

## **Licence Exempt Transmitters**

volume 4 issue 4

An article describing the use of  
radio transmitters in UK  
rocketry by Steve Randall

## **NRC 2000**

An overview of AspireSpace's  
National Rocket  
Championship by Julie Ince

## **PLUS**

Product Reviews  
Competitions &  
Latest UKRA News

## ***cover shot:***

Thomas Hicks trials the new  
UKRA Model Achievement  
Programme



# Editorial

by Pete & Angela Waddington

---

Welcome to the final issue of 10...9...8 for the year. UKRA has a new council, and the newsletter has new editors (or should that be 'ead 'itters?'). It's been another busy year, with the biggest ever attendances at UK rocketry events, and as the hobby grows, it opens up new areas of discussion. Anybody involved in the gripping conversation on uktr regarding communal launch equipment will testify to that! Rocketry as a whole does seem to have had good publicity this year with the Tomorrow's World Challenge, Modelmania, and the MARS team all doing their bit, plus all the dozens of newspaper and radio reports from successful rocketry events throughout the year will have done the hobby no harm at all.

But what price fame? Maybe over the winter months it's time to reflect on a great year, and consider what 2001 will hold for us all. Once the new council has had a chance to cut its' teeth, we can be sure that everybody will be doing their bit to take UKRA even further over the next twelve months.

This year has also seen the formation and growth of several new rocket clubs in the UK, a number of which have, or are in the process of obtaining, suitable flying sites. With the possibility of not returning to Garlands this year, a new site is a priority for the UKRA 2001 event.

Of course, an input is needed from you, the members. We will endeavour to produce four issues of the magazine a year. But, as it says on the cover, 10...9...8 is the voice of UKRA, so that's not just us, it's you as well! Articles, launch reports, kit reviews, photographs, hints and tips, anything is gratefully received. Don't panic if you don't see your article in the next issue - it just means that we had sufficient articles to publish this time, and you'll probably get your 15 minutes of fame in the following issue.

It just remains for us to say thanks loads to Darren Longhorn, the human kick in the butt we needed to get this issue done in time, and wish you all a Merry Christmas, and we hope you get lots of rocket kits from Santa!

Pete & Angela Waddington

---

## Cover Photo:

Thomas Hick proudly shows off his rockets that he used to gain his UKRA Model Achievement Programme level 2 award at the recent K-Lob flying event.

*Photo courtesy of Bob Arnott.*

# Contents

---

- 4 Using Licence Exempt Transmitters**
- 9 UKRA News:**
  - 9 - 2000 AGM**
  - 11 - 2001 AGM time & location**
  - 12 - New Safety Code**
  - 12 - Council Meeting minutes**
  - 14 - Model Achievement Programme**
  - 15 AspireSpace National Rocket Championship 2000**
- 19 Competitions**
- 20 Is that a J or a K?**
- 21 Mil-spec 9' Parachutes**
- 22 Kit Review: Blackhawk R&D - Astrobee D**
- 25 Rocketry Groups and Contacts**



# Using Licence Exempt Transmitters How far will the transmissions go?

*by Steve Randall*

The use of radio transmitters within model rocketry is increasing significantly - they have been used for tracking, telemetry and even live video. One of the cheapest ways of getting going legally is to use licence exempt transmitter modules. This article tells you how to go about choosing and using these modules. There is plenty of information on the internet on how to build practical systems (see the links section for details) - so I have not repeated it here. The intention of this article is to give more depth to the issues skimmed over on the web.

## Frequencies

Licence exempt transmitter modules don't have to be licensed because they have gone through a type approval process. They do however need to be used in accordance with manufacturer's instructions to be "legal". At first sight there appear to be about 10 licence exempt frequencies that might be suitable for rocketry - however the majority of these are for land use only - airborne operation is only allowed in the following two bands :-

- 433.050 to 434.790 MHz for telemetry
- 2400 - 2483.5MHz (2.4GHz) for video

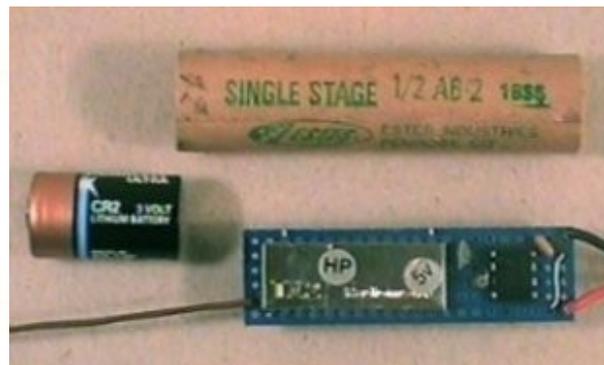
Both with a maximum radiated power of 10mW.

10mW is not a lot of power - however with the right techniques it can be made to stretch a long way - literally.

One of the first things you find out when you fly a transmitter in a rocket is that the signals go a lot further when the rocket is in the air (i.e. so called line of sight) compared with on the ground. A small 10mW 433MHz transmitter has a range of over 20Km in the air while it can be as low as a few hundred meters on the ground. The figures mentioned are for tracking - telemetry signals will go significantly less and wide bandwidth signals like video even less. With the right equipment you might expect to get 1Km or so line of sight with 10mW of video on 2.4GHz.

An advantage of the low output power is that the devices don't take much battery current - for example a 10mW transmitter should run continuously for over 24hours on a single Alkaline PP3 Battery.

The most readily available modules are for 433.92MHz which is nicely within the telemetry band mentioned. My particular favourite is the Radiometrix TX2-433-5V which transmits the full 10mW of output, is only 13mm in width and weighs under 3grams. The following photo will give you some idea of the size in comparison with an Estes 18mm motor. The transmitter module is the silver oblong with the HP and 5V stickers on it.



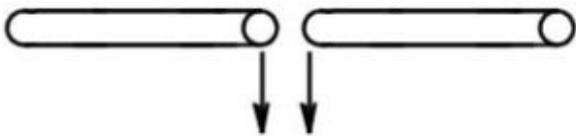
# Transmit Antenna

To stay strictly legal the licence exempt transmitter modules are restricted to using antennas that have no "gain" - this restriction is to limit the range of the transmissions. Antennas with no gain transmit equally in all directions - they are said to be "omni-directional".

Fortunately this turns out to be exactly what is needed for rocketry. An omni-directional antenna allows the rocket to take on any position in the sky and still ensure that a signal is being transmitted in the direction of the receiver.

Probably the best balance between simplicity and a true omni-directional antenna is either the 1/2 wave dipole or the 1/4 wave whip. Both are not completely omni-directional having poor signal strength along the axis of the elements (i.e. out of its ends). The effects of this can be minimised by placing the antenna to align with the axis of the rocket. The signal strength will only be weak when the rocket is either going directly towards or directly away from the receiver.

A 1/2 wave dipole is two elements (metal wire or rods) a half a wavelength tip to tip (see diagram below), A wavelength is just the length that radio waves travel in the time it takes to send a complete radio cycle (wave). As you might guess a 1/2 wave is just half of that length.



To Transmitter

In practice the length is affected by the thickness of the element. Here is a table of dipole length for various element thicknesses.

