CP. I actually did a genuine Barrowmann’s calculation by long hand as trying to use Rocksim to design this bird took more clever than I had on tap. Once I determined where the CP lived I could make sure that, as I increased the power loading, the CG wouldn’t make an arse out of me. There are better ways to do that with a flying tet without imperilling innocent bystanders - as I was to discover.

I love them tets. No fins to set wrong or snap off in the event of hard landings. No expensive and crude plastic nose cones that the paint always falls off. They make a great video platform because, unlike boring rockets, they have little tendency to pirouette around the



Paul with BBBB

vertical axis. And have a handy, flat, rearward facing camera platform into the bargain.

Tets have another charming characteristic: because they have the drag co-efficient of a free falling hay bale, no matter how much motor you put under them you never need to take long monotonous hikes across rugged or squidgy terrain to retrieve them. High drag also means low terminal velocity, an unanticipated property that I was to enjoy at KLOB. Not once but twice.

The overall size of the tet was determined by the motor casing dimensions. I wanted to be able to use a three-grain Pro38 motor with the chance to expand it to five grains for a Level 2 attempt. Pro38 was the safe choice seeing as how Aerotech was busy getting their act back together at the time.

Dusting off my slide rule and trig tables I calculated that equilateral triangles 500mm on a side would do the trick. Black Sky Rockets in the US had some lovely Nomex honeycomb G10 sandwich board... Bzzzzzt... wrong answer! Anytime the shopping list for building a rocket starts with “First, rob a bank” you know that you have to try harder to find the optimum airframe material. I’ll save the Nomex/G10 stuff for my Level 3 tet.

Since the geometry of the tet is so strong I felt that I could get away with foam board appropriately braced. RTV’s McCormick wasn’t too sure, he fancied 6mm plywood. I was pretty confident in my airframe rigidity estimate but I egged the pudding slightly by laminating some carbon fibre tissue onto the finished tet using my favourite lay-up polymer, water based polyurethane.



Prepping for the first attempt

Another nice thing about tets is the unfussiness of the finishing regimen. No sanding and filling spirals for me!

Construction was pretty straightforward using 30-minute epoxy, glass microspheres and a half-mile of low tack masking tape. Motor tube alignment was a bit trickier than with a boring cylindrical rocket.

I built a plenum for the ejection charge and lined it with quilted aluminised insulation. The parachute tube was arranged next to the motor tube with suitable ducts through the wall of the motor tube and a fat wad of steel scrubber pad to intercept any glowing bits that might try to set my contraption alight. The parachute tube, its dimensions constrained by tet facts of life, was a bit short. And so were sown the seeds of disaster.

The launch rod guide runs right through the middle and, in a stroke of inspired laziness, I sharpened the end of a bit of thin wall aluminium tube, chucked it into a drill and bored the odd shaped oval hole in the airframe face quite neatly and precisely where it needed to be, not to mention actually installing the rod guide in one fell swoop.

Forward CG bias was provided by a generous serving of rocket caviar (No. 7). It looked so good that I nearly added chopped onion, hard cooked egg, smetana and a squeeze of lemon. More vodka, tovarsh!

The as-yet-unnamed rocket was starting to look pretty polished and high tech especially when I put some more of that aluminised quilting on the skirt just in case the exhaust was hotter than I surmised. Melting tetrahedrons have very unpredictable flight characteristics and there would be no time for digging foxholes if it headed toward the expectant crowd.

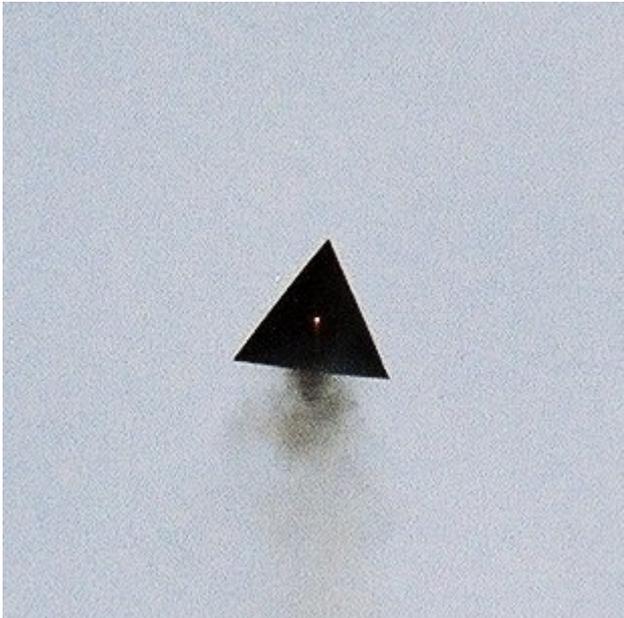
I have an understandable reluctance to eject rocket motors ad lib (and a bigger aversion to scouring acres of hostile rural terrain for said precious objects) so I used a handsome red Rowes Retainer that I proceeded to uglify by grinding a relief for the launch rod. The cover for the parachute hole was a bit of serendipity in the plumbing department. Did you know that 38mm is the size of a drain plug?

Flying Tetrahedron Version 1.0 needed a name. It looked like a tit. A cubist tit, at that. Undeniably, a big cubist tit. And it was black. So it became Braque's Big Black Breast, of course. Always attempt annoying alliteration, I say!

Arrival at KLOB produced the news that nearly the entire UK stock of Pro38s reloads were languishing in some blighted customs shack far from sunny Heckington. I skidaddled off to the Rockets and Things' encampment where I bought most of what little Pro38 gear that Malcolm possessed. He had just sold the last Hs, however. Grrrrrr

Before I could get the rusty fish hooks, bent pins and sharpened No. 2 wood screws into my Pete Davy voodoo doll, Pete kindly handed me the last two Aerotech H242 reloads in Christendom for my daughter's and my Level 1 attempts. Whew! Weekend salvaged! Only kidding Pete! You have my phone, fax and email addresses in case it happens again, though, right? ;-)

First flight for BBBB was with a Pro 38 137G60 with the delay drilled out to 3 seconds. The flight was perfect temporarily silencing the doubting Thomi sniggering in the back rows. However, the parachute demurred to make its timely appearance and BBBB quite majestically returned to earth turning sniggers into chortles.



First Flight Fears Find Foundation

Damn strong stuff that foamboard and the epoxy did a pretty good job of holding things together, too. The Vietnam war vintage flare parachute was just too big for the cavity and the tight pack kept it securely inside quite apart from the overly tight drain plug. I couldn't be sure but some of the damage may have been caused by excess ejection charge needing a way out.

With a half pint of five-minute epoxy and a soupcon (insert cedilla where needed) of microspheres, BBBB was unceremoniously knocked back into a rough tetrahedral shape the next morning after the shock of its maiden flight termination had dissipated. A smaller chute was crammed into the same cramped environs and we were ready to rock with a meaning business Aerotech H242 for a Level 1 attempt... this time with a smidgen less ejection charge but alas, the shortest delay grain available was 3 seconds.

Again a perfect flight followed by non-deployment made all the more galling by the text book Level 1 flight achieved by my child prodigy and Back2Mars beforehand. Who holds the spack record for KLOB? I may be in the running!

Not enough ejection charge? Too long delay? Who knows? (The editor has shortened this portion of the article that consisted of one thousand repetitions of "I will not pack my chutes too tight for reliable deployment".)

Redesigning BBBB for consistent recovery became a priority. I employed what is now known throughout the free world as Lateral Thinking Technology (patent applied for) and suddenly I had twice the volume for the 'chute and, as a no cost bonus, a means to keep the BBBB off its recently healed second round of rhinoplasty.

The price for this retrofit was a magnetic apogee detector, another 38mm Rowes Retainer, a Pratt ejection canister, a bit of BT 50 and a flagon of epoxy and microsphere cocktail. LTT was fiddly to install but it disgorged the chute without any hesitation when I test flew the ejection subsystem in the back garden. BBBB became the first rocket in the history of HPR to sport two Rowes Retainers.



Prepping for the second attempt

BBBB's third flight, on the weekend following KLOB, was completely successful. On a cool and breezy Cambridgeshire Sunday at EARS farm, la tet noir soared skywards despite the catcalls and derision heaped upon it by the disbelieving curs and nay sayers idling about nearby. RSO Roy Trzeciak-Hicks officiated and was the soul of helpful criticism and insight throughout the process.



Rowe's Retainers Reinforce Recoverability

A Pro38 4021170 handled the propulsion honours. The flight was near perfect and ejection was as planned right bang at apogee thanks to Robert Galejs' nifty invention. The wind pulled the tet over after landing and it slid along the unforgiving pebbles. A few scratches were nothing compared to two full frontal spacks up in Lincolnshire.

The Pro38 670J300 is next, perhaps as early as EARs in November. The five-grain J will have the same centre of mass as a three-grain I motor so the flight characteristics should be as before. A slight tendency to arc in the direction of the guide rod orifice may be corrected with a flap secured by the air stream. There have never been any sign of airframe deformation from any flight loading (just from dirt loading) so I think I am still within design tolerance there.

Under construction in my vasty Hesperis R&D labs is a smaller and therefore higher performance tet built out of polycarbonate plastic. This rather interesting bird will be known as Nothing2Hide. It will feature polycarbonate motor and parachute tubes as well. I may fit a transparent parachute to complete the stealth jellyfish rocket ensemble. Bonding of the airframe panels is being done with RTV and some NASA-grade sticky tape. It may fly at Brass Balls if not earlier. There will be lots of nice soft mud for worry-free spacking this winter, I'll bet!

I briefly considered developing a complex tet with a cluster of Estes E9s and C11s to be entitled "Oh, yes you can!" but that might be a joke too inside for anyone to appreciate this side of Mars.

On the drawing board and with some component materials already acquired is a hybrid-powered tetrahedron entitled "Laugh? I Nearly Flied!" No airframe material has been selected for this one yet but I am considering hardwood-veneered plywood. Having glued one and taped one together, why not screw one together?

If I wind up using ebony ply, why not fit an ivory tip? I may then name it Tet Offensive to go with my Vietnam war chute. It might be too pretty to fly... but well snazzy enough for a coffee table aside from the fact that my copy of A Brief History of Time and any drinks would slide off and make a mess on the Karadja.

Tets can be scaled downward, too. Look out for some very silly flying objects... and who knows, maybe kits?

Not only did BBBB earn my Level 1, it impressed those wild and crazy guys back in the US. RTV have subsequently indicated that I was their kind of rocketeer and would formally induct me into the team as soon as they could come up with a suitably humiliating initiation ceremony. Spacking the same rocket twice in two days at KLOB evidently wasn't humiliating enough.



