



10, 9, 8...

The voice of UKRA!

*Volume 3 Issue 1
May 1999*

NEW UKRA ADDRESS

**UKRA
PO BOX 1561
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Editorial by Liz Perman

Hello and welcome to 10,9,8..the voice of UKRA! My name is Liz Perman and I would like to welcome all new members to UKRA and thank all our existing ones for their continued support.

1999 has been a slow starter for UKRA. Please accept our apologies for the delay in getting our newsletter out to you but I hope you find the information useful, even though the layout appears basic!

The new editorial team consists of yours truly, my husband Mark and Pete Davy. I thought that I would open with a wee reminder on what UKRA is and why we are here.

During a specific meeting at the IRW 1996 (International Rocket Weekend) in Largs it was discussed and agreed by all present that we needed an association dedicated to rocketry, one that would provide insurance, safety guidelines and liase on rocketeers behalf with government bodies. UKRA was the result.

Note the wording: an association. UKRA is a voluntary organisation, operating as a specialist body of the BMFA.

We have produced documentation to attain Third Party Insurance, through the BMFA, up to and including M class rocket motors. We have slowly built the skeleton behind the face. This covers things like the Certification Programme, our Articles of the Association that give us focus, all the internal documentation that supports the workload, our Safety Code that is currently being adopted by the BMFA in an amalgamation with the BSMA's code. (British Space Modelling Association)

We help organise and run the three main rocket flying events currently being held in the UK: UKRA99, IRW and K-Lob. All of this has been achieved by a small band of dedicated individuals who have committed themselves to serving on the UKRA council.

In this edition of 10, 9, 8..you will find articles on the history of rocketry, a brief TV appearance and a focus on the Aerospace Museum at Cosford. An important article is included from Pete's Rockets on the classification of Aerotech motors. Please read it carefully. We have also included a contacts list of rocketry groups along with some flying dates that you might find useful.

Hint's and Tips (1) by Pete Davy

Before you start building your rocket ,you may find it easier to do the spiral groove filling. On phenolic tubes I find that Ronseals Craftsman Range of two part fillers is particularly good. It's easy to mix and apply with the spreader supplied. To apply, force it into the groove with the spreader, remove as much as possible from the surrounding area (it makes sanding easier) and leave to set for ten to twenty minutes.

Now for the hard part possibly, use 100 grit silicone carbide paper if possible (obtainable from decorating centres and motor factors etc) DO NOT use sandpaper it causes too many scratches! Sand all the tube and you will find that this also removes surface irregularities. You can the start to build your rocket but don't forget to sand the fins before gluing.

Hint's and Tips (2) by Mark Perman

Estes D motor, mounts can be made from the cardboard tube that Tesco Cling Film (Supercling) is wound onto.

Is That Motor Classified? By Pete Davy **IMPORTANT, PLEASE READ!**

OK you have your registered store , your explosive licence and RCA documents, lets go get that motor. *But Wait...* Before you do has the motor been Classified and Authorised by the HSE? Right Now, possibly not if you are intending to use a 29mm high power or higher reload kit. **Why not?** Simply because the motors have not had an application made to Classify and Authorise (C&A) them. The original importers of these motors should have ensured that the motors they were importing were C&A. For reasons best known to them they never did.

The subject of the motors not being C&A was recently brought to my attention. I contacted the HSE and after further talks discovered that a lot of the 'high power' motors were not. I then informed the HSE of the situation I was in and how it came about. They told me not to move, sell or use any of the motors not C&A. They also said that I should get an application in to them and that it would be dealt with as quickly as possible. At the time of writing this, the application is with the HSE and lists in excess of 160 items! I expect the matter to be resolved by the end of May. Full details of all motors C&A will be placed on the UKRA web site www.scotroc.force9.co.uk/ukra/ when this is completed.

What do we do now? If you have motors that do not appear on the following list then please do not transport or use them until they are C&A.

Where does that leave us now? Well due to a few individuals over the last few years a lot of the Aerotech Hobby/model range have been C&A along with some 'High power' motors. These motors are legal to use in this country (your normal documents are needed) As soon as the HSE issue the documents for the application that is with them now, then the other motors can be used. Please check the UKRA Web site or if you do not have Internet access contact after 1st June UKRA on 01905 773249 phone number. **Here is a complete list of Aerotech motors that have a CAD**

Classified and Authorised Aerotech motor list.						
Single use Motors		Reloadable Motors				Reloadable Motors
UN0349	UN0351	UN0351				UN0275
D21-4T	F25-4W	RMS-18/20	RMS-24/40	RMS-24/40	RMS-29	54mm
D21-7T	F25-6W	B6-2T	D9-4W	Cont.	40-120	J90-W
E15-4W	F25-9W	B6-4T	D9-7W	F12-3J	E16-4W	J180-T
E15-7W	F50-T	B6-6T	D15-4T	F12-5J	E16-7W	J460-T
E30-4T	F50-6T	C4-3W	D15-7T	F24-4W	E16-10W	J800-T
E30-7T	F50-9T	C4-5W	D15-10T	F24-7W	E23-5T	J275-W
G40-4W		C6-3W	E11-3J	F24-10W	E23-8T	J415-W
G40-7W		C6-5W	E11-5J	F39-6T	E23-11T	K550-W
G40-10W		C6-7W	E18-4W	F39-9T	F22-5J	K1100-T
G80-4T		C12-4T	E18-7W	F39-12T	F22-7J	L952-W
G80-7T		C12-7T	E18-10W		F40-4W	M1419-W
G80-10T		C12-10T	E28-4T	RMS-RC32	F40-7W	M1939-W
Econojets		D13-4W	E28-7T	60/100	F40-10W	
F20-4W		D13-7W	E28-10T	F13-RCT	F52-5T	
F20-7W		D13-10W		F16-RCJ	F52-8T	
G35-4W		D24-4T	RMS-24-R/C	F23-RCW-SK	F52-11T	
G35-7W		D24-7T	D7-RCT	G12-RCT	G33-5J	
		D24-10T	E7-RCT		G33-7J	
		E27-4T	E6-RCT		G64-4W	
			E12-RCJ		G64-7W	
					G64-10W	