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

	Element Thickness						
	0.5	1	1.5	2	2.5	3	4
<b>433.92MHz</b>	332	330	329	328	327	326	325
<b>2440MHz</b>	58	57.4	57	56.6	56.3	56.6	-

All dimensions in mm

(Don't worry too much about absolute accuracy - these figures are just a guide)

A quarter wave whip is a single element a quarter wave long - for successful operation the element needs something to act as "ground". In many designs the ground is provided by the mass of the transmitter and battery. Normally this seems to work well enough - although it may be helped by attaching some wires about a quarter wavelength long to the transmitter ground connection and running them at right angles to or away from the transmitting element

# Receiver Antenna

There is no limitation on the antenna at the receiving end. By using a high gain antenna like a yagi or helix you can receive the signals over a longer distance - you can also use these antenna to help locate the transmitter. A yagi is a collection of rod elements arranged on a boom (see figs 1, 2 and 3) - a good example is the common TV antenna. A Helix has a single spiral element arranged in front of a circular reflector (see fig 4).

Generally the longer the yagi or helix is the more "gain" it will have and the further you will be able to receive the transmitter signals - BUT the more gain an antenna has the more accurately you have to point it to receive the signal. In practice the length of antenna will be limited by what you can sensibly wave about - say about a meter in length.

# Polarisation

With ordinary (plain polarised) antenna like a dipole or yagi the signal strength can vary

dramatically the alignment between the transmitter and receive antenna changes. Ideally the elements in the transmitter and receiver will be aligned (see fig 1).

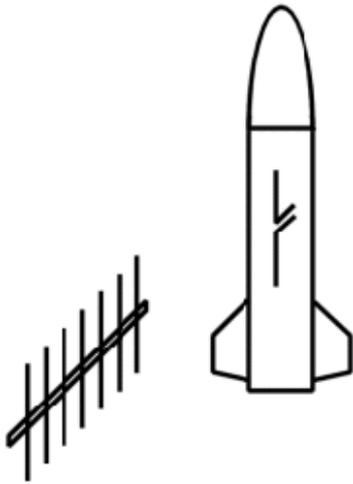


Fig.1 Good

The worst case is where the antennas are at right angles (see fig 2) - the received signal can be over 100 times weaker in these circumstances.

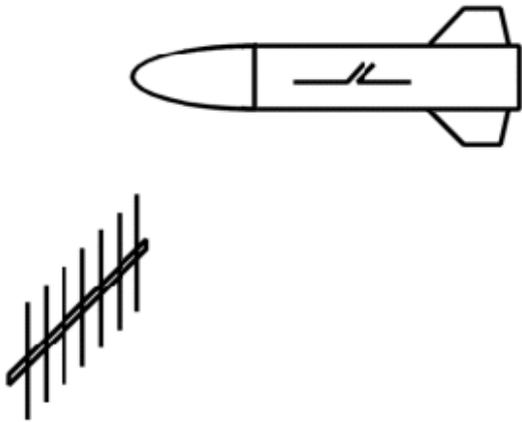


Fig.2 Bad

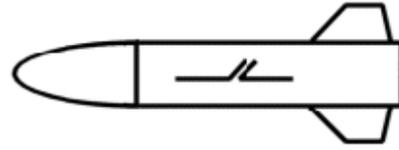


Fig.3 Good

One way to avoid this is to use a circularly polarised antenna like a helix.- you will get a signal no matter which way the rocket is oriented (as long as you point the helix at the rocket).

A chap called Jason Hecker has a design for a 2.4GHz helix. - see <http://www.eisa.net.au/~disco4/> - this uses 40mm OD PVC plumbing pipe - it turns out that 40mm is almost the ideal size for a helix at this frequency. This was the antenna Dave Thomson used for the live TV pictures from his rocket IRIS at UKRA2000.

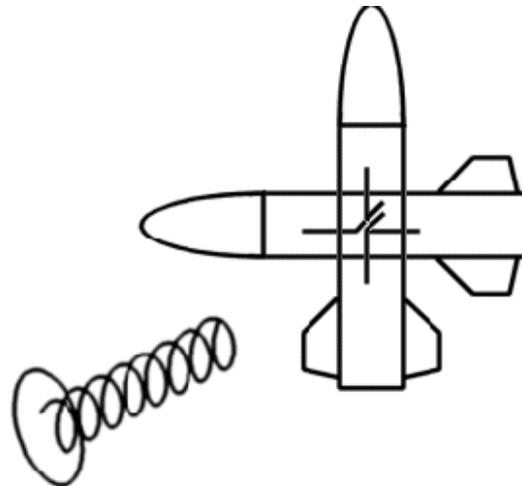


Fig.4 Good in any orientation

A helix for 433MHz would be quite unwieldy being about 22cm in diameter - so I suggest using a yagi at this frequency. A design for a 433MHz yagi is given on the PbP web pages (see the Links section) - Hugh Gemmell has also has a variant of it on his web page.

## Frequency use

As I mentioned the most popular licence exempt modules are for 433.92MHz - however this means that almost everyone at a launch meeting could be using the same frequency. Here are a few tips to avoid a punch up:-

1. If someone else is using a transmitter ensure that their rocket has landed and that they have a good bearing on it before you turn on your transmitter. It's a good idea to check with them that they are happy for you to start transmitting.
2. Only turn on your transmitter just prior to launch - ensure that no-one else on the stands is also transmitting (check with your receiver).
3. Turn off your transmitter as soon as you have located your rocket.

Due to manufacturing tolerances it turns out the transmitter modules actually aren't all on exactly the same frequency. A good receiver can pick out the different frequencies in use - it may be worth investing in one with a narrow bandwidth filter.

In order to differentiate your transmitter it may be worth giving your transmitter a unique sound signature. You can change the component values in the circuit given.

## Sources of Equipment

Licence exempt modules may be purchased from electronic component vendors such as:

- Radio Spares (<http://rswww.com/>)

- Maplin Electronics (<http://www.maplin.co.uk/>)
- Farnell (<http://www.farnell.co.uk/>)
- RF solutions (<http://www.rfsolutions.co.uk/>)

Maplins or Waters & Stanton (<http://www.waters-and-stanton.co.uk/>) carry a range of radio scanners suitable as receivers. One of the advantages of the 433.050 to 434.790MHz is that this coincides with the 70cms amateur radio band - this means that amateur radio antenna and equipment can be used for the receivers. Moonraker antenna (<http://www.moonrakerukltd.com/>) carry several 70cms amateur radio yagi.

## Choosing a Receiver for Location

For rocket location you need a receiver with good sensitivity and a good signal strength meter. The signal strength meter either needs to be one of the old mechanical types - or needs to have a reasonable number of graduations if its one of the Liquid Crystal types. You need a good number of graduations to determine maximum signal strength and hence get an accurate bearing. Take care - I have seen a number of the receivers that appear to have lots of graduations but these actually come on in blocks.

## Rocket Materials

Most model rocketry construction materials are reasonably transparent to radio transmissions - cardboard, phenolic, fibreglass, PML nosecones and PML quantum tube were all tested at 433Mhz and found to make no detectable difference to signal strength. This was not true at 2.4GHz with cardboard showing notable absorption, next worse was phenolic. Fibreglass showed only a little absorption. PML quantum tube and nosecones showing no detectable

absorption at all.

It goes without saying avoid metallic coatings like aluminium foil.

## Antenna placement

A transmitters range is severely reduced when the antenna is close to the ground. Try to locate the TX antenna somewhere where it will be a little way off the ground when the rocket lands - even a couple of inches can make quite a difference. Don't locate the antenna near metal objects - this is especially true near the tips of the antenna.

## Radio Location Technique

The simplest radio location technique is to use a yagi and receiver with a signal strength meter. As you swing the yagi around the rocket will be off in the direction of maximum signal strength. If the signal is weak try rotating the antenna through 90 degrees.