Prepping for the third attempt

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Channel 4 Schools Program

by Gary Sinclair

Late last year I was contacted by a film production company that had been commissioned by Channel 4 to create a schools program that featured children with unique and interesting hobbies. The program would consist of 5 minute segments dedicated to a particular hobby or interest. There would be no speaking or language bias to the program as it was going to be distributed to schools globally. The production company was interested in showing my son Guy build and fly a rocket. After this initial contact and a follow-up phone call where Guy talked 'rockets' with Clare the program's liaison person all went quiet.

be filmed in a single day building the entire rocket, finishing it and then flying it ! Plus, having seen some of the bigger rockets in the family fleet they decided that it should not be a simple Estes (et.al) low power kit. What was wanted was something which would stand out on film and show a degree of complexity.

Problem:

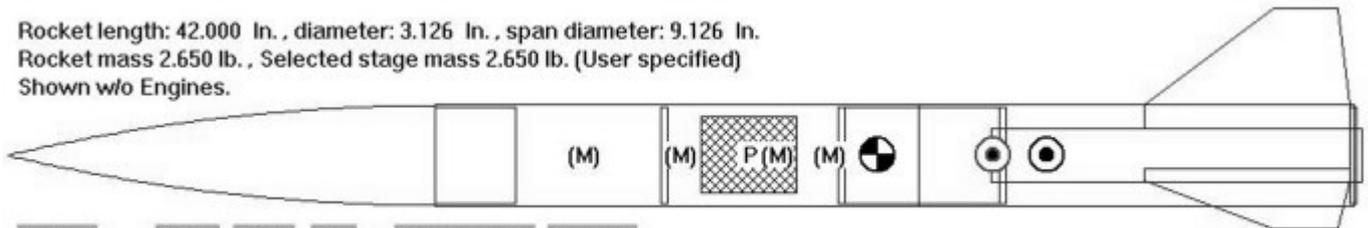
how to build, finish and fly a rocket in a single day?

Answer:

build a series of components in varying states of completion as well as having a completed rocket ready for the flight.

Guy and I sat down to Rocksim and came up with a 3"OD scratch built that would probably do the trick nicely. The rocket would have a zipperless design and use phenolic tubing, G10 fins and a PML nose cone. A 38mm motor tube was selected as the rocket would need to use the available Pro*38 G-I motors.

Rocket length: 42.000 In. , diameter: 3.126 In. , span diameter: 9.126 In.
 Rocket mass 2.650 lb. , Selected stage mass 2.650 lb. (User specified)
 Shown w/o Engines.



Method	CG In.	CP In.	CNa	Static margin	Analysis
Barrowman	27.000	30.581	8.553	1.16	The rocket is stable.
RockSim	27.000	32.243	11.007	1.69	The rocket is stable.

Some months later we received another phone call by Clare wanting to meet Guy and see some rockets and to discuss the program which was resuming its filming schedule. A visit was arranged and Clare was finally able to meet Guy and discuss his interest in rockets and having no experience with rockets see what was involved. Guy showed Clare some of his rockets which were of various sizes and discussed the kinds of propulsion possible and the general mechanism of how the rocket was launched and recovered. Again all went quiet for a couple of months until Clare once again contacted us to set a date for filming. OK we thought it will span a week or so with short filming segments to cover the process of building, finishing and then flying the rocket. As it turned out Guy was going to

Now that a parts list for the completed rocket was known it was next necessary to plan the construction stages required for filming so Guy could demonstrate the building of the rocket in single day. As time was short (only a couple of weeks notice before filming was to commence) I decided to minimize the number of pre built components as much as possible. Having decided upon a total parts list it was time to call Pete Davy and order all of the materials. In the end we had enough parts for 3 complete rockets. After the parts arrived Guy got busy building the completed rocket he would fly. I started building the pre built demo assemblies that Guy would use to demonstrate. The plan was for Guy to show each stage of the construction by performing one or more steps on a given component

then move to a ' completed version' of the component to progress until eventually he would have demonstrated all stages of construction and finishing.

The day for filming arrived. Guy had completed his rocket with only the decal left which would be filmed. All sub components were ready. I left a ' script' of the stages to be filmed for the production crew before driving to work so they could make best use of the time available. The film crew had decided in the end to span the filming over two days with a late afternoon start on the first day and an entire second day for filming.

All of the filming was going to take place in the garden in and around the garden shed used as the work area. The weather was perfect and Guy really seemed to enjoy himself. The first days filming ended with half of the construction steps covered. I took the day off for the second days shooting, ran errands where necessary for extra paint etc.. and organized the launch. Once all construction filming was completed we had a sunny afternoon to launch the rocket. We had decided to launch from the school grounds just round the corner using a Pro*38 G60 reload. More filming was done of Guy loading the rocket and prepping the RDAS which would ride in the forward payload compartment. Two cameras were used for the launch with one just under and left of the rocket for a nice close-up and another filming the ascent. 5.4.3.2.1-launch the rocket climbed very slowly and arched over for a nominal flight. The landing site was the adjacent golf course and the RDAS beeped out 730 feet. The rocket was just a bit too heavy for a G60. The second attempt confirmed this when the rocket struggled to stay vertical and ended up on the turf. With no damage to the rocket sustained we considered our options and I left it open for another launch from the EARS site where we could use High Power motors.

One month passed when I received another call from Clare wanting a re-shoot of the launch sequence. I re-assured Clare that the rocket would fly and that it was a simple matter of thrust to weight where we just didn't have enough thrust before (it was marginal on a G60). So I set about getting access to the



Guy after his L1 certification flight

EARS site which at the time was in the middle of harvest. In the end I was able to secure the 7th of September with Bob Arnott performing the RSO duties (thanks Bob).

Over the summer Guy had also applied for and received his BP/AP handling license. Hence, I asked Bob if he would RSO Guy's level 1 certification at the same time so Guy could prep and launch the rocket on an I170. Again the camera's were setup with one close and one a short distance away. Guy prepped the motor with a 7 second delay, loaded the chute and put the rocket on the pad. 5.4.3.2.1 - launch... the I170 pushed the 2.5lb rocket up to 3000 feet very quickly, deployed its chute and landed a few hundred yards away. Guy had just achieved the youngest Level 1 in UKRA history. A second launch was made with the camera further back to catch the neck snapping ascent of the rocket. This launch was arrow straight and deployed the chute for another successful recovery....

As yet I do not know when the program will air on the Tele' but sometime after the new year is a guess (they will inform me and I will let you all know).

(Photo courtesy of Bob Arnott)



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Canterbury Cup 2002

by Stuart Lodge

Two days at the Races. Edition Three of the Canterbury Cup series, comprising FAI and non-FAI contests, in addition to a mammoth sport flying programme was a brilliant success.

The sole disappointment of the weekend was the absence of overseas competitors in FAI; we were to be blessed with Vlaamse Rakiet Organisatie (VRO) – Flanders Rocket Group – on Sunday. Categories S69-Streamer Duration, S4A-Boost Glider and S9B-Gyrocopter Duration featured, with intense rivalries developing in what was now the British Championship! Rob & Matt O'Brien – no relation – have made the transition from sport flyers to FAI freaks brilliantly and were to feature prominently in the medals. But it was the veteran, Verney Montague, who was to show the way home in Streamer, posting consistent scores in cold conditions, whilst the O'Briens trailed and Ian Dowsett struggled to light his rocket motors. S4A-Boost Glider suffered similar uncooperative conditions, with Matt O'Brien winning easily.

S6B-Streamer Duration					
1	Vernon MONTAGUE	84	77	83	= 244s
2	Matt O'BRIEN	77	77	39	= 193s
3	Ian DOWSETT	0	138	0	= 138s
S4A-Boost Glider					
1	Matt O'BRIEN	38	56	51	= 145s
2	Rob O'BRIEN	79	0	30	= 109s
3	Ian DOWSETT	0	0	64	= 64s
S9B-Gyrocopter Duration					
1	Stuart LODGE	155	178	136	= 469s
2	Rob O'BRIEN	160	118	166	= 444s
3	Ian DOWSETT	0	147	127	= 274s

Sunday's contests were much better supported – and more intensely contested – than the FAI events on Saturday. Both Egg Loft Duration and "Lamprey" Parachute

Duration caught the imagination of the flyers and featured big start lists. Lofting a heavy fragile payload in a rocket and returning it safely is always challenging – make that payload an Egg and failure can be spectacular. The past two Canterbury Cups have seen the juniors, Trevor & Robin Seabrook feature prominently. This year saw another junior, 13 year-old Genni Lavin nail the first slot with a display of consistent boosting and recovery. Much the same principals did well in Lamprey – a Swiss parachute duration event for low-tech rockets and over the counter Estes propellants – Matt O'Brien & Ian Dowsett adorning their trophy cabinets once again. Very good to see Canterbury stalwart, John Jacomb, getting second behind an imperious O'Brien in Lamprey.

Egg Loft Duration 10Ns				
1	Genni LAVIN	165	73	= 238s
2	Ian DOWSETT	119	105	= 224s
3	Matt O'BRIEN	92	102	= 194s
"Lamprey" Parachute Duration 5Ns				
1	Matt O'BRIEN	250	240	203 = 693s
2	John JACOMB	126	177	79 = 382s
3	Genni LAVIN	59	192	0 = 251s

Other categories featured in non-FAI, with "Jetex Rapier Duration" being flown off in an ad hoc manner throughout the day – with some truly amazing performances being carded - well done Tony Betts, for the longest flight of the day – 4m 44s! Sport Scale was brilliant, with a hall featuring a plethora of prototypes – John Jacomb's Bachem Natter, Gary Blinco's OSC Pegasus XL air-launched satellite launcher was pretty different & pretty good.



Gary Blinco's Pegasus

Ibid dug out his BAJ Skua 2 sounding rocket, complete with dents & scratches, globally acquired over 16 years... But we also had Steve Moore's HARM AGM 99A missile, Dave Driver's superb Centaure and Zigi Kklyonssiki's V2 and Soyuz Vostok.



Genni gets gold

Genni also found time to win the gold medal in the egg lofting parachute duration and took the bronze in the Lamprey parachute duration. She didn't have a chance to take a higher medal because of a fin shred on her third Lamprey flight (wet rockets present interesting technical issues). She only had two good egg lofting times - the first rocket was not recovered and may be still adorning a tree between Charing and the Kentish coast. While Genni camped at the Charing Race Course near Canterbury in Kent, Mummy and Daddy relaxed at the New Romney Bay Hotel on the coast in Littlestone. It's a great hotel and a very good restaurant - but if you go, take your own ice! Also shown are shots of the Venus 1 before the fin/motor can was inserted into the holo-sparkle airframe and the stunningly beautiful 29mm coned Rowe Retainer on Back2Mars.