HOW WE GOT HERE By John Bonsor (UKRA 1023, BMFA 102707)

This is being written on a day when a rocket designed and built by two school pupils from Dunbar Primary School reached nearly 3,000 feet altitude (the calculated figure is 2,866 feet) above the Museum of Flight at East Fortune Airfield, near Edinburgh. I run a model rocket workshop programme for schools and the public. It flies under the title of "Rockets To Go!" - and they do! Some 1,339 rockets have been successfully built, flown and recovered in this programme since I started it in 1993. In the course of around 130 workshop sessions to date, an estimated 4,000 people have been introduced to the science, technology and joys of model rocketry.

The purpose here of these brief statistics is to underline a point which we perhaps all now take for granted. By "we" I mean all those of us active in Model and High Power Rocketry. And what we possibly now take for granted is the ready and affordable availability of reliable, safe rocket propulsion to boost our hobby/obsession (delete as appropriate). In running "Rockets To Go!" (RTG!) I have met several people who like myself spent a misfired youth experimenting with home made propellants and rocket motors. This approach certainly, sometimes, produced propulsion, but it was hardly reliable, never safe, and although not overly costly this was a false economy. To produce reliability at low unit cost, for any product, takes major financial investment. DIY rocket propulsion of the kind some of us tried out (in my case back in the 1960' s) was certainly educational, but only for the individuals who tried it. There is no way that any useful, credible or safe mass rocketry programme like RTG! could be flown on DIY propulsion. Nor could model rocketry have become the consumer hobby product that it now is, on the basis of DIY propulsion.

It is the existence and availability of the range of mass produced model motors turned out in their millions, by Estes and Quest in the US, and their equivalents in several European countries, that has enabled hundreds of thousands, possibly millions of people to discover rocket skies. These motors first became available in the US back in 1958, thanks to the work of Orville H. Carlisle, G. Harry Stine, Vernon Estes and others. As a result model rocketry gained early official approval and rapid popular uptake in the US. There was a similar history in some (former) Eastern European countries during the 1960' s. But not here in the UK. Narrow interpretation of the 1875 Explosives Act restricted rocketry to the status of an illegal, underground, basement bomber activity here in the mother of democracies. Meanwhile behind the Iron Curtain in Poland, Czechoslovakia, East Germany, Romania, Yugoslavia, Bulgaria and the USSR itself, all supposedly benighted Communist states, model rocketeers in hundreds of clubs and registered in their tens of thousands were given full encouragement in an enabling environment.

Many of you reading this article will not remember the days of the Home Office Ban on model rocketry, even with factory produced motors. This prevailed from the 1930' s (when the British Interplanetary Society was expressly forbidden to engage in the sort of amateur rocket research which was at that time going on in Germany, Russia, and the US, beginning the harnessing of Newton' s Third Law of Motion to reach space) until 1985. I want to tell you how things changed for rocketry in the UK. In the early 1980' s the British Space Modelling Association (BSMA), a rebel band, began flying model rockets using motors obtained by various interesting means from overseas - for example Delta motors from Czechoslovakia were brought in through "Diplomatic Channels". Also John Pitfield of Rocket Services in Dorset began manufacturing and supplying C, D, and F class motors to the BSMA, and to the Ayrshire Branch of ASTRA (Association in Scotland To Research into Astronautics) based in Largs, of which I was the Secretary at the time. Both the BSMA and ASTRA flew model rockets in an organised and open manner, including public flying displays, BEFORE the official ban was lifted. The BSMA was particularly focussed on hobby flying of scale and competition models, while in ASTRA we applied model rocket propulsion to small scale flight research, particularly on the Waverider aerospaceplane concept. In doing this the BSMA and ASTRA were attempting, successfully as it turned out, to push the door open to public and authority (e.g. the Police, Fire Brigades, science event organisers) awareness of the safe enjoyment and uses of model rocketry. In parallel with this effort the Paisley Rocketeers' Society (PRS) ran a campaign under the "Fund For the Freedom to Fly Model Rockets" (FFFFMR). The PRS, founded in 1935, carried out pioneering research flying, against the ban, from 1935 to 1939, and from 1965 to 1969 flew "rocket mail" to raise funds for charities. Thanks to a busybody notifying these activities to the Home Office in 1969 the PRS had to stop flying pyrotechnic rockets, but with great ingenuity turned to the development of "AquaJet" rockets, propelled by water pressure, as an unobjectionable alternative.

As a result of all these activities model rocketry became more familiar and proven in the UK. Lobbying by the British Space Modelling Association, coupled with financial backing from Peter Mackenzie of

Porteous Developments, led to Estes motors being tested by the Health and Safety Executive and thus cleared for importation and hobby flying in the UK. From 1988 the Estes motors, kits and accessories became increasingly available through model shops in the UK. This has been followed more recently by Quest products also going on sale here.

Up until a couple of years ago it was generally agreed amongst rocketeers in the UK that Model Rocketry encompassed the power range of A to D class motors, with anything above D being in the realm of High Power Rocketry (the agreed division is now A to G = Model, while above G = High Power, in common with the US convention). So in that sense HPR began in the UK in the mid-1980's with the use of John Pitfield's F36-5 and F72-0 composite propellant motors, with G and H motors also being supplied by John a few years later. In fact I think it is accurate to say that during the last few years of the official ban, apart from John Pitfield himself, the ASTRA Ayrshire Branch fired considerably more of his F motors than did the BSMA.