Given the limited transmitter power of you can't wait for the rocket to land and then start to try and locate it. By far the best way is to track the transmissions while the rocket is in the air, follow it to the ground getting a good bearing as it lands. The signal will normally disappear as the rocket lands - especially if it lands a significant distance away. For high altitude shots you may even want to draw the

bearing on a map. Once the rocket has landed head off in the direction indicated searching for the signal. When you are within a few hundred meters you should pick up the signal again - just follow the maximum signal strength until the rocket is found.

When you get close to the rocket the receiver can get swamped by the strength of the transmitter signal. This makes getting a direction difficult. If your receiver has an

attenuator switch it in at this point - if not you could use an external attenuator in series with the antenna lead.

## Sources of further information

Most public libraries carry copies of radio manuals used by radio amateurs RSGB (Radio Society of Great Britain) or ARRL (American Radio Relay League) these normally have a good section on antenna designs - look out for 70cms antenna.

## Links

Hugh was one of the first people to build his own radio tracker in the UK - he has some details on his site:- <http://www.cruiserd.demon.co.uk/> (look under electronics then Cheap Radio Location Tracker).

Roy Trzeciak-hicks also has his own design using a PIC chip:- [www.trzeciak-hicks.freemove.co.uk](http://www.trzeciak-hicks.freemove.co.uk) (look under Roy, HPR and the home brew).

For a US view of things see PbP (Programming by Pete) <http://www.tfs.net/~petek/projects#top> (look under 70cms Rocket RDF).



Steve with his Yagi

## 2000 AGM

This is an abbreviated form of the minutes of the AGM held on 11th November in Lincoln - by Steve Randall

### Chairman's Report

Mike Williams opened the meeting by thanking everyone present for braving the bad weather conditions (floods, winds and heavy rain) to attend. The meeting was kept short to allow as much light as possible for people returning home. Mike gave the chairman's Annual report. Mike covered the loss of Garlands flying site – but said he felt that clubs had recovered well by finding alternative launch sites. Mike sited the following improvements in UKRA over the last year:-

- Membership was up to 120 from 55 at the same time last year.
- The trial of the "Junior" scheme – which would soon launch as the "Model" scheme.
- The quality of 10,9,8 had dramatically improved.
- The web site was significantly better.
- UKRA continued to have a good relationship with the BMFA and they had recently made site insurance available.

Mike also stated that UKRA would be introducing an altitude competition in the new year. Mike went on to present a few topics that had received significant discussion within the council in recent weeks:-

- Should UKRA build a launch controller? – Mike had mixed feelings personally – UKRA should provide more than just insurance to its members – but should it spend funds on this project?

- What and where would UKRA 2001 be? – it was very unlikely that it could be held at Garlands. Mike called on suggestions to the members.

### Financial Report

Pete Davy presented the Financial report from Hugh Gemmell. The highlights were:-

- The account balance on the 1st Jan 20000 was £299.70
- The income for the year was £4,516.09 – this was primarily made up of Membership fees and Income from UKRA 2000
- Expenses totalled £3,855.53 which was primarily comprised of BMFA Membership/Insurance, the PO Box costs, Stamps and
- Stationary and UKRA 2000 costs and expenses.
- With the expected income and expenses there would be a predicted surplus of £784.26 at the end of the year.

### Results of the Election

68 voting forms were returned from the 101 members eligible to vote (67.3% "turnout"). The following members were elected to council: Pete Davy, Hugh Gemmell, Darren Longhorn, Richard Osborne, Ben Jarvis, Bob Arnott, John Bonsor, Malcolm Ingram, Charles Simpson, Mike Crew, Ziggy Kklynoski, Jim Macfarlane, Steve Randall, Mark Turner and Michael Williams

Analysis of the voting showed a distinct pattern. Two council members (Pete Davy and Hugh Gemmell) received votes from over 66% of members that voted. The remainder of the elected council received votes from between 24 and 31% of those that voted. Adam Baker missed a place on the Council by just a couple of votes.

### CE Marking

Pete Davy presented the topic of CE Marking. The CE marking regulation would come into force on 1st Jan 2003 and would

require all explosives to be certified by a notified body. Pete's investigations had showed that certification would be an involved and costly process. The UK notified body would require £500 just to process the 32 page application form and were talking in £1,000s rather than £100s for the cost of marking. In a meeting between Aerotech, Pete and the other 2 European suppliers it was agreed that Aerotech would fund the majority of the CE marking. It was likely that the German notified body would be used to complete the CE marking. Two points were raised:

- Was it known if the CE mark costs would be passed on as a price increase? Answer - This was unknown at this time.
- Were ESTES engines subject to the CE mark? Answer - No they were classified as a firework and were thus exempt.

## Rocket Launch Regulations

Pete Davy explained the history behind the proposal. The original members of UKRA had asked the CAA what legal regulations applied to the flying of rockets. The CAA responded that there weren't any and asked UKRA to write a proposal based on the UKRA safety code. Using this document the CAA set out a proposal with 4 different models of regulation. After discussion with interested parties the following is proposed as the basis for legislation:-

- Model Rockets up to and including G total impulse would be unregulated.
- For rockets with a total impulse from H to M there would be self regulation – CAA proposed UKRA would be body responsible.
- Above M total impulse DERA may well be the body to certify rockets – at commercial rates. Additionally UKRA safety and technical committee will be able to certify rockets above M for UKRA members.

## Safety Code

Charles Simpson reported that V3 of the safety code had been completed in February 2000. At this point the guide had been passed to the old Chairman before

passing to the BMFA. For reasons that are unclear this did not happen. The V3 safety code has been sent to the BMFA since the old chairman's resignation and has been approved by them. V3 will be sent to all members on membership renewal in the new year.

V2 of the safety guide has been sent to new members but has not been sent retrospectively to existing members because of the impending issue of V3 and because of the similarity of V2 to V1.

A question was raised as to what version of the safety guide should members work to? The response from the council was that V2 should be used until 1st Jan 2001 when V3 will become live. The V2 safety guide would be put up on the UKRA web-site in the next few days. *[Editor's note - V3 has since been approved by the BMFA and is now in force with immediate effect - see elsewhere in this issue]*

## Study Guide

Charles Simpson reported that the new Level II/RSO study guide and exam paper was nearly complete and would be available shortly.

## 10...9...8... publication dates

**The topic of the 10,9,8 schedule was discussed. Darren Longhorn responded on behalf of the council:- Although there was a commitment to produce 4 issues of 10,9,8 per year and that these would normally be aimed at Winter, Spring Summer and Autumn editions, it simply was not possible to give firm dates as publication depended on material being received from the membership and also depended on the commitments of the people producing it. It was agreed that:-**

- **The council would endeavour to publish 10,9,8 quarterly.**
- **There would be no strict publication dates.**
- **An email would be sent to members as soon as it became clear that an issue was approaching a submission deadline.**

## Secret Ballot

A question was raised as to why the AGM council ballot had not been secret as dictated in the UKRA constitution. Several reasons were given but this had primarily been driven by the need to introduce a cheap, simple scheme to stop any cheating by duplicating voting sheets. In previous years there had been less candidates than places on the council – so anyone standing was assured of a place. This year there had been more candidates than council places - so it was more important to stop any cheating. The Name and address stickers ensured that voting forms could not be duplicated. There was some discussion on how important people felt that a secret ballot was – a vote was held to gauge opinion:

- 3 people voted for a secret ballot
- 7 people voted to make it open
- 7 people had no strong opinion either way

It was agreed that the council would discuss the need for a secret ballot and ways of voting anonymously.

## H powered Altitude Competition

This competition is sponsored by BERUS AEROSPACE and PETE'S ROCKETS and will become an annual event running from AGM to AGM. The prize (a shield) will be presented to the person achieving the highest altitude with an H powered rocket within that period – not necessarily the highest altitude of all time. This years winner was Steve Randall who achieved 6566ft with his Aerotech H180 powered minimum diameter rocket "2Xtreme".