Huge thanks for the heroic efforts of Michael Jennings of Rockets & Things who emerged triumphant in his struggle with fierce wild roses and stinging nettles to recover one of Genni's medal-winning Super Cecil rockets.



Genni with recovery team

Sport Scale			
1	Gary BLINCO	OSC Pegasus XL	= 29
2	Stuart LODGE	BAJ Skua 2	= 28
3	Dave DRIVER	Centaure	= 26
Jetex Rapier Duration			
1	Ian DOWSETT		= 211s
2	Matt O'BRIEN		= 156s
3	Rob O'BRIEN		= 156s

Sport Scale was magic – lots of entries and the standard the best yet; the organisers might be faulted for not increasing the profile – we just squeaked it in at the end : It should have formed the Climax. Egg Lofting was just brilliant, with Lamprey not far behind. FAI classes might have done better, with only a UK entry. Jetex Rapier produced some astonishing performances.

Charing Racecourse proved a great improvement on nearby Stalisfield – bigger, better access & better facilities. A minor disappointment was having to fly the FAI categories with no foreign competitors, hence no World Cup. A major encouragement was the way the non-FAI classes went on Sunday.

Genni Sweeps 3rd Canterbury Cup Medals

Genni had a great time at her first rocket competition 2 -4 August. She successfully launched the Venus 1 - the first vehicle in the Barbie Space Programme and conducted a brilliant dress rehearsal for her Level 1 certification with a G motor in the big red Back 2 Mars (a big thanks to Team Seabrook for great support and encouragement). By dint of a great press release circulated by Peter Rennison of PRPR, Genni attracted the attention of ITV Anglia who taped her preparations at home and came to the launch on Sunday.

IRW 2002 Report

by Adrian Hurt

I arrived at Kelburn Country Centre on the pre-IRW Saturday, intending to help John Bonsor with a workshop on the Sunday. That didn't happen because, due to heavy rain, nobody turned up for the workshop on the Sunday. I did find that Largs Safeway had a special offer on Stella Artois, but it expired before anyone could take advantage of it.

The radio had said that there were workshops throughout the week, so one family, after phoning Kelburn to confirm it, turned up on Monday. In fact, there were not supposed to be any workshops after the weekend, but John ran a one-off for them anyway. That also provided an opportunity for him to fly his Shuttle and me to fly Hermes. George Rogozinski turned up, so while John was making preparations for the launch, the family got to see some large rockets. Pete Davy and his father also arrived later and started building their shop.



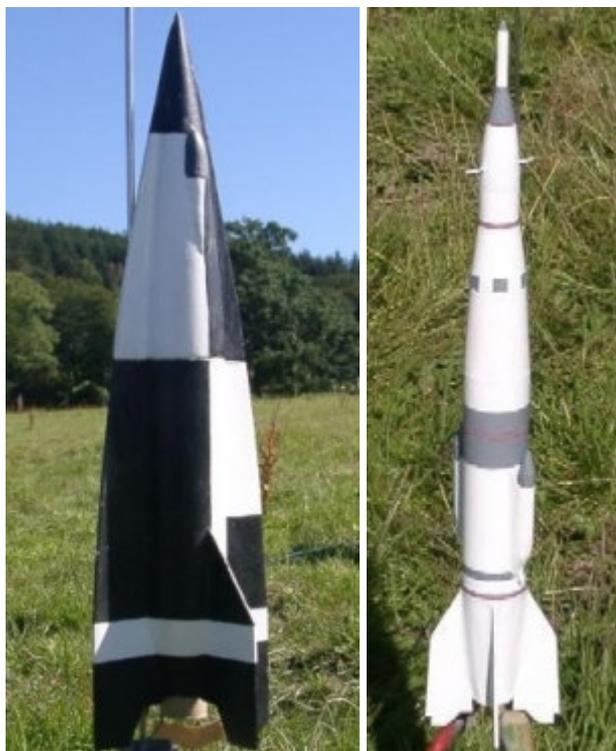
Flying Pig (and Pete)

On Tuesday, a press photographer returned. He had taken some photos of me last year and wanted more. He got reasonable co-operation up until the point when he wanted me behind a line of my rockets, didn't like the Paisley Rocketeers' posters in the background and started trying to take some down. At that point it was made quite clear that there was a line and he had just crossed it! Later on, Pete Davy demonstrated the newest toy he had for sale, a flying pig.

Wednesday saw the first largish flying session. More North Star people had turned up, and among other things, attempted to launch a two-stage saucer. It was not exactly stable. (*It is the opinion of the editor that it was in fact stable, just underpowered. Of course he may be biased.*) My newly built A-4b did fly

Launching workshop rockets

stably and horizontally, and was last seen heading for London. On the other hand, my A-9, which had done something similar at UKRA2002, had been given extra nose weight and now flew vertically, as did my V-2-A, which would enter the scale contest.



Adrian's A9 & V-2-A

The oddest rocket to be flown consisted of a short body with an AOL CD at each end. It should not have been stable, but it was. Sometimes you just have to throw the laws of aerodynamics out of the window...

The first high power flying was on Thursday. Nigel Woolcock kindly gave me a lift to the site, with a detour to Largs Safeway so I could get some food and drink. Even so, we were first there, by a long time. Half an hour later, I phoned Pete Davy to check that flying was actually still on. Some time after that, other folks finally turned up. A relay was formed to get equipment and rockets across a ditch into the field. Among many interesting flights were several powered by hybrids, a one-sided drag race, and George Rogozinski's Black Brant X with booster. The booster was unfortunately lost, despite the efforts of a search party, but the sustainer was recovered. During the evening model flying session, the most impressive launch was probably Dave Thomson's large UFO.



Dave Thomson's UFO

On Friday, Ross Findlay launched a very long model rocket made mainly out of polystyrene, powered by a cluster of four D12's. He also launched a rocket consisting of a stick with a cluster of motors at the top and a cord tied to several streamers. The rocket went up, pulling the streamers out of the box. It was certainly novel!

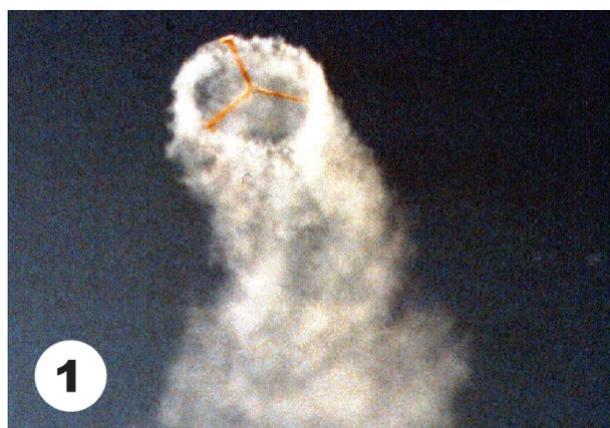
My own experimental flight involved King Titan, a silver rocket with one 24mm and two 18mm mounts. I had bought an 18mm smoke generator from Rockets & Things. This was fitted, with an adaptor, into the 24mm mount, and was meant to be lit by a piece of Quickmatch inserted into a small hole drilled into the rear of the smoke generator. Both motors lit, as did the Quickmatch, but the smoke generator did not. But the following day, I drilled further into the smoke generator so the Quickmatch could go in further, and this time it ignited successfully.

In the evening, I did a turn at model RSO, and had to deal with the first launch of Chris Eilbeck's Scroton, a sort of three blade rotor with a motor at each blade tip. I had mixed feelings about this - on the one hand, being a novice RSO, I was nervous about anything this unconventional, but on the other hand, I wanted to see it fly as much as anyone else! So I asked Chris to convince me that it had a reasonable chance of flying safely, and he pointed out various details of construction. I couldn't see any clear reason to refuse it, so I allowed it. It demolished my pad and took the launch rod with it! Chris made a generous offer of compensation, even though I said I could repair the pad. And then there was Pete Waddington's V1, one of the Das Modell kits, built stock apart from using an Estes D12

rather than the recommended but unavailable D7. The CG was aft of the wings. I had an idea what that would do, having built some models of winged German rockets myself, but as it was a stock kit, I let it go. It went unstable. So much for the stock kit...



Chris Eilbeck' s Scroton



Scroton Flight Sequence

The aquajet contest on Sunday saw a major break with tradition as Paisley Rocketeers didn' t win! Hugh Gemmell took the Oscar Schwigelhofer Trophy for the Sheffield Rocketry Association. The individual aquajet contest was scrapped due to lack of interest. Over on the model field, another tradition was broken as none of the boost gliders shredded - not even my Revenge of Thunderbunny, rebuilt from Ghost of Thunderbunny which had lost a wing last year. In fact, it flew quite well, although not well enough to beat Dave Thomson Jnr' s Manta. I also entered a double-jointed flex-wing, but although the booster carried it well and separated properly, the glider didn' t glide very well. At least it didn' t get down before the booster! The most interesting entry, though, was probably the Sea Vixen powered by a Rapier motor. The other contest I entered was Russian Scale. The only entries were my V-2-A and Mike Crewe' s LRDD-3. Both made safe flights and Judge John liked both so much that we both got prizes on Monday morning. (He knows what I like. If I' d had the choice out of all the prizes awarded, I' d have taken the one I got anyway, a Das Modell kit of an Ariane 5.) In the evening, a splendid barbecue was organised by two newcomers to IRW, Gary and Amanda Blinco.



Hugh Gemmel, Aquajetting



Aquajet fliers prepare for launch

The prize-giving was on Monday morning. In the afternoon there was some more open/experimental flying for those who hadn't already gone home. The experimental side mostly involved gliders. The Sea Vixen was fitted with a Held 1000, which gave it enough power to do a full loop and chase its owner. Meanwhile, I fitted a Rapier motor to my Thunderbunny glider, ignited it with an Estes igniter and some slow match, then chucked the glider. This proved that Rapiers can be ignited electrically, which will have useful implications for next year's boost glider contest... I also stuck a Rapier onto a Tim Bird toy which I'd bought from Pete Davy. The birds are being sold by rocket dealers at a rocketry event, so it had to be done! NSRG were also flying a lot of their models, including Mike Crewe's IRCS Ghost Rider and Pete Waddington's V2 and V-1.



Adrian's Thunderbunny

After that, it was time for me to pack up and head home. And now I have a new kit to build, plus a few ideas for boost gliders next year...

Contest Results

Contest entries at IRW 2002 seemed a little thinner on the ground this year compared with previously. There were some excellent prizes awarded, which might encourage more entrants next year.