A major outcome from the lifting of the ban and the importation of Estes motors and kits was the formation of new rocketry groups, particularly in England. One of these, the Middlesex Advanced Rocketry Society (MARS), set up by Ben Jarvis around 1993, was possibly the first of these new "3rd Generation" (*) groups to move up the power curve into HPR, but using Aerotech motors and propellants, and specialist rocket components bought in from the USA. (* Taking the Paisley Rocketeers as being amongst the "1st Generation", i.e. the pre-WWII rocket research societies - others being, in Germany the Society for Space Travel, in Russia the Group for the Study of Reaction Propulsion, and the American Rocket Society; with ASTRA being in the "2nd Generation" of groups formed in the 1950's and 1960's). A few years later High Power Rockets Ltd., run by Ian Holtham and John Arthur, and associated with the Thrust For Space rocket club, both operating in the Midlands, began to import Aerotech motors, Public Missiles Ltd. kits and other HPR products from the USA on a commercial basis. I must confess that I do not know the details of how it became legally permissible to bring HPR motors and propellants into the UK for hobby use here, however, I imagine that the fact that the import and use of model motors and propellants had previously been established here made the British advent of HPR much easier than it might otherwise have been. Perhaps those who were directly concerned with the bringing of HPR into the UK could elucidate this bit of the history, maybe by writing another article for "10,9,8".

A most significant development, I think it is fair to say, in parallel with all that has been described above, has been the evolution of the "Scottish Rocket Weekend" (SRW), first held in 1986 and organised by the ASTRA Ayrshire Branch (and very much inspired by the first ever "rocket weekend" organised in the UK, by the Paisley Rocketeers' Society in 1985). The Scottish Rocket Weekend became the "International Rocket Weekend" in 1992 (the annual SRW having been organised by STAAR Research from 1989 onwards), which since last year (thanks to an inspired suggestion by Stephanie Pritchard at the conclusion of the 1997 IRW) has become the "International Rocket Week". The bringing together of so many of the UK's active rocketeers at the annual IRW made it possible at the 1996 event to convene a competent meeting to discuss the pros and cons of setting up a national rocketry association for the UK, particularly in view of the growth of HPR activities. Thus the United Kingdom Rocketry Association (UKRA) came into being that year.

This is perhaps an appropriate point at which to conclude this admittedly summary and very incomplete history of the development of Model and High Power Rocketry in the UK. I have tried to show how much things have been greatly improved for Model and High Power Rocketry in this country. This has been achieved through the inspiration, applied dreams, dedication and sheer hard work of many people, in all the significant areas - technical, regulatory and organisational. Where we go from here, and how we get there is up to us and to those who will join us. From all that I have seen and experienced over some forty years of rocketeering, I think it is going to be a fascinating and worthwhile journey. I look forward to travelling on with you in the brightness of rocket light.

Note: If I have committed any serious inaccuracies or omitted anything important, please do let me know, either directly or through the Editor.

Safe Practice by Mark Perman (UKRA Model Rocket Safety Officer)

Safe distances and launch site dimensions have been a cause of some discussion at various flying days I have attended. I thought it would be a good idea to reprint the relevant sections of the Safety Code here as a reminder to us all of the relevant dimensions.

Safe Distance Table All persons, except those required for the launch of a rocket must be kept at least the given minimum distance from the Rocket Motor during / after ingiter installation. The Launch Controller should also be operated from at least this minimum distance.

Total Impulse of all Motors (Newton-Seconds)	Equivalent Motor Type	Minimum Distance From Rocket with Single Motor in Meters (ft)	Minimum Distance From Rocket with Multiple Motors in Meters (ft)
0.00 -- 1.25	¼A ½A	2 (7)	3 (10)
1.26 -- 2.50	A	2 (7)	3 (10)
2.51 -- 5.00	B	3 (10)	6 (20)
5.01 -- 10.00	C	3 (10)	6 (20)
10.01 -- 20.00	D	5 (16)	10 (33)
20.01 -- 40.00	E	7 (23)	15 (50)
40.01 -- 80.00	F	10 (33)	20 (66)
80.01 -- 160.00	G	10 (33)	20 (66)
160.01 -- 320.00	H	15 (49)	30 (98)
320.01 -- 640.00	I	45 (148)	60 (197)
640.01 -- 1,280.00	J	45 (148)	60 (197)
1,280.01 -- 2,560.00	K	60 (197)	90 (295)
2,560.01 -- 5,120.00	L	90 (295)	150 (492)
5,120.01 -- 10,240.00	M	90 (295)	150 (492)
10,240.01 -- 20,480.00	N	150 (492)	300 (984)
20,480.01 -- 40,960.00	O	150 (492)	300 (984)

Launch Site Dimension Table The Launch site should have the following minimum dimension (i.e. The launch position must be at least half the given distance from the edge of the launch site). Additionally the minimum site dimension should be equal to or greater than the predicted maximum altitude of the highest flight being made. The largest of these two dimensions should be used.