## 2001 AGM time & location

There have been a number of lively discussions on the time and place for the next AGM. I am writing this in order to find out what the membership of UKRA want from next years event.

The AGM's traditional goals have been to deal with major issues that affect UKRA and the way it is run. In addition the AGM is a good opportunity to exchange views on UKRA and on how well, or badly it is doing.

Some of the ideas that have been put forward attempt to extend the goals. Perhaps into the form of some kind of UKRA social event, or non-flying event. There are so many ways that this could be done that I'm not going to try and list them. What do you think?

One suggestion that always generates a heated debate is holding the UKRA AGM at a flying event. At first glance this seems like a great idea. There are lots of people together and everyone has rocketry on their mind. In reality it is very difficult to hold peoples interest in the details of AGM business. Council members may well be involved in running the event and even, actually flying some rockets! I am not trying to rule out the idea of holding the AGM at a flying event only to point out that it is very difficult indeed.

Another point to consider is when do we hold the AGM? Once the flying season is over, autumn or early winter has been traditional. But, given the terrible weather we had to contend with in 2000 maybe we should move it earlier in the year. Again, what do you think?

The next question I would ask you to consider is should the AGM be held in England or Scotland? Scotland is important to rocketry, indeed UKRA as born as UKHPRA at Largs in 1996. But, England has many more members than Scotland, and if we don't hold the AGM during the Largs event then what sort of attendance will we really have?

If we hold the event in England then it would seem sensible to hold it "centrally," however there are three ways to view centrally:

Firstly, by Geography, that puts us pretty close to where the 2000 AGM was held in Lincoln.

Secondly, by travel time, this is probably London. It is a communications hub for the whole country after all. Not only that it is far easier for many of our Scottish members to fly to London than it is to drive to Lincoln.

Thirdly, by looking at the distribution of membership. Though I can't tell you exactly where that would put us, but I believe rather south of Lincoln, Birmingham maybe?

This is one more subject where I would like your thoughts, the AGM is meant to be for the membership as much as it is for the "process" of running UKRA.

I hope to get your thoughts on the AGM in the next couple of months. Please send you ideas either to the UKRA PO Box or directly to a member of the council.

Thankyou,  
Michael Williams  
Vice Chairman UKRA.

---

## Safety Code

A new version of the safety code is now in force. Version 3 of the safety code is available in a number of formats. Paper copies are available, on demand, from the Membership Secretary immediately, although all members will receive a paper copy on renewal of membership. Alternatively, electronic copies are available for viewing on, or download from the UKRA website [www.ukra.org.uk/](http://www.ukra.org.uk/)

---

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

## Council Meeting 26/11/00

### Present

Steve Randall (minutes), Michael Williams.  
Malcolm Ingram, Bob Arnott, Darren Longhorn  
Mike Crewe, Hugh Gemmell, Ziggy Kklynoski,  
Charles Simpson, Pete Davy

### Apologies

Richard Osborne, Jim MacFarlane.

### Election of Executive Officers

This was achieved by a simple show of hands.

- Charles Simpson was voted Chairman
- Michael Williams was voted Vice Chairman
- Hugh Gemmel remained Membership Secretary and Treasurer
- Steve Randall and Darren Longhorn will perform the role of secretary (Steve will retain the document file and signatory – Darren and Steve will alternate writing council minutes.)

It was agreed that Hugh would pass some of his current responsibilities to other council members to reduce his load. Darren would keep the list of clubs up to date, and the handling of enquiries would be split. Hugh will continue to answer membership enquiries, but general enquires would be handled by Darren.

It was generally agreed that the non executive roles would remain unaltered. Michael Williams would remain BMFA liaison – unless he had to take up the role of Chairman.

### Minutes of AGM

After much discussion over the action point to publish the V2 safety guide it was agreed that:-

page 12

- The V3 safety guide should be put up on the Web Site (9 For, 1 Abstention)
- The V3 safety guide would come into effect immediately. (8 For, 1 Abstention, 1 Against)
- The AGM minutes were accepted unanimously.

It was unanimously agreed that the secretary could produce a potted version of the AGM minutes for the web site and 10,9,8 without further verification from the rest of the council. Minutes of the October council meeting The October council minutes were accepted unanimously.

## **UKRA 2001**

Various options for UKRA 2001 were discussed. Council members were given action points to investigate possible venues. It was agreed that the EARS site although a possibility should be used as a last resort – due to the high cost of providing facilities. The date for UKRA 2001 was nominally set as the weekend of 16/17th June.

Other UKRA event dates were discussed. It was unanimously agreed that KLOB would be run as an official UKRA event – with an entrance/flying/camping fees. The date was set as the weekend of 29/30th September.

## **Secret Ballot**

It was agreed that the council election should be secret. It was agreed that the voting forms will be embossed with a UKRA official stamp for next years election – and that they will not bear a name or address identifier. Voting forms will be distributed with a notice that damaged forms may be returned for replacement.

## **Council Media Representative**

Pete Davy was unanimously voted the UKRA media rep.

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

## **Model Scheme Rates**

It was agreed this scheme would be free to UKRA Junior members. For Schools and Youth Groups there would be two offerings:-

- With insurance - for children via the BMFA group membership – the fee would be set at £2
- With the Supervisor insured as an UKRA member – where the children were insured by some other means (e.g. school insurance).

## **Constitutional Changes**

It was agreed that Mike Crewe would co-ordinate changes proposed by Council members and would have a combined proposal ready by Mid December. It was agreed that the changes needed to make further alterations to the constitution easier would be a priority. It was agreed that if necessary UKRA would bear the extra cost of a separate mail shot of SGM notice.

## **Web Site hosting**

It was agreed that the web site renewal fee of £150 was too expensive and that UKRA should look for an alternative arrangement.

## **Web site content**

A discussion over what could and could not be hosted on the web site took place. It was agreed that the entire membership information pack – including constitution and safety guide could be published on the web-site.

It was agreed that council members should not post information from council meetings on the news groups and that such communication with UKRA members should be made via email if necessary.

It was agreed that a "potted" version of the minutes should be made available on the web site. It should include:-

- Lists of Topic Discussed
- Any decisions made
- Anything that directly affects the membership

It should exclude:-

- direct reference to members in disciplinary cases etc.

It was agreed that the potted minutes would normally be produced by the secretary and would not need review by the council before being published on the web site – however any contentious items should be sent to the chairman for approval first.

### **Breaches of Constitution**

Two examples of breaches of the constitution were cited:-

1. Where 2 temporary members had been allowed to certify to L1 at the IRW.
2. Where members below the age of 16 had been allowed to certify to L1.

Re: 1) It was unanimously agreed that the 2 IRW certifications should stand (by effectively granting full member status on that day). It was agreed that the rule to allow only full members to certify should stand. The action point to remind RSOs of the constitution was already underway – It was agreed this would be sufficient to remind the RSOs of the rules applying to certification.

Re: 2) It was agreed that:- That people under the age of 16 should be allowed to certify on a case by case basis with the approval of the safety and technical committee. The constitution should be changed to this effect. That the existing certifications should stand.

### **Range Safety**

It was agreed that there was a need for a 10,9,8 article that sets out the legal position and makes recommendations regarding the storage of both BP and AP propellants.

### **RSO Interview Day**

It was agreed to hold a RSO test and interview day later in the year.