Contest	Flyer	Affiliation
Boost Glider	Dave Thomson Jr	NWR
Helicopter	Pete Waddington	NSRG
Lander	David Hart	HART
Payload	Rachel Thomas	Rocksteady Rockets
Scale (Russian theme)	Adrian Hurt (Joint 1st)	SARA
	Mike Crewe (Joint 1st)	NSRG
Sweetie	Darren J Longhorn	NSRG

Aquajets

The Aquajets were keenly contested this year and the Schwighofer Trophy was awarded to a team other than the Paisley Rocketeers for the first time in several years. Actually the Paisley Rocketeers, the longest continually operating rocketry group in the world, have won the event 13 times since 1984. As such it seemed only appropriate that Hugh Gemmell, leader of the Sheffield Rocketry Association should be presented the trophy by John Stewart of the Paisley Rocketeers

Team Event	
1st	SRA
2nd	ASTRA (Team 1)
3rd	Paisley Rocketeers
4th	Thrust
5th	ASTRA (Team 2)

K-Lob 2002

by Mark Robinson

The K-LOB weekend went quite well - I enjoyed it a great deal (my first time down on the farm) despite the fact that I didn't do much flying myself. I spent too much time in the shed (Hangar 18) socialising, building and repairing.



Andy with his Mini BBX before launch

Andy's weekend was spoilt somewhat due to the fact that his terrier booster spacked in - the BBX staged and recovered fine, even though it was trying to head miles into wind. It came down in the same field as the booster - big field! and the farmer managed not to run over it. George of NSRG helped to recover Andy's booster by digging it out of a hole about 18" deep.

We recovered the "core sample" back to base, but did not hold out much hope for the G-Wizz. The front half of the booster was shattered. However, on investigation it turned out that the front bulkhead was intact, thus protecting the G-Wizz behind it. Andy felt a little better after that. The reason for spacking in? The ejection charge on the PRO 38 motor Andy used failed to fire - the delay grain hadn't burned correctly. Pete was going to pursue the matter further so we shall wait and see. I'm not sure if it was the first problem of this nature with a PRO 38 or not.



Ooopss! Nasty... Andy's Mini BBX booster

At long last my PML AMRAAM2 has flown! It went "commando" on an Aerotech G54 white lightning. I was going to at least put some primer on it, let alone paint it, but the challenge of a drag race from Mel Sharpe changed my mind, although he did express his disgust at my lowering of standards by letting my rocket go forth naked! He'd got 2 G54 motors and his AMRAAM2 with him. I lost. Mel's AMRAAM leapt instantly off the pad, mine suffered some clutch slip and smoldered for a second before valiantly giving chase. The delay charge and piston eject worked fine for both Mel and myself, both rockets landing undamaged. It did not matter to me that I'd lost. It was my first successful launch on anything bigger than a D- motor. The AMRAAM had proved itself worthy of a paint job, which it now has. My Estes Sidewinder (now also painted, in a frenzy of rocket science after I'd got back home) compliments the AMRAAM nicely.



Mark with his new AMRAAM2

Other points of note were that the Dutch team (Tripoli NL) got a level 3 after a launch and recovery of a large 10' (I think) Mpowered Super 8 camera carrying red beast. Pete's large, red rocket didn't recover properly. Richard gained his level 1 with the rocket he'd built out of the parts he bought at Largs. There was a bloody good home grown firework display on the Saturday night (the weather was good all weekend). Red distress flares are VERY bright! There was a framework which, when ignited said K-LOB. This was a nice touch although as someone pointed out, when viewed from the road behind the field the letters would appear reversed, therefore reading BOL-K.

Anyway, enough of my ramblings. Andy mentioned about an NWR meeting (possibly called G-Up) sometime next year before UKRA etc. Hope that comes to fruition.....see you there next year.

by Ray or Hank, Black knight

It all started on Friday just as I was about to leave home. Visitors arrived, so travelling was cancelled to an early start Saturday morning. Up at 4:30am cup-of-tea and away off to K-Lob at "Pete's Farm", Heckington. Got there just in time for breakfast with Mel, Pete & Malcolm. To cut the story short we had good weather got some Rockets off, a nice Firework display and that BANG at the finale, WOW.

Mel and me was sure we heard glass tinkle tinkle! A great show lads. Packed away the rockets, said my goodbyes and left for home. A good trip back but as I arrived, who was there to meet me but the wife with a message that the Police are looking for me! "What for?" I asked. Apparently someone had reported a motor car going through Grantham with Rockets in the back. Any way things were put right with the Police and we are still friends. But it makes you think....

by R. Parkin #1268 L1!

The cunning plan this time out was L1 certification using my virgin Pro38 2 grain casing in a scratch built 54mm rocket - 3,500 feet, no electronics, no problem!

Well, there was one minor problem in that when I arrived on Saturday morning there were no H110 reloads to be had. Pete instead offered me an obscenely excessive I300 reload which simmed out to about 2,000' higher and uses a casing I don't own. After buying a much smaller chute and borrowing said casing off Andy Norrie (thanks again Andy) I decided to go for it

Not wanting to jump straight into a certification flight I flew my Cirrus Dart (sporting a spiffy new paint job) on a Pro38 G60. This is a pretty cool motor which kicked the Dart through the clouds to about 3,000' - even with the fairly heavy (125g) radio tracker in the nose!

I was pretty lucky on the short walk to recover the rocket; we came across a single grain Pro38 casing lying in the dirt, and the fact that it was red hot made us suspicious that it was probably mine! Note to self - buy better masking tape.

The field just behind the range was bone dry and rock hard that day, so the dart was forced to employ it's patented damage limitation & deceleration system to cushion the landing. Some would say it just sheared a fin off, but I prefer my explanation...

I then sat around watching a pretty damn cool collection of flights for a while, but as I wanted

to fly the Dart again at some point I decided to retire to the hanger and make some repairs. The fact that the UKRA building also housed my beer forced a postponement of my L1 flight until the Sunday morning.

I am not sure but I think there may have been some fireworks later on that night, did anyone else see them? My optician seems to think that the scars in the shape of the word "K-LOB" will eventually fade from one or both of my retinas.

Sunday dawned and the weather didn't look hopeful for my L1 flight; mist, rain and low cloud. Luckily, this was short lived and I quickly coerced Darren into watching me prep my Innocent Bystander. As launch time approached I began to wonder if my glib rocket naming policy was a little ill-advised...



Richard' s ready to rock!

The flight itself was pretty good - arrow straight off Andy Issott's pad (thank-you Andy) with plenty of smoke and noise to keep people interested. The recovery could have gone better though; I was forced to walk a distance that I would normally only consider traversing with the aid of a Boeing product. Note to self (part 2) – RockSim really doesn't understand the prevailing wind patterns of Lincolnshire. Probably because I didn't tell it about them...

The rocket was recovered without any damage at all, a bit of a first for me! After lugging it (via the burger van) all the way back to the line to be signed off I was content to sit in the sun and watch the other flights rather than prepping anything else of my own. I came to the conclusion that Hybrids are great, something to pencil in for next time I think.

As always at these events I wish I had flown more stuff, but watching other peoples rockets is almost as much fun. I do worry about how the fireworks blokes are going to top that display, I suspect thermonuclear will be the order of the day...

Javelin Rocket Experience

UKRA member Frank Sharman' s Javelin Rocket Experience will be on display at a special exhibition to be held at Mansfield Museum.

The exhibition will comprise the large, light-weight Javelin rocket vehicles, plus some of the smaller rockets as well as video & audio media from some of the many flying displays that Javelin have put on over the years.



The exhibition will run from 8th March 2003 for one week only. Frank hopes to be attending the exhibition himself on the 10th to 13th inclusive.

Blast off for Britain

by *Paul Lavin*



Objectives

Blast Off for Britain (BO4B) is an educational charity that assists dedicated and talented British youngsters under the age of 18 to learn 'rocket science' so that they can effectively compete in national and international rocketry events as a Junior British Rocketry Team.

BO4B promotes the sport of rocketry as an exciting adjunct to secondary school science education. It also aims to generate awareness of the sport as a fulfilling and safe hobby of a lifetime. Worldwide, model rocketry is a fast growing hobby and competition flying is becoming an increasingly popular activity.

With a two-year program to develop Britain's first junior rocketry team in place, the Junior British Rocketry Team can successfully enter and compete in 2003 European and 2004 World Championships. BO4B works with the senior UK team to enable young British rocketeers to develop the skills and knowledge needed to win international level competitions for the future.

At the same time, BO4B's out reach programme encourages all secondary school age Britons of all abilities to take up the hobby of model rocketry and apply the lessons learned to their academic studies.

Blast Off!

Beginners can fly model rockets with little knowledge of 'rocket science' by building simple kits with small rocket motors available from local hobby shops or one of a number of specialist vendors in the UK. With basic skills and not much money, a student can build a model rocket that flies at hundreds of miles per hour to altitudes of over 1000 feet and recovered for re-use on a small parachute.

The more young rocketeers understand about

physics, maths, chemistry and technology, the better their rockets will fly. Soon rocketeers graduate from simple balsa wood, cardboard and white glue rockets to designs using space age high tech materials and fabrication methods.

The path to the world championship for the junior team members can start on a school games field. With the traditional countdown 5 4 3 2 1 Launch! novices send their crude but functional rockets into the sky! Is learning science ever more fun?

To compete successfully against the world, however, design, construction and flying skills must be honed. Competition rockets must comply with strict specifications laid down by the Federation Aeronautique Internationale. The deceptively simple World Cup rockets weigh only a few grams and stay aloft on gossamer parachutes for many minutes at a time. They are a blend of art and science.

The newly established junior team is working under the guidance of Dr Stuart Lodge, Britain's most accomplished competition rocketeer. He is committed to handing down his team's knowledge, gained over many years in competition, to a new generation of British rocket fliers.

The junior British team is competing in five categories at both the European and World Championships:

1. S1A altitude (highest altitude attained with a restricted motor)
2. S3A parachute duration (longest flight with parachute recovery)
3. S4A boost glider (longest flight on a rocket boosted glider)
4. S6A streamer duration (longest flight using streamer recovery)
5. S9A helicopter duration (longest flight using helicopter recovery)

Events on the FAI competition calendar for the junior team are now being finalised for 2003.

How to get involved

As a Team member

Juniors from existing rocketry clubs will be

invited to become involved in the team based on outstanding performance at local rocketry fixtures. Because some of the components needed to fly competition rockets are extremely difficult to get in the UK and resources are constrained, initially the team size will be limited.