Total Impulse of all Motors (Newton-seconds)	Equivalent Motor Type	Minimum Site Dimensions in Meters (ft)	Equivalent Dimensions in km (miles/yards)
0.00 – 1.25	¼A ½A	15 (49)	0.015 km (16 yards)
1.26 – 2.50	A	30 (98)	0.03 km (33 yards)
2.51 – 5.00	B	60 (197)	0.06 km (66 yards)
5.01 – 10.00	C	120 (394)	0.15 km (130 yards)
10.01 – 20.00	D	150 (492)	0.15 km (164 yards)
20.01 – 40.00	E	300 (984)	0.3 km (328 yards)
40.01 – 80.00	F	300 (984)	0.3 km (328 yards)
80.01 – 160.00	G	300 (984)	0.3 km (328 yards)
160.01 – 320.00	H	450 (1476)	0.5 km (492 yards)
320.01 – 640.00	I	760 (2493)	0.8 km (½ Mile)
640.01 – 1,280.00	J	1600 (5,249)	1.6 km (1 Mile)
1,280.01 – 2,560.00	K	1600 (5,249)	1.6 km (2 Miles)
2,560.01 – 5,120.00	L	3200 (10,498)	3.2 km (2 Miles)
5,120.01 – 10,240.00	M	4700 (15,420)	4.7 km (3 Miles)
10,240.01 – 20,480.00	N	6445 (21,145)	6.5 km (4 Miles)
20,480.01 – 40,960.00	O	8045 (26,394)	8.0 km (5 Miles)

Full details of launch site requirements may of course be found in Article 2.03 of the handbook

UKRA has a Big Breakfast! By Liz Perman

My name is Liz Perman and I am the Secretary for UKRA, the United Kingdom Rocketry Association. Laid out below is a brief recollection of the morning I spent at Channel 4 to appear on the “Join our club!” slot for The Big Breakfast.

What a day! What an experience! Such short sentences but they go a long way to verify what a great time I had when I appeared on live, terrestrial television. Monday 12th April 1999 was a good day!

It started early, at approximately 2.50am. The car was arriving at 3.30am to whisk me away from Droitwich and down to Channel 4's Big Breakfast studio in London. I had forgotten how beautiful the sunrise is. What a treat it was to be driven down a clear motorway instead of battling with the usual Monday morning traffic. My driver was a friendly chap and we exchanged banter on a wide range of topics covering football, motorbikes and the royal family. I arrived at the studio at about 6am where I met up with my friends and UKRA colleagues Pete Davy and Charles Simpson. A welcomed cup of coffee was enjoyed by all and then it was time for a quick rehearsal. The whole team on the Big Breakfast was very friendly and accommodating as we fretted about our impending task.

I don't know how many of you have watched the Big Breakfast but I for one had never seen the show. I was in for a big surprise! As we moved down into the waiting room the atmosphere changed. You could almost reach out and touch the anticipation. We sat and watched the show on the T.V. while chatting amongst us about the day ahead. I was due back in the office later that afternoon and we were taking bets as to my state of mind after such an early start! We watched a couple of real stars go by as we waited, and waited, for 8.30am to arrive. This was show time for us. We had been fitted with microphones and had run through the interviews again just to make sure. I swear that the last 10 minutes before going on air passed in slow motion.

Johnny Vaughan introduced himself during a brief advert break and we were on. Going out on live T.V. I couldn't believe the feeling, sufficed to say I took to it like a duck to water. This may sound blasé but I felt completely at home. Had I been given the option of retiring 5 minutes earlier then it would have been a different story.

The interviews went well. Charles and Pete were excellent. They fielded some tough questions that came out the blue, all I had to do was sit there and laugh at Johnny's innuendo. All in all our few minutes of fame went past in a whirlwind of questions, photographs and laughter. We had fun!

We stayed on the set until the end of the show. At which time another big breakfast was waiting for us. A full English breakfast was laid out in the canteen for all the team, including guests. It was gratefully received!

After being amply fed and watered it was time to say thank-you and goodbye to the team at Channel 4. Our cars were waiting to take us away, back to normality. The afternoon passed very slowly indeed!

So You Want To See A Rocket? By Mark Perman

Some time ago my wife Liz, a couple of friends and I were chatting about Model Rocketry. During the talk somebody wondered where we could see an exhibition of the real thing in England. I remembered hearing of a Museum near Telford, which had some WWII German rocketry exhibits. Anyway enquiries were duly made and a few weeks later a small group of us headed off to "The Aerospace Museum" at Cosford.

We arrived at lunchtime so after buying a guidebook we popped into the cafe for sandwiches and a cake. Suitably refreshed we headed straight for Hangar 1 which houses the missile collection. The missile collection is a real treat for Rocket nuts as it contains not only historic WWII German items but examples of missiles right up to the recently decommissioned Polaris.

Exhibits are labeled but the official guide book is well worth investing in as it contains much additional information on the various items on display, exhibits include: -

V-1, V-2, Rheinbote, HS 298, Rhientochter, Enzian, Taifun, Feuerlille FS5, Schmetterling HS 117, Thunderbird, Rapier, Bloodhound, Henschel 293, Ruhrstahl X4, Sidewinder, Sparrow, Fireflash, Firestreak, Red Dean, Redtop, SRAAM, Thor (Yes the forrunner of today's Delta Space Launcher), Blue Steel, Skybolt, Polaris, Sea Skua, Martel, Swingfire, Aerospatiale AS 11, Malkara, Baka, and a Messerschmitt ME163 Komet.

Also on display are the following Rocket Engines: -

The Spectre from the Saunders-Roe SR53, de Havilland Super Sprite HTP/Kerosene RATO unit, Walter 109-509C from the ME 163, a Bristol Siddeley BS605 HTP/Kerosene RATO unit and a Walter Starhilfen 109-500 RATO.

Apologies but lack of space does not permit a fuller description (so go and see them for yourselves).

Other collections at Cosford include:-

A Warplane collection featuring examples of military aviation from Britain, Germany, North America and Japan.

A Transport Collection which includes airliners from British Airways and Royal Air Force transport aircraft.