## **UKRA Model Achievement Programme**

As you may know from reading the previous issue, UKRA have been working on an attainment scheme initially aimed at our younger members and based around model rocketry. The working title has been the Junior Certification Scheme. During the trial, it was decided to increase the scope of the scheme to include our own Juniors, Senior members with an interest in Model Rocketry, and Youth Groups. Consequently we have renamed the scheme which is now known as the UKRA Model Achievement Programme. The programme is free for all existing members.

The programme itself remains unchanged, but by opening it out to youth groups we hope to increase participation in Model Rocketry and ultimately boost our membership. To run the scheme with a youth group. At least one of the leaders must be full, insured UKRA member. The group themselves have two membership options, one with insurance ( provided by the BMFA group membership scheme), one without. The membership fees for the insured class of group membership will be dependant upon the BMFA insurance premium. UKRA will also levy an administration fee for each group participant, of around £2

The programme will be launched as of 1st January 2001. For more details of the programme, you should find a pull-out Model Achievement Programme handbook in the centre of this issue of the newsletter. If you want to get involved in running group, contact us at [UKRA-MAP@northstarrocketry.org.uk](mailto:UKRA-MAP@northstarrocketry.org.uk), or the UKRA PO box.

# AspireSpace National Rocket Championship 2000

---

*by Julie Ince*

September 2000, marked the second AspireSpace National Rocket Championship (N.R.C) launch event, the aim of which was for competitors to produce and launch the best overall sounding rocket. It was the climax of a year of hard work for the five teams of university students and gave them the chance to see whether their designs worked as predicted. The event was held at the Davy family farm near the village of Heckington, Lincolnshire one of the largest areas's of uninhabited land available for the launch of amateur rockets.

The members of the teams, who were mainly undergraduate university students, learnt and refined a variety of practical skills to supplement their University Degree. Thanks to the support and generosity of Astrium UK and DERA and the help and enthusiasm of UKRA members, especially Pete Davy, James Macfarlane and Charles Simpson and our judges , John Harlow, formerly Head of Future Projects for Royal Ordnance, Mark Perman who is a founder member of UKRA (United Kingdom Rocketry Association), the governing body for amateur rocketry in the UK and employed by Royal Ordnance, and Mick Johnson, Head of Mission Systems, Astrium UK whose main area of interest was in the Payloads, AspireSpace has been able to inspire part of the next generation of engineers, scientists and rocketeers.

## **The Teams and The Launch Event**

Building on the success of last year's

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

championship, five teams competed in The National Rocket Championship 2000. Bristol University (BURT) and Kent at Canterbury (KART) were unable to stay away, joined by a second team from Canterbury (ARK) and new teams from both Kingston and a joint UMIST and Manchester University team. The NRC Launch Event was the climax of a year of hard work for the three teams of university students and gave them the chance to see whether their designs worked as predicted. It took place over the weekend of 23rd/24th September 2000. Due to poor weather and low cloud, it was necessary for three of the teams to return the following weekend to launch their rockets.

The Saturday got off to a rainy start, giving many of the teams chance to spend the morning making last minute adjustments and carrying final safety checks also giving the judges a little an opportunity to talk to the teams. In the afternoon, once the rain had eased off, Kingston's Millennium Rocket was loaded into the launch tower. After several ignition attempts due to various motor and ignitor problems, Robert's rocket was the first of the NRC rockets to be launched.

## **Kingston University**

Robert's final year project for his M.Eng. Aero Engineering degree was the final design, and construction and testing of the rocket. Originally designed to fly on an 'M' motor, but adapted to fit the standard NRC K550 for the NRC site. At 2.2m long and weighing 8Kg at launch, the Millennium Rocket had a finish and build quality to be envied. However despite a perfect ascent, against a spectacular sky to what was probably the highest altitude attained by the NRC rockets due to battery failure the RDAS flight computer, which was due to trigger the recovery mechanism reset in mid -flight causing the rocket to return ballistically. Despite being buried several feet under, the rear of the rocket remained intact - a testament to the quality of its structure.



On launching Kingston's Rocket it became apparent that the cloud cover was getting lower, and a Range Safety decision was made to postpone the rest of the NRC launches for early on the Sunday morning, giving Robert a chance to dig out his rocket in the fading light.



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

Early on the Sunday morning all the teams assembled back at the launch site keen to put their rockets to the test. The UMIST/Manchester team were to launch first and the rocket was loaded into the launch tower. Despite the early start, once the rocket was ready for launch the cloud was already too low for the current motor. The rocket was taken out of the pad and a smaller motor fitted to keep the rocket below the cloud base. Once reloaded in the launch tower, the UMIST/Manchester rocket was given the go for launch.

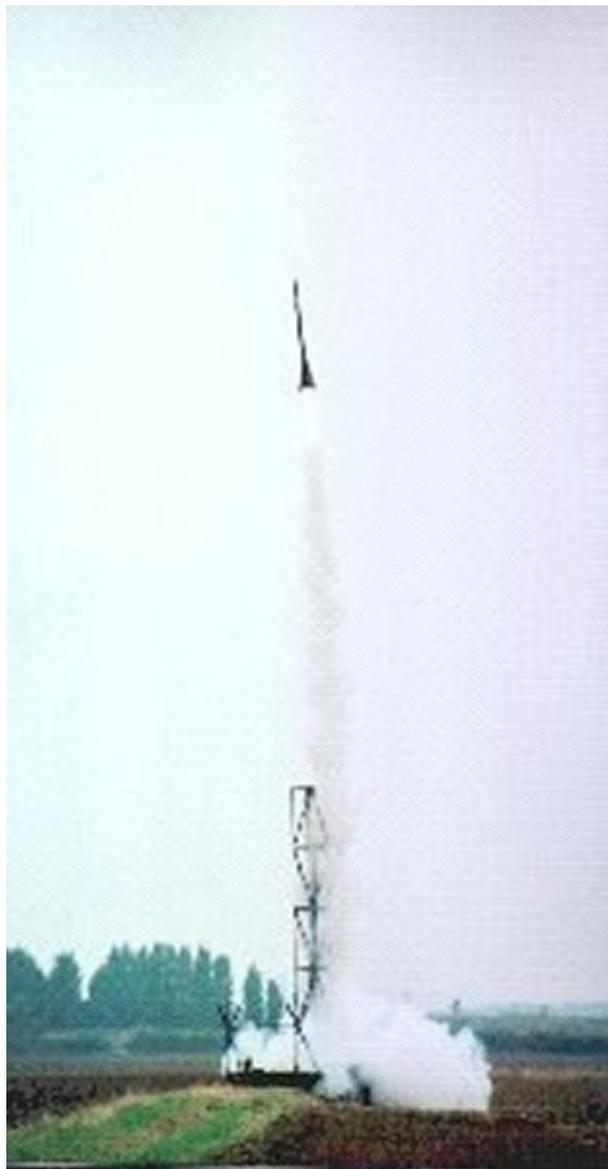
### **UMIST and Manchester University Rocket Team**

Whilst this was the only NRC rocket to use standard 4" phenolic tubing, this is where the use of 'off-the-shelf' parts ends. The team fabricated its own fibreglass fins, a nosecone with built in pitot tube. An impressive flight computer including timers, servo controllers and a home built altitude sensor, along with hand sewn parachutes. The Drogue chute deployed shortly after apogee and the servo release mechanism operated at 300m however the piston which should have been pulled free by the drogue had become jammed due to the tube becoming damp and expanding. Most of the impact was absorbed by the coupler tube, which is very easily replaced, allowing the rocket to be flown again.



page 16

Unfortunately, the cloud was getting thicker and the forecast was for worse in the afternoon, meaning that if it was possible to launch at all it would have to be on very small motors so as not to go through the cloud. This was not really a suitable option for some of the rockets, and the teams all chose to return the following weekend in hope of more suitable conditions.