Formal qualifying events will be held during the early summer of 2003 for the 2004 flying season. A junior section has been added to the National Championships, the Canterbury Cup, held at the beginning of August in Kent. However, BO4B encourages all school-aged rocketeers to join local and regional clubs and to participate in the UKRA Model Achievement Program, growing the skill base for the team assembled for the 2004 World Championships.

As a sponsor

Sponsors are actively being sought to help make the British Junior Rocketry Team the best in the world.

Entry fees and accommodation cost from competing in international events are covered by the British Model Flying Association. However the costs of setting up the team, conducting national competitive rounds, creating publicity, organizing outreach programmes, traveling to international events and R&D will quickly outstrip the financial ability of the team's parents to support the effort. Additional sponsorship is needed from commercial entities that are close to rocketry, education or those that just want to help Britain's youth stride onto the world stage.

To fulfill its outreach and sponsorship goals, BO4B is aggressively attracting media attention. Team members and their rocketry activities have been on BBC radio and TV, Anglia TV and Yorkshire TV several times this year already. BO4B is supporting the national team in this year's BBC TechnoGames rocketry events. We intend to enlist local press and radio as well as the national press to put rocketry on the educational and recreational agenda.

Find out more

The BO4B web site is still very much under

construction but that is where you can find out more about rocket flying with local clubs, international competitions, our sponsors and (hopefully) our growing string of successes! <http://www.blastoff4britain.org.uk/>
info@blastoff4britain.org.uk
sponsor@blastoff4britain.org.uk

Background

Competition flying has always been a part of model rocketry in the form of rocket drag races, altitude and duration contests and spot landing derbies. Launching and safely retrieving a raw egg, called egg lofting, is featured in major competitions such as BBC's TechnoGames. National model flying associations have their own formula championships for flying all manner of rocketry events as well.

Britain has entered a senior rocketry team in the European and World Championships for a number of years. A host of gold medals have been won and world records have been set by British rocket flyers. Most notable of these competitors is Dr. Stuart Lodge, author of books used by rocket hobbyists around the world. Dr Lodge is the head of the British Space Model Association.

The Federation Aeronautique Internationale (FAI) coordinates competitive aeronautical pursuits around the world. In Britain, competition flying is done under the auspices of the Royal Aero Club (RAeC). The British Model Flyers Association (BMFA) is the affiliate of the RAeC that supervises model flying competitions.

A specialist group, the British Space Model Association (BSMA), is directly involved with competition rocketry in the UK. The United Kingdom Rocketry Association (UKRA) has a programme for developing skills for younger fliers although their main focus is on high power rocketry within the BMFA.

All national sport flying associations belong to the FAI that creates and maintains the rules for international rocketry competitions. Each year, a series of World Cup events are held around the world and, on alternate years, European Championship and World Championship events are organised.

UKRA News

- AGM 07/12/02
- Council meeting 07/12/02
- Annual Financial Report

AGM 07/12/02

Location

UKRA Hut, Southview farm, Heckington

Attendees (Council)

Cath Bashford (CB), Bob Arnott (BA), Mike Crewe (MC), Hugh Gemmell (HG), Darren Longhorn (DL), Jim Macfarlane (JM), Richard Osborne (RO), Mike Williams (MW). Apologies were received from Ziggy Kklynossiki.

Attendees (Members)

Mike Roberts, Paul Britton, Kevin Cave, Ady Waters, Pete Waddington, Angela Waddington, Charles Simpson, Chris Eilbeck, Damian Burrin, Marcus Lauder, Sally Davis, David Warman, Graham Platt, David Thompson, Pete Davy.

Agenda

- Chairman' s Remarks
- Minutes of previous AGM
- Annual report of the council
- Financial Report
- Result of election to council
- Appoint Auditors
- Appoint Solicitors
- General Business
 - Motion to reduce the size of the council
 - What is UKRA doing to promote itself?
- Any other business
- Date and venue of 2003 AGM

Chairman' s Remarks

MC welcomed everyone and said it had been a good year for rocketry in the UK, with lots of rockets flown. He thanked Graham Platt for providing the food for the AGM.

Minutes of previous AGM

DL read the minutes of the last AGM. They were approved as a true record by a show of hands.

Annual report of the council

MC reiterated that it had been a good year. he thanked everyone that had done any work for UKRA over the past

year, especially the efforts in preparing the UKRA hut. He gave special thanks to Hugh Gemmel who was standing down from the council after four years. Hugh had held the very demanding posts of Membership Secretary and Treasurer and his work has been much appreciated. UKRA launched a new logo and identity in the new year, which has been very well received. The web site was kept well up to date with over 90 updates. Pages have been added for MAP recording and a new newsletter archive. 10...9...8... had been delivered on schedule and was considered to be bigger and better than ever. Safety & Technical have helped work through the problem regarding ignition of some hybrids, with UKRA helping to find the authorisation of a purpose made igniter. New safety code incorporating changes due to ANO and hybrids available soon. New guidelines for RSOs are being worked on. The new hut has been used successfully for two events and is available for use by the membership. Equipment procured over the year includes tables and chairs for the hut, PMR radios and signage for events. UKRA has made links with overseas groups. We have allowed groups New Zealand and Germany to use our documentation to help them start up national associations. We have had an increased foreign attendance at events, particularly by Tripoli The Netherlands. UKRA 2002 & L-Lob 2002 were the best ever, excellent weather helped here. Model Achievement Programme took off this year with a total of 30 participants. Black Knights are leading the way here. BA is actively looking for any improvements that can be made, please contact him with ideas.

Financial Report

HG presented the financial report. Generally a bumper year, unrecognisable from when he began four years ago. (See separate financial report.) HG suggested that there were enough to start thinking how we can spend the money to improve services to the membership. MW suggested members get in touch with ideas.

Result of election to council

MC proposed that this be delayed until after the proposal under general business to reduce the size of the council, to avoid the potential situation that someone may be elected to the council for only a brief period. There was much debate as to the proper order in which these items should be carried out. Eventually it was felt that here was no problem with the existing order since the new council did not take over until the end of the AGM. A motion was proposed by MC (seconded by RO) that the existing order should be used. This was carried by a show of hands.

HG noted that approximately 25% of the membership voted and read the results:

Darren J Longhorn	42
Richard Osborne	40
Mike Williams	13
Mike Crewe	33
Cath Bashford	39
Jim MacFarlane	26
Pete Davy	46
Bob Arnott	20
Ziggy Kklynossikki	20

Appoint Auditors

MW presented this point. He stated that we discussed this every year and that generally it was felt that we had not

reached the point where auditors were required, but that we should revisit the topic every year. BA said that he felt the time had come to have the accounts audited now that we had reached an income of more than £10000. He added that this could be done by non-council members not associated with the running of UKRA. A proposal was made that there should be no official appointment of external auditors, but that the council should attempt to find two members to fulfil this role before the next AGM. It was passed unanimously.

Appoint Solicitors

MW stated that the situation with solicitors was similar to that with external auditors, and that it was not felt necessary at present, but would be revisited at future AGMs. A question from the floor asked what the situation would be if a need for solicitors arose during the year. It was stated that we had access to the solicitors of the BMFA. A motion that we should not appoint solicitors now but should revisit the item each year was carried unanimously.

General Business

- Motion to reduce the size of the council

HG reiterated his reasoning behind this proposal, summing up by saying he always felt the council was most effective with fewer members. The results were:

In favour of the proposal 55

Against the proposal 2

There being more than the required 2/3 majority, the proposal passed.

- What is UKRA doing to promote itself?

Mike Roberts presented his ideas on this subject admitting that he was seeking help with materials for a stand at a model engineering show in January. There was lots of discussion on this topic regarding the pros and cons of spending money on new members rather than existing members. It was noted that in the past we had several invitations to attend such events, but lack of manpower had prevented this. Now the situation seemed to be changing in that there were more people willing to take on such activities if help with materials could be provided. Eventually a proposal was made that Mike should investigate what was required and that UKRA should spend some money (amount to be determined) in this area. This was approved by a unanimous show of hands.

Any other business

RO suggested that some money could be usefully spent on tracking equipment for use by the membership. It was agreed that the council should consider this.

HG suggested that some money could be spent on a PA system similar to that owned by EARS, but with more (and more remote) speakers. It was agreed that the council should consider this.

Charles Simpson asked what had happened to the next release of the safety code, that he had been working on while Chair of S&T. JM said that this was being reviewed and apologised for the lack of progress citing a number of personal & work related issues that had delayed this. It was suggested that the issue of how updates to the safety code were disseminated should be reviewed. This was agreed.

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

HG suggested that we consider moving the date of the AGM away from the end of the year. MW commented that we held the AGM after the BMFA AGM. It was generally felt that there was no pressing reason for this. The suggestion was made to hold the AGM on one of the evenings of the annual UKRA flying event. Advantage would be that more members would attend leading to better feedback to the council and accounts for year could be closed and audited before presentation. It was pointed out that the pointed out that the best attended AGM had been at the IRW.

Chris Eilbeck asked the council to comment on the rumours of use of Estes C11 & E9 motors & US Rockets motors. After some discussion it was agreed that there was no evidence of any of these motors being flown at UKRA events. Pete Davy provided some background as to the status of these motors. A summary of which appears below.

- *The HSE have declared that the Estes C11 motor is classified as 'articles pyrotechnic' and as such is authorised under the same terms as the other C class Estes motors. As with other Estes motors of this class, it is exempt from CE marking*
- *The Estes E9 is classified as UN0351 (due to propellant weight), and is not authorised for use. It could be, but Ripmax would be unlikely to do so since users would require a license to acquire (or acquire and keep). The E9 would require CE marking.*
- *At least one very large (9" diameter) US Rockets motor is classified and authorised, but that the HSE is unwilling to classify & authorise smaller motors by analogy. The classification & authorisation of these smaller motors was being sought by Congreve Rockets. The motors would also require CE marking.*

Paul Britton asked about CE marking. Pete Davy stated that without a CE mark, it would be illegal to sell motors in the EU after 1st January 2003, but that Juerg Thuring in Switzerland had applied for CE marking for Aerotech motors, and that Cesaroni were actively pursuing CE marking for their entire Pro range (yes, up to and including Pro150). It is legal to store and fly any motors you already own. Estes motors up to D are exempt from CE marking.

BA queried if there wasn't a requirement (as a specialist body of the BMFA) for trophies to be awarded at our AGM, and who had won the H altitude trophy we had introduced some years ago> It was agreed that there was no such requirement, and that the reason the H altitude trophy had not been awarded was the same as last year - no entries had been received. It was clarified that the award was for the highest H flight between AGMs - not for the highest altitude ever. It was agreed to give the contest more promotion in 10...9...8...