A Research and Development Collection featuring some rare and exotic aircraft.

Over fifty aero engines are also on display.

The exhibits are well laid out and the museum staff is friendly and helpful. Guided tours can be arranged for groups on weekdays. It has been suggested that, if there is enough interest, UKRA could get a party together for a visit. If you are interested in a group visit contact the editorial team and we will see what we can arrange, for one of those long otherwise rocket free days in the winter months.

Contact details: The Aerospace Museum, Cosford, Shifnal, Shropshire, TF1 8UP
Telephone 01902 374112/374 872 Fax. 01902 374813

In our next addition we hope to bring you a few words on the Museum of Flight at East Fortune.

Model Solid Rocket Motors by Ian Holtham

Motors are obviously an essential feature of any model rocket, so we thought we would start this series of technical articles with a brief look at motors.

Any model rocket motor may be viewed as five essential components, which have been drawn diagrammatically in Figure One below:

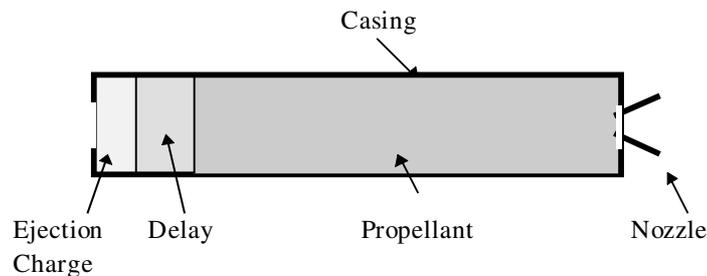


Figure One - Diagram of a Model Rocket Motor-

The form of each component changes depending upon the manufacturer of the motor and its size and type:

Casing - The casing of a model rocket motor is normally made of either cardboard or aluminium. Cardboard is used for single use motors which are used just once and then thrown away, this type of motor is supplied ready for use with all the other components already in place. For multiple use motors the casing is made from aluminium with the other components supplied in a kit which are loaded into the casing before use.

Propellant - The propellant grain provides hot gases, which are sent through the nozzle to provide, thrust for the rocket. The propellant consists of both fuel and an oxidiser and so even model rocket motors can function in space! Some propellants also contain ingredients for special effects such as smoke, etc for more spectacular launches.

Nozzle - The nozzle accelerates the gases produced by the propellant to efficiently provide thrust for the rocket

Delay - The delay grain starts burning when the propellant has run out. The delay grain does not produce any thrust but as the name suggests provides a delay while the rocket continues to climb to its maximum height (apogee). Motors are equipped with different delay times and the motor should be selected with a delay that matches as closely as possible the time-to-apogee of the rocket.

Ejection Charge - When the delay grain has finished burning it will ignite the motor's ejection charge. This produces a puff of gas, which will pressurise the rocket and force out the rocket's parachute for its descent back to the ground.

Note: Some rockets require the ejection charge to be separate from the motor or do not require an ejection charge. Motors are therefore available without an ejection charge or delay grain.

Estes / Quest Motors

Estes and Quest Motors are very similar in construction and use, so this section is relevant to the motors from both manufactures.

Estes Motors are end burning black powder motors provided in a single use motor cartridge. The Black powder used in the motor is similar to the powder used in Fireworks. Estes motors are similar in construction to the classic model rocket motor shown in Figure One in the section above. The motors are designed to burn through the propellant grain starting at the nozzle end of the motor and burning through to the delay charge.

Each Estes motor is classified with a motor type.

C6-4 Where: C - is the motor's total impulse classification letter (in Newton Seconds)
6 - is the average impulse of the motor (in Newton's)
4 - is the ejection charge delay from propellant burn-out (in Seconds)

In the UK Estes motors are available from ¼A to D in Total Impulse.

Aerotech Motors

Aerotech motors are available in the UK ranging from B to M in total impulse. The use and/or purchase of Aerotech Motors in the UK requires an Explosive Certificate. Future articles will detail the procedures for obtaining the legal documentation required.

Aerotech Motors are available in Single Use (cardboard/phenolic casing) and multiple use (aluminium casing) called RMS (Reloadable Motor System) Motors.

Aerotech Motors use a composite propellant and are core burning. The propellant is similar to that used in the Space Shuttle's Solid Rocket Boosters and is three times more powerful than black powder. Core burning motor's burn through the propellant grain from the middle until they reach the outside of the grain at the casing.

Aerotech Motors are available in three different propellant types, which vary in flame colour, smoke colour and sound characteristics.

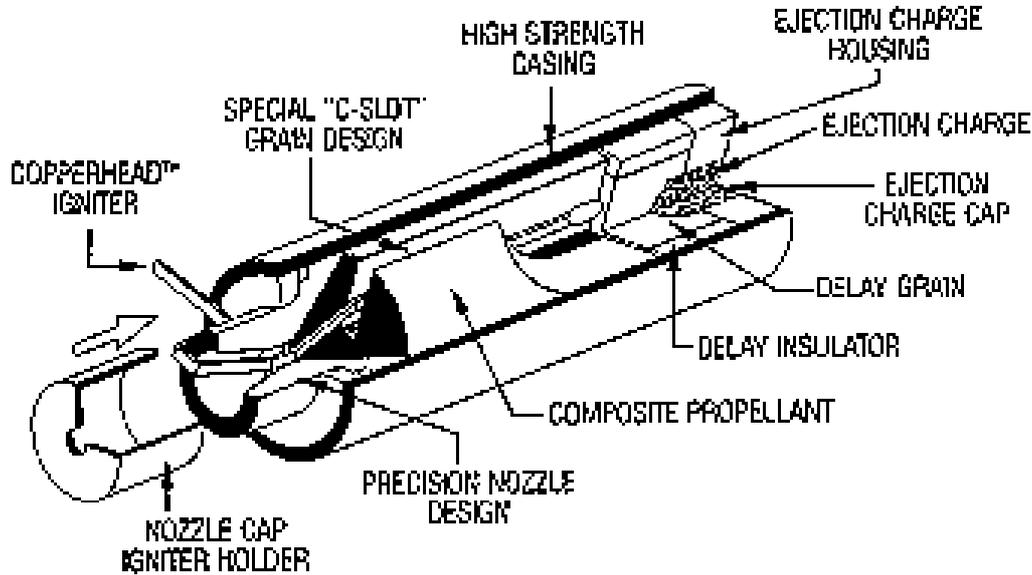
White Lightning - Probably the most popular choice of propellant. White Lightning produces a brilliant white flame, dense bright white exhaust and a throaty roar. White Lightning looks and sounds like actual sounding rockets and launch vehicles.