The remaining three teams two from Kent and one from Bristol arrived back in Lincolnshire on the following Saturday, which although starting off misty cleared up shortly after midday. Ready to launch first were Nicola and Rob from ARK, and anxious to

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

learn from the previous weekend's delays a more powerful ignitor enabled their rocket to leave the pad easily.

### **ARK2000 - Amateur Rockets in Kent**

ARK's team of three came up with a minimum diameter design, using a carbon fibre and wood airframe, giving a total length of 1.2m and a launch mass of just over 3.5Kg. ARK's rocket utilised a solenoid timer deploying the parachute through the side hatch. Launched on a I161 motor, it left the pad with a deafening roar and rapidly disappeared from sight (quite impressive for an I161 motor) The parachute had not opened and the rocket was descending rapidly and whistling. Almost in answer to the shouts of "Come on, Open" the parachute deployed just a few feet off the ground to everyone's surprise and relief and although the rocket was going to fast to safely inflate the parachute, it increased the drag enough to slow it down, so that only the nosecone was damaged on impact.



## **BURT2000 - Bristol University Rocket Team**

Shortly afterwards BURT's all-Al vehicle rocket flew on an I357 solid motor again to keep it within the cloud cover. It employed a two stage, servo actuator controlled recovery system, and contained an RDAS flight computer. At an altitude of 1600ft the drogue chute deployed, however the main chute had tangled cords and did not inflate fully. After a few changes to the recovery system it flew and recovered perfectly the following day.



## **KART2000 - Kent Amateur Rocket Team**

Last of the NRC Rockets but by no means least, was KART, with ErnieMk2. Not only was this carbon fibre rocket packed with payloads including an accelerometer, altimeter airspeed sensor, camera, Geiger-muller tube, but it also contained a daring rear ejection parachute, housed within a 4 part carbon fibre boat tail split by a double redundant pyrotechnic release mechanism.



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

A few seconds after apogee, that probably felt like a lifetime to KART's team, three out of four frangible bolts detonated deploying the streamers and rear ejecting drogue chute as planned. Just as everyone breathed a sign of relief and cheered, it became obvious that the main chute had failed to deploy. The rocket sustained minor damage to nose and upper body, but thankfully the payload bay remained intact.

## **NRC 2000 AWARDS**

The teams were judged on a number of categories with particular attention being paid to their payloads, recovery system, team-work and proof of engineering thought in their design, giving the judges the difficult job of determining who the awards should be presented to at the Annual UKSEDS conference:

The Astrium Payload trophy -for the winner of the best payload was awarded to the KART (Kent Amateur Rocket Team) for both the effort, skill and time that they had put into their payload as well as the highly successful rear deploying recovery device that was a payload in itself.

The Geoffrey Pardoe Trophy for the overall winner of the Championships was awarded to the UMIST and Manchester University Rocket Team, for outstanding performance in all categories. They exceeded all expectations, particularly since this was their first year in the Championship and due to excellent teamwork achieved all their goals. All the teams involved were happy to have had the opportunity to be able to fly their rockets, and despite the delays and weather problems were in very high spirits. The rockets produced by the teams were the product of a great deal of engineering design, manufacturing skill and thorough testing, as well as commitment and enthusiasm from the teams involved. Although there can only be a couple of trophy winners, the teams agree that the greatest reward is the skills and experience that they have gained through their hard work.

page 18

# Competitions

Every cloud has a silver lining, and when Beatties experienced their recent financial troubles, UKRA managed to acquire some Quest kits for a bargain price. We hope to use these kits to run a regular competition spot here in the newsletter.

So to kick off here is this issue's competition. The prize is a Quest *Apollo* kit. All you have to do is spot the odd one out (and say why!), from the following list of spacecraft:

- Shenzhou
- Buran 02
- Enterprise
- Gemini 2

We've included pictures of each of these vehicles to help you out. Can you work it out yet? If so, send your answers to either the usual UKRA PO Box number, or submit your answer by email to: [10-9-8-competition@northstarrocketry.org.uk](mailto:10-9-8-competition@northstarrocketry.org.uk)



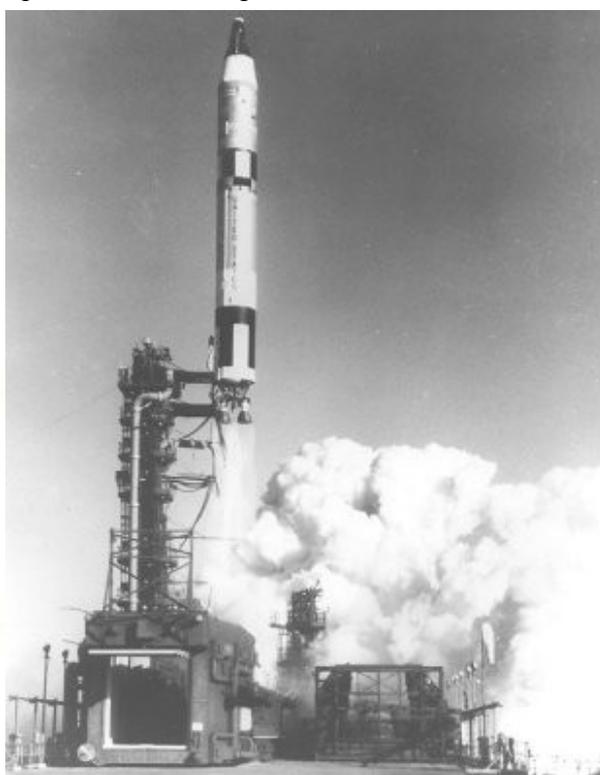
Buran 02



Space Shuttle *Enterprise*



Chinese Shenzhou capsule



Gemini 2

Perhaps some of you would like to take the competition idea a step further and sponsor a competition yourselves? One of our newest flying clubs, Black Knights decided to celebrate the launch of their group by providing a competition question and prize....

## Black Knights

---

### *West Midlands Rocket Club*

**In order to celebrate the launch of our club here is a competition based around the our namesake the Black Knight.**

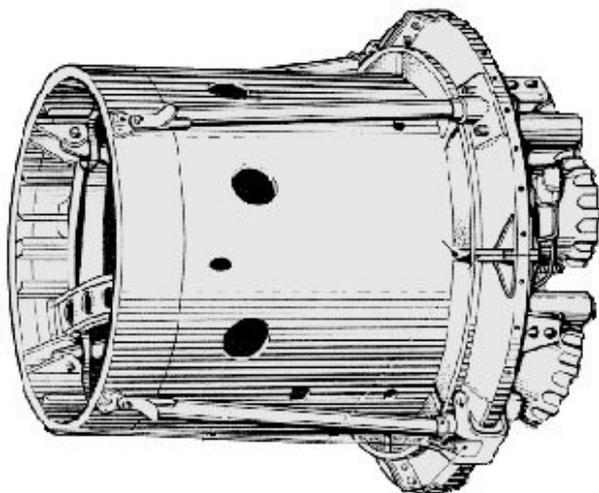
### The prize

**Bristol Aerospace of Canada (The manufacturers of the Black Brant family of sounding rockets) have kindly donated a poster and some mission stickers as a prize.**

### The questions

- **What were the liquid propellants used by the first stage of Black Knight?**
- **From which country were the Black Knight vehicles launched?**

**Answers to the editor, winner to be announced in the next issue.**



A clue?

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



Business end of a Black Knight

---

## Is that a J or a K?

---

*by Richard Osborne*

The Aerotech J-415W propellant reload is actually a K-class motor! The propellant reload was comprehensively tested in the U.S. by the Tripoli Motor Testing board, and was actually designated a K-434W motor, with a total impulse of 1298 Newton seconds. This makes it a K-class motor by 1 percent!