Pete Davy suggested another format for a contest, cumulative altitude over a year. It was agreed that the council should discuss this.

DL noted that Mike Williams had been an ever present council member since UKRA began, but had not been elected. Mike was thanked for all of his work over the years. Mike responded by saying he would be there to assist the council as required, and finished with the words "I'll be back".

Date and venue of 2003 AGM

BA proposed that the AGM should be held in the evening at the UKRA flying event. This was agreed by a unanimous show of hands. Exact date will be determined when the UKRA 2003 event date has been set.

Council Meeting 07/12/02

Location

UKRA Hut, Southview farm, Heckington

Attendees

Bob Arnott (BA), Cath Bashford (CB), Mike Crewe (MC), Pete Davy (PD), Darren J Longhorn (DL), Jim Macfarlane (JM), Richard Osborne (RO).

Agenda

- Apologies
- Minutes of last meeting
- Minutes of emergency meeting
- Election of executive positions
- Outstanding actions
- AOB
- DVNM

Apologies

Apologies were received from Ziggy Kklynoosikki.

Minutes of last meeting

The minutes of the meeting on 12/05/02 were read and approved.

Minutes of emergency meeting

The minutes of the emergency meeting on 08/06/02 were read and approved.

Outstanding actions

This item was taken out of order, before the election of new council positions. [The detail of the individual action points has been omitted for brevity] It was agreed that MC would contact MW with regard to him carrying on the work he had been doing with aqua jets and continue to be general BMFA liaison.

Election of executive positions

There was only one candidate for the posts of Chair, Secretary and Treasurer. BA and RO stood for Vice Chair. Both candidates were given the opportunity to make statements. BA stated that he wanted to be Vice-Chair to further his work with the MAP. RO stated that he wanted to be a pro active Vice-Chair and forge links with other organisations.

Chair Mike Crewe (unanimous)
Secretary Darren J Longhorn (unanimous)
Treasurer Cath Bashford (unanimous)
Vice Chair Richard Osborne (three votes)
Bob Arnott (three votes, one abstention, Bob elected on toss of a coin)

The non executive positions were agreed as follows.

Membership Secretary	Mike Crewe
Chair of Safety & Technical	Jim MacFarlane (Jim to appoint other members as required)
Web site, Newsletter editor	Darren J Longhorn
Records, Web site	Richard Osborne

AOB

RO said that he would like to pursue links with other organisations, in particular the BIS. It was agreed that he should do so and investigate potential areas of cooperation.

JM suggested we might form a more pro active relationship with the HSE. He suggested a visit by himself and other council members might help to introduce us to the HSE. This was agreed.

JM reported that there was some confusion as to the weight limit that may be introduced by draft proposed EU legislation. He had heard it reported variously as 7Kg and 70Kg. DL confirmed that the BMFA had said 70Kg. It was agreed to investigate further.

PD suggested that the burden on RSOs regarding certification paper work could be reduced if the onus could be placed on the flier. He also suggested that pads of flight cards might encourage them to be filled out, as the flier could keep a copy.

PD suggested that UKRA 2003 could be a three day event held on the 2nd weekend of June, and that he would confirm asap. Fees would remain the same. DL suggested that fees could be reduced for those flying only model rockets. After some discussion it was felt that this would not be possible. PD also reported that K-Lob would be the last weekend in September. It was agreed that PD would be the main organiser for both events.

Following on from the AGM it was agreed that PD should look at leaflet costs and CB should look at sticker costs. RO should investigate procurement of tracking equipment and that CB and JM would look into PA equipment.

DVNM

Sometime in January at UKRA hut.

Annual Financial Report

Balance Sheet (all monies in & Sterling)

<i>Income</i>	<i>(2002)</i>	<i>(2001)</i>
Membership Fees		
BMFA Credit Notes	55.00	50.00
Cash	150.00	164.00
Cheques	5364.00	4184.00
Postal Orders	94.00	94.00
	<i>5663.00</i>	<i>4492.00</i>

Certification Fees		
Cash	140.00	65.00
Cheques	135.00	185.00
	275.00	250.00

Income from UKRA 2002		
Hire of Tables	175.00	140.00
Raffle	95.00	195.00
Vendor/Flyer/Spectator Fees	1398.50	953.00
Event Sponsorship	500.00	0.00
Late payments	40.00	0.00
	2208.50	1288.00

Income from K-Lob 2002		
Hire of Tables	120.00	150.00
Raffle	310.00	0.00
Vendor/Flyer/Spectator Fees	1150.58	481.00
	1580.58	631.00

Miscellaneous		
Advertisements	60.00	35.00
Monies owed*	10.73	10.00
Bank Interest	1.55	2.02
Returned Cheque**	35.25	0.00
Tshirt Sales	450.00	0.00
	557.53	47.02
Total Income	10284.61	6701.02

Notes: * Owed Certification Fees ** Returned - not presented after six months

Expenditure	(2002)	(2001)
Membership/Insurance to BMFA		
Cheques Issued	3369.00	2520.00
BMFA Credit Notes	55.00	50.00
	3424.00	2570.00

Stamps and Stationary		
Stamps	470.40	518.00
Stationary	285.31	216.11
	755.71	734.11

Photocopying and Printing		
10...9...8... (3 issues)	543.12 (4)	609.39
Printing Manuals/Election/AGM	393.96	396.23
	937.08	1005.62

Purchase of other Goods/Services		
New Members Rocket Kits	325.50	120.00
UKRA PO Box	52.00	52.00
Wind meter	83.95	0.00
8 PMR Radios, 4 Headsets	273.28	0.00
Cash box	14.98	0.00
UKRA Tshirts	605.12	0.00
Certification of Hybrid ignition Grains	150.00	0.00
Other	0.00	42.81
	1504.83	214.81

UKRA 2002		
Table hire	117.50	117.50
Hire of Farmland	300.00	300.00
Building Hire	600.00	527.58
Fireworks	140.00	0.00
Portaloos Hire	141.00	164.50
Event booklet Printing	228.00	67.26

Float	150.00	0.00
	1676.50	1176.84

K-Lob 2002		
Table hire	117.50	117.50
Hire of Farmland	300.00	0.00
Building Hire	600.00	586.33
Raffle Book	2.00	0.00
	1019.50	703.83

Miscellaneous		
Re-issue of uncashed cheque, etc	35.25	40.00
Total Expenditure	9352.87	6445.21
Activity Balance	(2002)	(2001)
Total Income	10284.61	6701.02
Total Expenditure	9352.87	6445.21
Activity Balance (surplus)	931.74	262.81

Notes: Income was up by 53.3% from £6701.02 in 2001, Expenditure was up by 45.1% from £6445.21 in 2001, Activity balance was up by 254% from 262.81 in 2001.

Banking Activity

	(2002)	(2001)
Balance on 16th December 2001	1212.69	896.63
Deposits to Account	9919.07	6501.00
Bank Interest	1.55	2.02
Cheques Drawn on Account	7829.88	6186.96
Standing Orders Drawn	440.00	0.00
Balance on 7th December 2002	2863.43	1212.69
Less Standing order commitments	660.00	0.00
Cheques not presented	59.00	35.25
Net Balance	2144.43	1177.44
Net increase in Funds	931.74	280.81

Notes: Net Monies in the Bank have increased over 2002 from £1212.69 to 2144.43. This equates to an increase in Cash in the Bank of 76.8%

Membership Report

Full Members	(2002)	(2001)
Senior	132	102
Junior	27	9
Associate	2	3
Family Members		
Senior Lead	18	15
Partner	0	2
Junior Flyer	18	16
Family Associate	9	9
Schools and Youth Groups		
Senior Lead	1	0
Total Membership 2002	207	156
Temporary members (Expired)	6	5
School/Youth Group - Youth Members	4	0

Notes: Membership has increased by 32% from 156 in 2002.

These accounts were prepared by H.Gemmell, UKRA Membership Secretary and Treasurer 06/12/2002.



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Prospero One

(part one) by Stephen Baxter and Simon Bradshaw

In the minutes before launch, Doctor Geoff Lighthill heard the whine of the elevator gantry leaning away from the booster stack, and the clatter of power and propellant umbilicals popping out of their sockets in the Blue Streak's metal flanks.

The pressure cabin of the Prospero was an aluminium box the size of a small car. There was barely room, in this little cone, for the two of them - Lighthill and his commander, Roly Gough - lying side by side in their contoured couches, cocooned in their bulky white pressure suits.

The walls around Lighthill were coated with switches, circuit breakers and dials. In his months of training at Stevenage, he'd come to learn the meaning and function of every one of those switches. And he knew every step of the mission ahead of him. He felt as if he was a cog in some immense machine, that would work through its predestined sequence of steps, regardless of the spark of consciousness cradled inside his skull...

It was Friday, April 26th, 1974; today, Britain was launching its first astronauts to orbit.

And its last.

Flight director Josh Morris stood at his workstation, scanning the Operations Room.

Morris's controllers were working smoothly through their countdown procedures. There were 20 of them, all in ties and shirtsleeves. Their accents - cultured British, or crisp Australian from the de Havilland contractors who had built the launch facilities - permeated this stuffy box, here in the middle of the Australian desert.

Compared to the jargon-ridden verbal pyrotechnics that typified US launch procedures, this was typically British, he thought.

Big TV monitors showed the public feeds. The BBC coverage was reaching its climax; in a lashed-up studio elsewhere in the Woomera complex, James Burke, Patrick Moore, Arthur

C Clarke and Joe Muldoon, the Apollo Moonwalker; were staring intently at monitors. The Brits looked a little absurd in their light tropical-style suits. Another live feed showed a small band of Aboriginal protesters, at the security gate of the complex. The military police faced the protesters now, a calm, solid line; the Aborigines weren't a problem for today, and anyhow, they would get their land back once Woomera was dismantled, after this mission.

Right now, Josh Morris found it hard to care about the plight of Aborigines.

Restless, he looked out, over the heads of his controllers, through the big picture window at the side of the Operations Room.

Launch Complex 6D stood on an escarpment overlooking a dry lake, all of three miles away, isolated save for the gleaming shells of lox tanks. The Woomera facilities were still crude compared to Canaveral, where he'd trained with the Americans for this mission; the launch stand was not much more than a metal platform, with a single gaunt gantry rising alongside the booster itself.

The Black Prince III, exposed, looked like a complex toy set against the huge tan expanse of the desert.

The Blue Streak boosters were five squat, silvery cylinders, four of them strapped together around a stretched core stage; he could see the flaring nozzles of each booster's twin Rolls Royce RZ-2 rocket engines, and the shine of ice coating the lox tanks. The boosters, bright, striped paintwork was vivid. Above the lower stages rose the Black Knight IV - the squat, kerosene-and-peroxide powered upper stage - and then the cylinder-cone shape of Prospero itself, with the stubby launch escape tower above that.