Blue Thunder - Produces a bright violet-blue flame with a minimum of exhaust smoke. These motors provide a higher level of thrust than White Lightning or Black Jack motors of the same total impulse.

Black Jack - Provides the high visibility tracking of the dense black exhaust. In addition to a distinctive lift-off roar, Black Jack motors give your models lower acceleration and longer powered flight than White Lightning or Blue Thunder motors of the same total impulse.

Single Use Aerotech Motors

Figure Two - Aerotech Single Use Motors (Courtesy AeroTech Consumer Aerospace.)



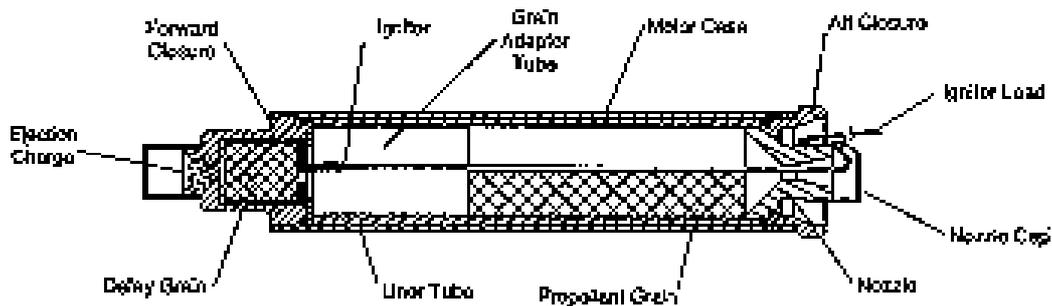
Each Single Use Motor has a motor type, which looks like the example below:

F25-9W Where: F - is the motors total impulse, classification letter (in Newton Seconds)
 25 - is the average impulse of the motor (in Newton's)
 9 - is the ejection charge delay from propellant burn-out (in Seconds)
 W - is the propellant type (W-White Lightning, B-Blue Thunder, J- Black Jack)

Aerotech RMS Motors

To fly an Aerotech RMS motor requires two basic items, the RMS Motor Hardware and an RMS Reload kit. The Motor Hardware provides a Casing to house the Motor Reload kit. Motor Hardware is designed to be used again and again. The Reload kits provide all the items which are used only once per flight (such as propellant) and so a new reload kit is purchased for every flight. RMS Motors provide a lower overall cost per flight than equivalent single use motors.

Figure Three - An RMS Motor - showing all components (Courtesy AeroTech Consumer Aerospace.)



Each RMS Motor Hardware Kit is made from anodised aluminium and consists of three items, a forward closure, an aft closure and a casing. The Motor Hardware is given a type, an example of which is given below:

RMS-38/240 Where: 38 - is the diameter of the motor in mm (either 29, 38, 54 or 98)
240 - is the length of the motor given by the amount of propellant it will hold (in Newton Seconds)

Aerotech RMS Reload Kits

RMS Reload kits include the disposable items used for each flight of the RMS Motor. Amongst the items included are:

Propellant grains, Delay Grain, Ejection Charge (Black Power), Copperhead Igniter, Spacers, washers and O-rings, Instruction and data sheet

Reloading the RMS Motor is a simple process and takes only a couple of minutes. Reloads are given a type code similar to that of single use motors, for example:

H123W-S Where: H - is the motors total impulse classification letter (in Newton Seconds)
123 - is the average impulse of the motor (in Newton's)
W - is the propellant type (W-White Lightning, B-Blue Thunder, J- Black Jack)
S - is the delay (S-Short, M-Medium, L-Long). The actual delay time may be varied and will be covered in detail in a future article.

Other Manufacturers

Of course Estes and Aerotech and are not the only manufacturers of Rocket Motors, but they are the most widespread, certainly in the UK.

This first article in the technical series has attempted to give a brief introduction to the motors used in the UK

UKRA Council Members by Liz Perman

John Bonsor: Secretary for S.T.A.A.R. Research and has been running the International Rocket Weekend for over 13 years. Actively involved with Bobby Wark teaching and demonstrating rocketry to schools, universities, museums, science fairs etc. John builds rockets from scratch and carries out Wave Rider experiments. (Resume by Liz Perman)

Pete Davy: UKRA NOTAM Officer: I have been on the UKRA Council for just over one year and a member of UKRA slightly longer. During this time I have tried to be an active council member and have thoroughly enjoyed the work (and now familiar UKRA curries!!). It has been challenging at times but overall very rewarding. I have several ideas that I should like UKRA to carry out in the future and would welcome the opportunity to serve for another year. I also have Pete's Rockets which many of you support and I thank all of my Customers, long may we all fly high and safe.