This information is important not only for Range Safety Officers when determining motor class limits for launch sites, but also for those wishing to set records using this motor. The matter will be discussed by the UKRA Council, but what we would suspect is the fairest step for the UKRA records categories, is to move those who have recorded altitudes on this motor over to the K-class category.

The J415W Propellant reload is designed to be used with the Aerotech 54/1280 Reloadable Motor System casing. So now, anyone who has one of these casings, has a casing suitable for accomodating both J-class and K-class motors.

# Mil-spec 'chutes

*by Bob Arnott*

On the 16th of June Steve Moores posted to the newsgroup uk.tech.rocketry about a source for some mil-spec 9' parachutes that he'd found. Since I've got a couple of large projects on the go I thought I check them out as buying big PML chutes or importing Rocketman chutes is quite expensive.

After emailing Steve to get more details about these chutes I phoned the company who were selling them and placed an order. The chap I talked to on the phone was very pleasant and explained what they had in stock. Evidently they also carry 22' chutes and occasionally 32' chutes, however all the shroud lines have been cut. He also said they could order 90' chutes, yes that's 90', but they are quite expensive at around 250 and again all the lines are cut.

It took about a week for the package to arrive at my work, there's no way this thing was going through the letterbox. After looking at the receipt that came with the packages I paid a total of £22 for two 9' parachutes and the postage & packing. Not bad really when you consider that a 6' PML parachute will cost you £81 here in the UK.

So what do you get? Well they come in a rather fetching green drab coloured nylon deployment bag that is absolutely stuffed to bursting point with the two chutes. It's got loads of white tape stitched onto it and a lacing system of sorts over a folded flap that runs the length of the bag. At the bottom end there is a set of ties and a bit of para-cord sealing this end up, there are also four attachment points for what I presume would be the drogue chute.

Down at the front end there is a pull pin that is stopping a bit of para-cord from releasing, the para-cord is closing the front access. Presumably they would remove the pin just before flinging the bag out of a

plane with a drogue attached. After pulling the pin out and opening the flap you are presented with a view of all the suspension lines.

There's a flap of material joined to the bag that has a row of hoops on either side of it, the suspension lines are neatly folded through the hoops and finally through a couple of hoops that shut a flap over the parachutes. This flap is to keep the chutes in the bag until the suspension lines are taught and thus reduce the shock loading when the chutes open.

Both chutes are attached to a bit of nylon strap that is backed up with a metal chain. Each parachute has a ring at the bottom of the suspension lines and the nylon strap is bartacked through these rings. This means that unless you want to recover your rockets with both chutes all the time you need to cut this bit of nylon off. The metal chain is easily removed as it uses split rings to anchor it's self so it's just a matter of removing those.

If you've got a big project that could use dual 9' chutes as the main recovery device then I'd be tempted to leave the chutes in the bag without disturbing the suspension lines. You should be able to attach a drogue to the bag and to an attachment point on the top of one of the parachutes with out too much trouble. This would then fit in quite a small space when compared with a similar set up.

Not having a project big enough to warrant dual 9' chutes I decided to try and remove one of the chutes to have a look at it. Unfortunately due to the fact that both chutes are joined by the nylon strap at the bottom and the fact that they seem to have been vacuum bagged into the deployment bag, it's impossible to remove one without the other. So I just pulled on the nylon strap and all the suspension lines came out from their loops and eventually the parachutes popped out.

If you've ever seen the big parachute that MARS used when they recovered Kev Stick Bullet and Primary Koncern then you'll

already know what these chutes look like, except they are smaller. I don't know exactly what they are made from, it could be either some sort of silk or some sort of nylon, either way they are made from a lightweight white material.

There are 18 suspension lines that are made from para-cord, which are sewn into the parachute at the top and bottom of the canopy. There are actually nine bits of cord, but since they form a loop around the parachute there ends up being 18 lines. The lines are in the region of 115"-120" long and are sewn together at the top of the chute in the ~15" diameter spill hole.

So by now you'll want to know where you can get hold of these chutes, as the price is definitely right for what they are. I don't know how many they've got and I don't know what their supply is like so you might want to phone them and make sure they still have some. So the contact details are:

WS Surplus Supplies Ltd.  
165 Botley Road,  
Oxford,  
OX2 0PB

Tel: 01865 241433  
Fax: 01865 202916  
Email: [sales@wssuppliesoxford.co.uk](mailto:sales@wssuppliesoxford.co.uk)

## We want your articles

Send us your articles, reviews, launch reports, and opinions. Got a handy hint or tip? Don't keep it to yourself, share it with your fellow rocketeers. Stocks are low and we have only one review for the next issue. Flying events are few and far between so that gives you all the ideal opportunity to build that kit and write a review.

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

# Blackhawk R & D - Astrobee D

*by Pete Waddington*

I've been wanting to build an Astrobee D for over 12 months now, and have been undecided as to what size or scale to build. Aerotech produce a super Astrobee kit, but it's not cheap. Yank Enterprises have also introduced a 2" diameter kit, and I also considered scratch building. All my questions were answered, however, when I came across a small kit of the Astrobee D produced by Blackhawk R & D. High power flyers may be familiar with this manufacturer, who have an established kit

range in the USA, and their full range of kits is now becoming available in the UK. Blackhawk have now introduced a range of small model kits under the Mini Missile banner. All these kits are very reasonably priced, the Astrobee D costing around £10. All the kits in the range are based around the Estes BT50 body tube, are suitable for 18mm motors and - best of all - ideal for kit-bashing!

## It's all in the bag

The kit is presented in a basic poly bag with a simple header card and the instructions would appear to be photocopies. All the various tubes, centering rings, basswood for fins, templates etc. and water slide decals were included in this kit. Now it's difficult where to pitch a skill level on this kit. The instruction sheets are concise and each written assembly stage is accompanied by a simple diagram. Some skill is required when using the supplied template to actually mark and cut the fins. I do prefer using basswood for fins as it's slightly stronger than balsa and a lot easier to finish. Usually a couple of coats of sanding sealer will do the job.

page 22



## It's all in the build.

The kit is supplied with a resin cast nose cone, which is a superb moulding, clear of any defects and flash lines. However, it is VERY heavy. I have cautiously removed some of the inside of the resin using a sanding disc and a dremel. Of course any modifications to the standard kit must be taken into account before flight. My variations to the kit include fastening the shock cord and kevlar line to a small payload section instead of just the nosecone. I have also added some surface detail and various decals left over from previous model kits.

The kit comes with a suggested paint scheme, but on my sheet all the different shaded patterns used for the key all looked the same! A quick look at Pete Alway's scale data book rectified this.

The completed model was given two coats of Stevens primer filler with a light sanding between coats. One coat of white primer was then applied before the finishing touches were added. The model is finished in a variety of different paints. The main body is Plastikote cream gloss, while the nosecone and payload section are airbrushed Flare military colours and Humbrol silver finished off the fins.

## It's altogether a good kit.

I would suggest the builder has one or two Estes/Quest kits under their belt before tackling one of these models. Although for the most part assembly is straightforward, one or two of the steps do assume a certain amount of skill and previous modelling experience on the part of the builder. To date, the model has not flown, although I hope to rectify that soon.

Hopefully, the kit review will be a regular feature of 10,9,8...., but it will only become that if you provide the material! Otherwise, you'll have to put up with my ramblings on a regular basis.