Around the launch stand stretched the red-brown surface of the South Australian desert. The gibber stone - sun-baked earth covered in sharp, slate-like rocks - was flat, brown, lifeless save for salt bushes and clumps of dark green, spiny grass. It was, Morris thought, like a slab of the surface of Venus, transposed beneath the huge blue sky of Earth.

Lox vapour swirled around the Blue Streaks, dispersing quickly.

In a few weeks, when the flight was done, his assignment here would be over. He was on sabbatical from the Royal Aircraft Establishment at Farnborough; he would have

to pack up and go home, leaving behind all this - the pure light, the elemental landscape, the electric blue sky - for the stultifying green of Hampshire.

The last time he'd gone home had been the middle of winter. Britain had been on a three-day week, because of striking miners; the whole country seemed huddled, cramped and cold. Going back would be claustrophobic, hard to take. But Britain wasn't going anywhere else in space; there was nothing else for him to do.

The countdown, orderly and controlled, reached its final minute.

In 1945, Roly Gough had been 19 years old. He had missed out on the war; because he was born too late.

He had built up a career as a test pilot, but that had almost been scuppered in 1964 when he had worked as the lead pilot on the TSR-2, which got itself cancelled by Harold Wilson.

Space had beckoned. But as Britain's aerospace programme had limped through the 1960s, suffering endless cuts and delays, it had started to look to Gough as if he had been born too bloody *early*.

But now, unlikely as it seemed, here he was, with this one chance to reach orbit. And as far as Gough was concerned, as soon as the blue touch paper had been lit on this firework under him, nothing was going to stand in his way.

The clock reached ten, nine, eight...

Wing Commander Roly Gough closed his eyes.

Four, three.

Morris felt his heart thump, hard.

Two seconds before launch, eight main engines ignited. There was a flare of brilliant white light. Smoke, white but tinged with red Australian dust, billowed out to left and right of the booster stack, blasting out into a ravine towards the Lake Hart Saltbed. In this desert, there could be no fancy water-cooling system of the type employed at Kennedy; instead, the flame buckets were lined with big fire-bricks, bolted down beneath that massive blast.

So it had begun.

At least, Morris thought with a surge of savage anger; I got this far. At least they can't take this away.

Today, there would be fire across the desert. And Morris would control it.

The count reached zero.

When the hold-down bolts exploded, Lighthill felt the ship jerk under him. At first there was vibration but no acceleration; he knew that the rocket had left the ground and was in momentary stasis, burning kerosene and peroxide, balanced on its thrust.

Already, he had left Earth.

It's happening, Lighthill thought, exultant. The Yanks have been to the Moon and back, and now they're heading for Mars. But so what? Right here, right now, Britain is finally putting men into space.

And I'm one of them.

He could hear the Operations Room speaking to them, but could make out no words.

Now the rockets' roar engulfed him. Acceleration settled on his chest, mounting rapidly.

He felt the booster pitch over as it climbed. Prospero One was arcing slowly over to the north-east, tilting into the trajectory for its 53-degree orbit. Inclined enough to permit the all-important Sunday supplement pictures of Britain from space...

He tried to stop analysing. He wanted simply to exist, to be in the mouth of this extraordinary moment, this huge outpouring of energy.

The cabin shook around him, loose equipment rattling.

T plus a hundred and forty seconds. Core ignition, called Woomera; there was another tremor as the core Blue Streak shuddered into life, and the acceleration piled higher.

Then came a clatter of explosive bolts, a dip in the acceleration. Staging: the four strap-on liquid rocket boosters had been discarded.

Roly Gough was already more than 30 miles high, already in space.

Now the main core of the Black Prince burned under him, and as the mass of the ship decreased the acceleration built up. The acceleration felt savage; the Blue Streak heart of the launcher had, after all, been designed as an ICBM, not as a man-rated booster, and even the weight of its payload seemed barely to hold it back.

The cabin started to rattle, juddering back and forth. Some minor flaw in the core stage was feeding in fuel or oxidiser incorrectly; the booster was chugging and popping.

Testing fighters, he had pulled more G than this before-and that had been sitting up, not lying in a contoured couch. But that had been for a few seconds, not minutes on end.

Lighthill, next to him, was muttering: "Bloody hell, bloody hell, bloody hell..."

The chugging smoothed away, leaving a steady pressure on his chest.

Then came a loud bang, right outside the cabin's hull, as the escape tower streaked away, hauling the protective shroud with it. The blue light of Earth flooded the cabin. He could see fragments of ice, shaken free of the hull of the booster; they glittered briefly.

The pressure mounted still further as the core Blue Streak burned the last of its propellant. Then there was a jerk forward, a sudden surge of weightlessness; Gough was hurled forward against his restraints. He heard rattles as the main booster core was discarded, and the clatter of the Siskins, the solid propellant separation rockets, which kicked the final apogee stage forward, settling the propellants in their tanks.

At last he felt the crisp surge of the apogee stage's six Gamma 304s, cutting in for the final and relatively gentle push into orbit. He was thrust back into his seat. The acceleration was light and smooth: good Hawker Siddeley engineering, he thought.

Through the small triangle of tough silica glass before him, he could see the skin of Earth, spread out like a glowing carpet: there was the wrinkled, unmistakable profile of New Guinea, and the sea in the Gulf of Carpentaria was as bright as a tropical sky.

Then, right on cue, the apogee stage cut out.

"Bugger," whispered Roly Gough.

Guy Briggs followed the launch on TV, in Bill Maclaurin's office at Stevenage.

In the heart of the screen, blurred and excessively magnified, the Black Prince was finally lost against the glare of cobalt-blue Aussie sky. The BBC cut away to their Woomera studio, where Burke, Moore and Clarke were gushing excitedly. They seemed to be talking an awful lot about the British Interplanetary Society. Raymond Baxter joined them now, intoning well-rehearsed words about the antique days when he'd known Roly Gough as a test pilot flying Hunters and Lightnings.

Bill Maclaurin got up and waddled over to

the set. He was a comfortable, portly man, his face pocked by the exploded capillaries of the habitual drinker. Maclaurin, BAC's project manager for Black Prince, was nominally a dotted-line report into Briggs; Briggs, with overall responsibility for the Black Prince-Prospero programme, was a civil servant, reporting into the Ministry of Trade and Industry. As of March 6th - when Wilson was re-elected - Briggs's political boss was Anthony Wedgewood Benn.

Briggs spent much of his working life in London. But he'd had no doubt that this was the right place to be, today.

He thought back over all the other Blue Streak and Black Prince test firings he'd followed. Even off duty in his digs up at the hot-firing test facility at Spadeadam, he used to hear the windows rattle during a test fire; he would sit with his landlady and their bloody cat, counting through each firing. A launch sounded different: the low level rumble and roar close to the ground, and then the high-altitude crackle as acoustic shocks from the engines rained over the green Northumberland moor...

Maclaurin switched to ITV, but when the smug face of David Frost peered out at him he turned the set off. He opened a steel filing cabinet and pulled out two chipped tumblers and a half-empty bottle of Glenlivet; he poured two healthy measures.

Briggs took the drink. "Here's to you, Bill, you old bugger." He rolled the clear, sharp liquid over his tongue.

"End of an era, Guy," Maclaurin said. "Two Brits in orbit, our first astronauts. But it's an end of an era all the same. It's TSP2 all over again. Harold bloody Wilson. Gives in to the miners on day one, shuts down the space programme on day two." Maclaurin knocked back his drink, and poured himself another.

Briggs declined.

They took their glasses to the window-wall of Maclaurin's office. From here they looked down over the big, brightly-lit plant at the heart of BAC Space Division's Stevenage facility, where the Blue Streak tank bay and airframe structures were manufactured. The plant was now deserted, the jibs and presses and power tools idle under the pitched roof's skylights. The half-finished rocket structures, lying on their sides in their handling frames, looked, Briggs mused, like the corpses of dinosaurs laid out in some museum.

"But you have to look at the bigger picture," Briggs said. "You wouldn't believe the pressure the Americans have brought on us. They just won't accept the competition for their own launch capabilities."

"Pressure, sure. They've bought us off; with a promise for a berth for one of our boys on Skylab A, or the Moonlab. I tell you this, though. They sure won't be taking us to Mars with them... But it's the timing, Guy. The bloody timing that hits you, right in the gut."

Briggs felt vaguely ashamed. "I'm sorry, Bill."

Maclaurin's face worked. "At least we got this far. And we had some bloody good times, didn't we?" He raised his glass to the deserted plant.

Lighthill unlatched his helmet and cautiously raised it over his head. He smelled the fresher air of the cabin, heard the busy hum of the environmental systems, pumps and fans.

He pulled back his hands and watched the helmet tumble slowly, weightless, in the little space before his chest.

My God, he thought. My God.

Roly Gough already had his helmet off. His head, protruding from the neck of the pressure suit, was like a steel cylinder, with its grizzled crewcut and bull neck. "Feeling okay?"

Lighthill turned his head with deliberate slowness. "Better than I expected." Avoid sudden head movements, the NASA astronauts had advised; so far it seemed to be working, although the drug patch on his neck must be helping.

Gough was already working through his flight plan's list of tasks and checks.

Lighthill fumbled in his shin pocket and extracted his own thick ringbound checklist, then set to work with his assigned litany of switch-pushing and dial-reading.

There was no real sense of speed. He was in silence, now, apart from the humming of the cabin's instruments, the gruff voice of Gough, the rustle of paper, the hissing crackle of the capcom's voice.

It was hard to concentrate.

Earthlight slid across his lap and shimmered from the banks of switches, as if the cabin was some underwater jewelled cave.

If he looked ahead he could see the planet's curve, a blue-white arc framed by black space. And there was a slice of pale blue seascape, with an island an irregular patch of grey and

brown in the middle of it, and clouds scattered over the top, lightly, like icing sugar.

He was an Englishman, in orbit, aboard a British-built, British-launched spacecraft. He felt a surge of patriotic pride, unexpected and embarrassing.

Gough folded away his plan. "Looks okay down my end. And yours?"

Lighthill focused, and hurried through the rest of his list.

His flight plan listed the steps needed to bring air; light and power to the Observation Module, the short cylinder sandwiched between the Entry Module and the Propulsion Module. Lighthill was an atmospheric scientist on sabbatical from the Met Office at Bracknell. Once through the hatch in the heatshield below them, he would be calling the shots for the next two weeks, running the cameras, radars and telescopes that were the *raison d'être* of the mission.