Hugh Gemmell: UKRA Membership Secretary: I started in model rocketry in 1985 at Polytechnic

when a friend challenged me to a contest to build a rocket powered by an Estes C6 motor... I lost! But from then on I was hooked. I've now built and flown over 30 rockets from the Estes Alpha III to a 9 foot 2 stage PML Thunder n Lightning High Power rocket developing some 1800Ns thrust. I am also interested in electronic payloads and accurate flight prediction via computer software. I am a full member of UKRA with a level 1 HP flight certification. I hope to gain my level 2/safety officer certification early next year. In 1998 I formed the Sheffield Rocket Association (SRA) and its Website to promote rocketry in the UK and provide a source of information and contact for other rocketeers. I fly from the Thrust site at Tamworth and attend all the major events!

Ian Holtham: UKRA Treasurer: I have been flying rockets for some years now after being hooked by my first Estes starter kit. I fly rockets from A through to K, both building from scratch and using kits. I have been involved with the UKRA committee since its inception at Largs in 1996. I believe UKRA should strive to improve the services it offers to its members in 1999 and should look to unite all rocketry groups.

Liz Perman: UKRA Secretary: Since attending the International Rocket Weekend '96 I have been actively involved with the creation and running of UKRA. The skills that I offer to UKRA come from over a decade of organisational experience in various business fields including: Sales; Marketing; Customer Service and Business Development. The majority of my flying experience comes from Estes and Quest kits but I am very proud of my recently acquired UKRA Level 1 Certification and am aiming for Level 2 in 1999.

Mark Perman: UKRA Vice Chairman/UKRA 99 Site Manager: My background in rocketry comes from over 24 years working as an Aerospace Engineer for Royal Ordnance Rocket Motors (part of British Aerospace). I have worked on various programmes including Polaris missiles and Skynet satellites. My enthusiasm for model rocketry has run hand in hand with my career and I first got actively involved in model rocketry at the International Rocket Weekend '96.

Charles Simpson: UKRA Technical and Safety Committee Chairman: Although I am a relative newcomer to rocketry, having only been interested for the last three years, I feel quite passionate about this growing hobby. Last year, I achieved the highest level of Tripoli Certification (level 3) during a trip to LDRS and BALLS in America. I have also appeared on national TV as a team expert for Channel 4's Scrapheap programme in which two teams competed against each other to build a rocket from scrap in one day. My interest within the hobby lies at the large higher powered end on the range and it is my goal to advance the public image of UK rocketry through well organized bodies such as UKRA. As part of this plan I intend to build a large scale rocket and have a successful launch on national TV.

Bobby Wark: Scottish Liason Officer : I came into rocketry late but made up for that by coming in at an excellent starting point. I have spent the last 4 (four) years touring the country with John Bonsor of STAAR Research, teaching and demonstrating rocketry to schools, universities, museums, science fairs, basically any place that liked the idea of something a bit different for their event (s). The post I have applied for is a communications post for Scotland, and I feel I am in the best position at this moment in time to fulfil this post. I am centrally situated, possess most forms or methods of communication that will be used to pass the information, and could put some time into the position.

Michael Williams: UKRA Chairman: I have been acting chairman of UKRA for three months, before that I was deputy chairman and produced the 10,9,8 newsletter. I am also president of Thrust, which is an affiliated club based in the Midlands. I am a member of the Tripoli Rocket Association and I am level 1 certified, by both Tripoli and UKRA. I have been flying model and high power rockets for three years. These have ranged from the usual small Quest and Estes kit we all start with up to the I311 Public Missiles Limited Sudden Rush. I have run demonstrations at schools and clubs on a number of occasions and have (by the time of the AGM at least) represented UKRA at a meeting held with the British Model Flying Association.

THE 1999 INTERNATIONAL ROCKET WEEK MONDAY 23rd TO MONDAY 30th AUGUST

(INCORPORATING THE 1999 INTERNATIONAL ROCKET WEEKEND,
FRIDAY 27th TO MONDAY 30th August)

At Kelburn Castle & Country Centre, Largs, Ayrshire, Scotland.

For the full details please visit our web site on: <http://www.gbnet.net/orgs/staar/>

The 1999 IRW is the 14th annual "LARGS" ("Largest Annual Rocketry Gathering in Scotland") rocket festival to be held at Kelburn castle & country centre. It is organised by STAAR Research, with assistance from ScotRoc and the UK Rocketry Association (UKRA).

The 1999 IRW will build upon the successes of the Scottish Rocket Weekends (1986 to 1991), the International Rocket Weekends (1992 to 1997), and the International Space & Rocketry Week of 1998, all held at Kelburn, near Largs. This growth of rocket festivals in Scotland was begun and inspired by the Paisley Rocket Weekends held in 1985 and 1987, organised by the Paisley Rocketeers' Society (PRS - founded in 1936 and still active!).

The 1999 IRW is open to all groups and individuals active or interested in Model and High Power Rocketry in all its aspects, from all countries of the world. Beginners as well as experienced rocketeers are very welcome to participate. Spaceflight and space exploration enthusiasts are also welcome, as there will be much of interest to them at the 1999 IRW, particularly in the realm of Amateur and Independent Venture launch vehicle and space activities.

In recent years the LARGS/IRW event has developed into a gathering attended by individuals, clubs and families. The Kelburn Castle & Country Centre looks over one of the most spectacularly beautiful parts of the Scottish West Coast, and is itself a naturally and spiritually embracing place. For non-rocket flying family members there is much of interest to do at Kelburn itself and in the area, including trips on the Clyde in the "Waverley", the world's last sea going paddle steamer; full details are available from the Largs Tourist Information Office.