# DEEPSKY ROCKET SUPPLIES

[www.modelrockets.co.uk](http://www.modelrockets.co.uk)

[Email:deepsky@i12.com](mailto:deepsky@i12.com)

Tel/Fax:01524 730981

**Big kits at little prices!!**

**Exclusive European dealers for:**

**Blackhawk R&D High Power**

**BSD High Power**

**Cosmodrome**

**Yank Enterprises**

**True Modelers Rocket Kits**

**Tango Papa Decals Mars Lander kits**

**We also sell Estes and Quest kits and motors, Aerotech motors, launch rods and ammo boxes.**

**Coming soon...many OOP Estes kits, Including Satrun 1B, Optima, Black Brant, SM3 Seahawk, Space Shuttle, Super Vega and many more!!**

**Example prices:**

**Blackhawk R&D Sandia Tomahawk £46.00**

**Yank 3" Black Brant X £64.75**

**Yank 3" IRIS £60.37**

**BSD 4" DIABLO £44.00**

**Cosmodrome Black Brant II £38.80**

**We pride ourselves on our customer service...email and telephone enquiries are always answered on the same day. If we don't have what you are looking for, we can probably help you to find it!**

# Rocketry Groups and Contacts

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

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

## Groups

### AspireSpace

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

Web site: [www.aspirespace.org.uk](http://www.aspirespace.org.uk)

### BSMA

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

Contact: Stuart Lodge

Email: [loggi.interspace@lodge28.freemove.co.uk](mailto:loggi.interspace@lodge28.freemove.co.uk)

### Black Knights

Black Knights are based in the West Midlands. They fly model and HPR rockets and have regular flying events. Details are available on their web site.

Email: [blackknights@cs.com](mailto:blackknights@cs.com)

Web site: [ourworld.compuserve.co.uk/blackknights/](http://ourworld.compuserve.co.uk/blackknights/)

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

### CROCK

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

Contact: Tony Betts

Email: [y2ksoftware@btinternet.com](mailto:y2ksoftware@btinternet.com)

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

### DSC

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

Contact: Robert Law

Tel: 01505 815100

### EARS

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

Contact: Steve Randall

Address: 47 Western Ave. Felixstowe, Suffolk, IP11 9SL

Tel: 01394 274579

Email: [steve@btinternet.com](mailto:steve@btinternet.com)

Web site: [www.ocston.org/~bobar/ears/](http://www.ocston.org/~bobar/ears/)

### HART

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

Contact: Peter Barrett

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

Tel: 01708 458463 or 0789 9742481 (mobile)

Email: [pete@hartrockets.co.uk](mailto:pete@hartrockets.co.uk)

Web site: [www.hartrockets.co.uk/](http://www.hartrockets.co.uk/)

## MARS

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

Contact: Ben Jarvis

Email: [info@mars.org.uk](mailto:info@mars.org.uk)

Web site: [www.mars.org.uk](http://www.mars.org.uk)

## North West Rockets

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

Contact: Dave Thompson

Email: [DATSCOPE@aol.com](mailto:DATSCOPE@aol.com)

## NSRG

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

Contact: Darren J Longhorn

Email: [info@northstarrocketry.org.uk](mailto:info@northstarrocketry.org.uk)

Web site: [www.northstarrocketry.org.uk](http://www.northstarrocketry.org.uk)

## PRS

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

Contact: John D Stewart, PRS Honorary Secretary

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

Tel: 0141 8842008

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

## SERFS

Southern England Rocket Fliers.

Web site: [www.serfs.co.uk](http://www.serfs.co.uk)

## SRA

Sheffield Rocketry Association.

Contact: Hugh Gemmell

Email: [hugh@cruiserd.demon.co.uk](mailto:hugh@cruiserd.demon.co.uk)

Web site: [www.cruiserd.demon.co.uk](http://www.cruiserd.demon.co.uk)

## STAAR Research

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

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

Contact: John Bonsor

Address: 15 Smith Avenue, Longbar, Glengarnock, Ayrshire, KA14 3BN, Scotland, UK

Tel:

Email: c/o Bobby Wark

[bob@scotroc.force9.co.uk](mailto:bob@scotroc.force9.co.uk)

Web site: [www.gbnet.net/orgs/staar/](http://www.gbnet.net/orgs/staar/)

## Thrust

After the loss of Garlands, Thrust are currently without a flying site. Check the website for future developments.

Contact: Mike Williams

Tel: Tel:01283 533848

Email: [100306.20@compuserve.com](mailto:100306.20@compuserve.com)

Web site: [ourworld.compuserve.com/  
homepages/thrust\\_for\\_space/](http://ourworld.compuserve.com/homepages/thrust_for_space/)

## UKRA

United Kingdom Rocketry Association.

Address: PO Box 1561, Sheffield, S11 7XA.

Email: *Membership enquiries:*

[hugh@cruiserd.demon.co.uk](mailto:hugh@cruiserd.demon.co.uk)

*General enquiries:*

[ukra-enquiries@  
northstarrocketry.org.uk](mailto:ukra-enquiries@northstarrocketry.org.uk)

Web site: [www.ukra.org.uk](http://www.ukra.org.uk)

## WLRS

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

Contact: Rob O'Brien

Email: [club@wlrs.org.uk](mailto:club@wlrs.org.uk)

Web site: [www.wlrs.org.uk](http://www.wlrs.org.uk)

## UKRA Regional Rocketry Contacts

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

If you would like to volunteer to do the same, send us your contact details for inclusion here.

## Ayrshire

Contact: Bobby Wark

Email: [bob@scotroc.force9.co.uk](mailto:bob@scotroc.force9.co.uk)

## Cambridgeshire

Contact: Bob Arnott

Email: [bob@fatboab.org](mailto:bob@fatboab.org)

## Lincolnshire

Contact: Charles Simpson

Email: [chas@helix.ukf.net](mailto:chas@helix.ukf.net)

## London

Contact: Ben Jarvis

Email: [rocketandroll@hotmail.com](mailto:rocketandroll@hotmail.com)

## Merseyside

Contact: Dave Thompson

Email: [DATSCOPE@aol.com](mailto:DATSCOPE@aol.com)

## South Yorkshire

Contact: Hugh Gemmell

Email: [hugh@cruiserd.demon.co.uk](mailto:hugh@cruiserd.demon.co.uk)

## Staffordshire

Contact: Mike Williams

Email: [lawn\\_dart@yahoo.com](mailto:lawn_dart@yahoo.com)

## Sussex

Contact: Rick Newlands

Email: [rnewlands@aol.com](mailto:rnewlands@aol.com)

## West Yorkshire

Contact: Darren J longhorn

Email: [darrenlonghorn@yahoo.com](mailto:darrenlonghorn@yahoo.com)

### ***Editors note:***

The second part of Bob Arnott's series *How to certify UKRA level 1* could not appear in this issue due to Bob's hectic schedule. Rest assured we hope to print it in a subsequent issue.

# Pete's Rockets

The UK High Power and Model Rocket Specialist

P

*Pete's Rockets now carry a HUGE range of kits, motors, electronics and accessories at our 'rocket shop' including:*

- *Vaughn Brothers Rocket Kits*
- *AED 'RDAS' flight computers*
- *RATT-Works hybrid rocket motors*
- *MENTAL 29mm minimum diameter fibreglass rocket kits*
- *G-Wizz accelerometer / altimeters*



**RDAS Flight Computer,  
NOW in stock!**

*Pete's Rockets wishes season's greetings to all our customers*

*Call us on: 01529 460 279  
e-mail us: [davy@btinternet.com](mailto:davy@btinternet.com)*

*Come and browse through the UK's largest selection of model and High Power rocketry merchandise at our shop and showroom!*

*The shop is situated in Heckington, near Sleaford, Lincolnshire just off the A1*