He got to the point where the twin solar cell panels should be unfolded from the flanks of the Observation Module.

".. Minus Y Array - deployment confirmed. Plus Y Array -"

The deploy light stayed red.

He stopped.

Gough looked across sharply.

From the ground telemetry it looked, immediately, as if the plus Y solar array had got stuck. At the first hint of a problem, all of Josh Morris' s euphoria at achieving orbit evaporated. He listened anxiously to the dialogue between Lighthill, in orbit, and the controllers here at Woomera.

"The positive Y array deploy switch' s backlighting is still red," Lighthill was saying.

"Understood." The capcom was Bob Nash, an astronaut trainee who had served as backup to Lighthill. "Prospero, Woomera. What about the negative Y switch?"

"Gone to green."

"Copied, Prospero."

"Woomera, Prospero. I don't think we can have a telemetry problem here. Looks like a genuine gremlin on the starboard array."

Morris knew Lighthill was probably correct. He checked the fat, bound flight plan on the desk before him, looking for options.

"Capcom, tell him to recycle."

Lighthill would push the button again, and wait for the red glow to change to green.

"Bugger," Gough called softly.

No green light.

"You can't say 'bugger' on the BBC, Roly," Nash said weakly.

"Tell them to start contingency OPA3C, capcom," Morris said. That was the sub-procedure for diagnosing the non-deployment of an array.

"... Josh, this is Electronics." The electronics controller was a subcontractor from Marconi.

"Go ahead."

"They're working through OPA3C. I'm seeing a nice 60 volts off the neg array, but absolutely nothing off the positive. Microswitches indicate that the array is unlatched, but not at full extension. I'd say that it's jammed in the stowed condition. In fact we ought to get them to cut the array deployment motor before it burns out."

"Did you get that, capcom?"

"Yes, Josh. I'll tell them."

Electronics said, "Josh, the best we can do is to look at the telemetry from the drive motor and see if anything sticks out as the cause."

"And how long will that take?"

Morris could see Electronics shrug his broad, fat-laden shoulders.

The answer didn't really matter; Morris knew.

The Prospero was a cut-price spacecraft, capable of sustaining two crew in orbit for a fortnight. The entry capsule, which the crew were riding to orbit, looked a little like the Americans' Gemini which had first flown nine years before - but it was much cruder, designed only to sustain its crew for a few hours before they transferred to the compact Observation Module beneath it.

Right now, 30 feet behind Lighthill and Gough, the Propulsion Module's battery packs were slowly draining their power into Prospero's life systems. Unless recharged by the solar arrays within a few hours, they would drop below the critical margin at which an early return would be mandatory.

And it was surely going to take more than a few hours to diagnose and fix the solar array problem.

"...Damn," Morris said. "Damn, damn."

He tried to focus.

He spoke on the open loop to all his controllers. "I think you all understand the situation. Electronics, I want you to keep working on that solar array problem. In the meantime, we're looking at a reduced mission. Environment, give me a prediction on how

long they can stay up there with just one array."

"Already working on it, Josh." Mitch Clapp was the Australian spacecraft engineer responsible for Prospero's life-support systems; his voice was calm, competent, reassuring.

"Trajectory, start working on reentry profiles. Recovery, work with him on splashdown points."

"Understood, Josh."

"Flight Activities, start pulling together the reentry checklist. And compile some kind of schedule for what they can achieve before we have to bring them down. Medical tests, observation from the cabin... We ought to get every ounce of value out of this mission while we can."

"Roger."

"We still have a job to do; we still have two men in orbit. Capcom, inform the crew."

With that, Morris turned off the loop. He picked up the red phone that would connect him to Stevenage, and Guy Briggs.

The state of the cabin showed they were getting a little more adapted to zero-g, Lighthill thought. The spare spaces on the walls were peppered, already, with pens and pads and checklists and other small bits of kit, stuck there by Velcro.

In this dreamlike environment, it was somehow hard to become agitated by the problems: to imagine the frantic activity at Woomera, the Clarke-relayed phone calls buzzing back and forth to England.

Roly Gough wasn't so relaxed, though. He was taking a leak, which involved jamming a condom-shaped urine collector up against his crotch. "Four hours. Four bloody hours for a stuck array to magically fix itself, otherwise we're in line for a short trip home. What a waste. What a bloody, bugging waste."

"Roly -"

"What?"

Lighthill hesitated. "Take it easy. We've achieved orbit, and the chances are we're going to make it home. Operationally the mission's already been a success. This snafu with the array has scuppered the science experiments, not the operational side... What I'm saying is that it's my mission that's lost, not yours."

Continues in next issue...

National Space Centre

by Michael Williams

The National Space Centre is either:

- A. THE UK's premier space centred attraction
- B. A great success
- C. A fun day out for all the family
- D. A weird shaped building in Leicester
- E. The proof of lottery commission madness

The space centre isn't:

- A. An archive
- B. A museum
- C. A rocketry exhibition
- D. A place to dump the kids while you get some shopping done

The Space Centre is located just north of Leicester and is sign posted from the M1. The nearest train station is Leicester. Detailed bus information can be found on the website.

It is important to realise that the Space Centre is not a museum of rocketry or space travel but there is plenty there to feed the inner rocket nerd in all of us. Before I discuss that there are a few other things to talk about.

The space centre contains a very wide range of artefacts from a toothbrush to a Blue Streak. The whole collection is valued at around £11M. It is this collection that dominates the eye as you approach the space centre building with the big rubber rocket tower on the side. More on this later.

There is a very good astronomy exhibition. The solar system exhibits are particularly impressive. I'm sure that you have seen this sort of exhibit before; it's just that the space centre is a particularly fine example. There is also the customary history of the great astronomical thinkers. This wasn't up to the same level as the solar system exhibits but remember this isn't a museum.

Another of the space centres great attractions

is the "Space Theatre." Your admission price gets you into one of the AV presentations. When I attended I got to see "big." This is a beautiful blend of the hitchhikers guide to the galaxy and Jurassic park. Please imagine Richard Attenborough saying, "Space is big, I mean really big..... you may think its a long way down to the shops..." Quality entertainment.

On the day of my visit I had a chance to attend an additional AV presentation on the planets. This was an extra four quid, and well worth it. The presentation had an interactive component and the audience was asked questions and had to select an answer by pressing buttons on the arm of your chair, think of who wants to be a millionaire asking the audience.

The results of this were slightly scary. When asked which is the planet in the solar system furthest from the Sun, the number of votes received for planet-X and Jupiter make you wonder where these people have spent the day.

This sets me on to one of the tough subjects, dumbing down. We need to think how much more Astronomy, rocketry and science in general that a UKRA member is going to know compared to the average member of the public. In addition, a good deal of the space centres output is aimed at children.

Another tough subject is sanitization. The arms race, politics and the horrors of the A4/V2 production are pretty much absent. I don't think that there is a policy of removing this from public view but let's face it much of what is here is either a weapon platform or was born from one.

From the 10th of August the main AV presentation is now SETI. If you don't know what that stands for please close down, switch off and walk away in the full and certain knowledge that you did the right thing.

Why a rocketeer should visit

You know you're onto a good thing on the journey up to the space centre. You will be able to see the two large rockets in the five-

story rocket tower. These are a US built Thor Able and the last Blue Streak. The Blue Streak was built in 1971 and had never been stood up until its installation in October 2000. This rather impressive piece of tubing is on loan from the National Museums and Galleries on Merseyside.

The rocket hall also contains a great deal more than the two big rockets. First up is the Sky Lark, looking for all the world like a scaled up Estes kit with a CHAD motor taped to the bottom.

The rocket tower is divided into five levels. These contain a great deal more by the way of exhibits and information than either the guidebook or the hall itself suggests. My recommendation is get some exercise and climb all those stairs.

One final "goody" that is hard to miss is the Soyuz Space capsule located in the front entrance. This was "recovered" from a car park in Georgia (Russian Federation). There is little doubt that this is the most complete Soyuz in the west.

Why a rocketeer may walk out with a stunned expression

The Space Centre has an obsession with going to the toilet. There exhibits concerned with personal hygiene all over the place. Turn the corner and there is another piece of bizarre plumbing. This turns out to be one of the most often asked questions by visitors. Black holes generate a lot of questions but less than toilets.

OK, so the Blue Streak is a piece of history and the Thor Able might make a good scale build but where is the modern stuff? The Space Centre certainly would like a few more modern vehicles but it really isn't as easy as all that. Where would you put an Ariane V? Can you persuade NASA that they don't need Enterprise? If you are capable of getting Boeing to part with a Delta rocket I'm sure the Space Centre will want to hear from you.

The curious story of suit number 9

On display at the Space Centre is one of Michael Collins Apollo suits. This is on loan from a museum in Moscow and has been sat in a basement for thirty years. An Apollo astronaut had three suits on for flight, one for training and one as a backup.

This example is dated May 1968 and it appears to be the training suit for Apollo 8. Collins didn't make it to Apollo 8 due to a neck injury, lets hope getting moved to Apollo 11 was some compensation. It is interesting (at least for me) that this suit follows the "simplified" layout seen in Collins' Apollo 11 photographs.

It is not clear how this suit got to Moscow, any ideas? (**Ed's Note** if you really do want to know, I recommend asking on the newsgroup *sci.space.history!*)

Just a final note on just how successful the National Space Centre has been. Given a target of 270,000 visitors in its first year the fact that they managed 322,000 visitors in its first 12 months is impressive indeed.

Check out: www.spacecentre.co.uk, a slightly top heavy site. Informative and very pretty website that gave a designer a chance to show off at the expense of our phone bills. Or, telephone 0870 60 77223.

UKRA Discount

Remember that UKRA members qualify for reduced admission rates on production of valid membership cards from October 31st 2002 until March 1st 2003 (*see advertisement elsewhere in this issue for details*)



The National Space Centre is offering the members of the United Kingdom Rocketry Association discounted entry to this amazing new attraction. Simply bring your membership cards (both picture & year card) to the ticketing desks between 31st October 2002 and 1st March 2003 and you'll be entitled to £1 off entry price per ticket or £2 off per family ticket purchased.

The National Space Centre in Leicester is the UK's largest attraction dedicated to the excitement of Space. Since opening its doors to the public last June, the Space Centre has taken more than 450,000 people on a journey of voyage and discovery. From the minute you catch sight of the Space Centre's futuristic Rocket Tower, you'll be treated to hours of breathtaking discovery where the stories, personalities and technology of the past and present are used to explain our current understanding of space and how it will affect our future.

For more information on the Space Centre, opening hours and prices, visit www.spacecentre.co.uk