Note: During the 1999 IRW it is planned to have a group visit to the Museum of Flight (National Museums of Scotland), near Edinburgh. Arrangements and the date for this will be announced in due course.

Full details of the following aspects of the event can be found on our Web Site:

VENUE, FACILITIES & FLYING SITES
ACCOMMODATION & MEALS
PARTICIPATION CHARGES
PROGRAMME OF FLYING & OTHER ACTIVITIES
COMPETITION RULES
SAFETY and FLIGHT INSURANCE

All enquiries & prior bookings should be directed to:
John Bonsor, STAAR Research Secretary, 15 Smith Avenue, Longbar, Glengarnock,
Ayrshire, KA14 3BN

Tel. & e.mail c/o Bobby Wark: 01505 682563 bob@scotroc.force9.net
OR Tel. c/o Kenny Bradshaw: 01475 689653

Links to information are also at: www.scotroc.force9.co.uk/

NB: Prior booking is not essential, you are welcome just to turn up at the IRW.

The UK's Leading High Power Rocket Dealer !

Pete's Rockets.

**We stock Aerotech kits motors and reloads,
RMS hardware by DR. Rocket.**

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**Robby's Rockets pre-wired Flashbulbs, LES
systems.**

**Blacksky Research Altacc and Timer2B and the
latest PRM.**

**One hour and five minute epoxies, 'supa' glues
Estes Kits and motors. Firestar ignitors**

Books High Power Rocketry Magazine.



Rattwork 29mm Hybrids,

Hypertech Hybrids

4" Honest John nosecone

Custom work - Petes folding launch pad

For Serious Rocketry Stuff !

Contact Pete's rockets

**Tel: 01529 460279 Fax: 01529
461483**

29-38-54 mm motor retaining rings

E-mail: Davy@btinternet.com

**Address: Unit 1, Southview Buildings, Burton Road, Heckington, Sleaford,
Lincs. NG34 9QS**

Open Monday to Friday 9am to 5pm - All other times please phone.

UKRA 99

Friday 25th June 1999
to
Sunday 27th June 1999
At
Garlands Shooting Ground
Tamworth
(Home of Thrust Rocket Club)

Following on from the great success of previous UKRA events we are pleased to announce our 3rd Annual meeting.

Join us on Garlands 600 acre site where there will be entertainment for all and on site Rocket shops.

Our experienced Event Management Team will be on hand to answer questions or provide general assistance throughout UKRA99. The Range Safety Team will be operating sophisticated electronic equipment to help spot and track rockets. This service will be freely available to all participating flyers and we hope to adopt this system for future events.

All flyers welcome!

The weekend offers:

Rockets up to J class flown **
Certification flights
Safety Officer Exam sessions
UKRA Quiz night
Drag Races
Range Safety Officers
On site workshop area
"Rockets to Go!" Workshop.
Additional £5 fee includes rocket materials, motors and tuition. Age Limit 8yrs and over. See Web site for full details. **Limited places**

Prices

Full weekend pass includes:

Camping for 2 nights
Two full days flying
Use of indoor facilities
Access to Restaurant and Bar
Evening Entertainment

Adult Admission **£10.00**
Flyers Fee **£ 5.00**
Temporary UKRA
Membership **£ 8.50**
Child Admission * **Free**

Daily Pass includes:

One days flying
Use of indoor facilities
Access to Restaurant and Bar

Adult Admission **£10.00**
Flyers Fee **£ 5.00**
Temporary UKRA
Membership **£ 8.50**
Child Admission * **Free**

All flying during UKRA 99 will follow the UKRA Safety Code.

* Free Child admission applies to children 14 Years of age and under.

** The motor class flown by any individual is subject to their UKRA Full Membership status and Certification Level. Full details are on our Web Site.

Please contact us for further details and directions at:

UKRA
PO BOX 1561
SHEFFIELD
S11 7XA

www.scotroc.force9.co.uk/ukra/

Rocketry Contacts and Flying Dates by Liz Perman

All dates are subject to confirmation with the relevant clubs, please check prior to attending. Please let me know about others and I will include them in the next issue.

AspireSpace

<http://www.gbnet.net/orgs/aspire/>

ERA (Eastern Rocketry Association)

<http://www.jcsoftware.freemove.co.uk/era>

H.A.R.T. (Hornchurch Airfield Rocket Team)

http://ourworld.compuserve.com/homepages/hart_rockets/

1999 Flying dates: Saturday 5th June, Saturday 3rd July, Saturday 7th August, Saturday 4th September and Saturday 2nd October

KRC (Kent Rocket Club)

1999 Flying date: Sunday 13th June.

MARS (Middlesex Advanced Rocketry Society)

<http://www.mars.org.uk/>

SERF's (Southern England Rocket Flyers)

<http://www.steve-moores.demon.co.uk/index.htm>

1999 Flying dates: Sunday 27th June, Sunday 11th July, Sunday 25th July, Sunday 8th August, Sunday 22nd August, Sunday 12th September, Sunday 26th September and Sunday 10th October.

SRA (Sheffield Rocketry Association)

<http://www.cruiserd.demon.co.uk>

S.T.A.A.R. Research (Space Technology Applications, Astronomy and Rocket Research)

<http://www.gbnet.net/orgs/staar/>

1999 Flying event: International Rocket Week Monday 23rd August to Monday 30th August inclusive.

Thrust Flying Club

http://ourworld.compuserve.com/homepages/thrust_for_space

1999 Flying dates: Sunday 18th July, Sunday 26th September (TBC) and Sunday 10th October (TBC).

UKRA (United Kingdom Rocketry Association)

<http://www.scotroc.force9.co.uk/ukra/>

1999 Flying event: Friday 25th June to Sunday 27th June inclusive.