



# **10...9...8...** **the voice of UKRA**

volume 5 issue 4

## **MARS PEAV**

by Richard Osborne

## **2002 Calendar**

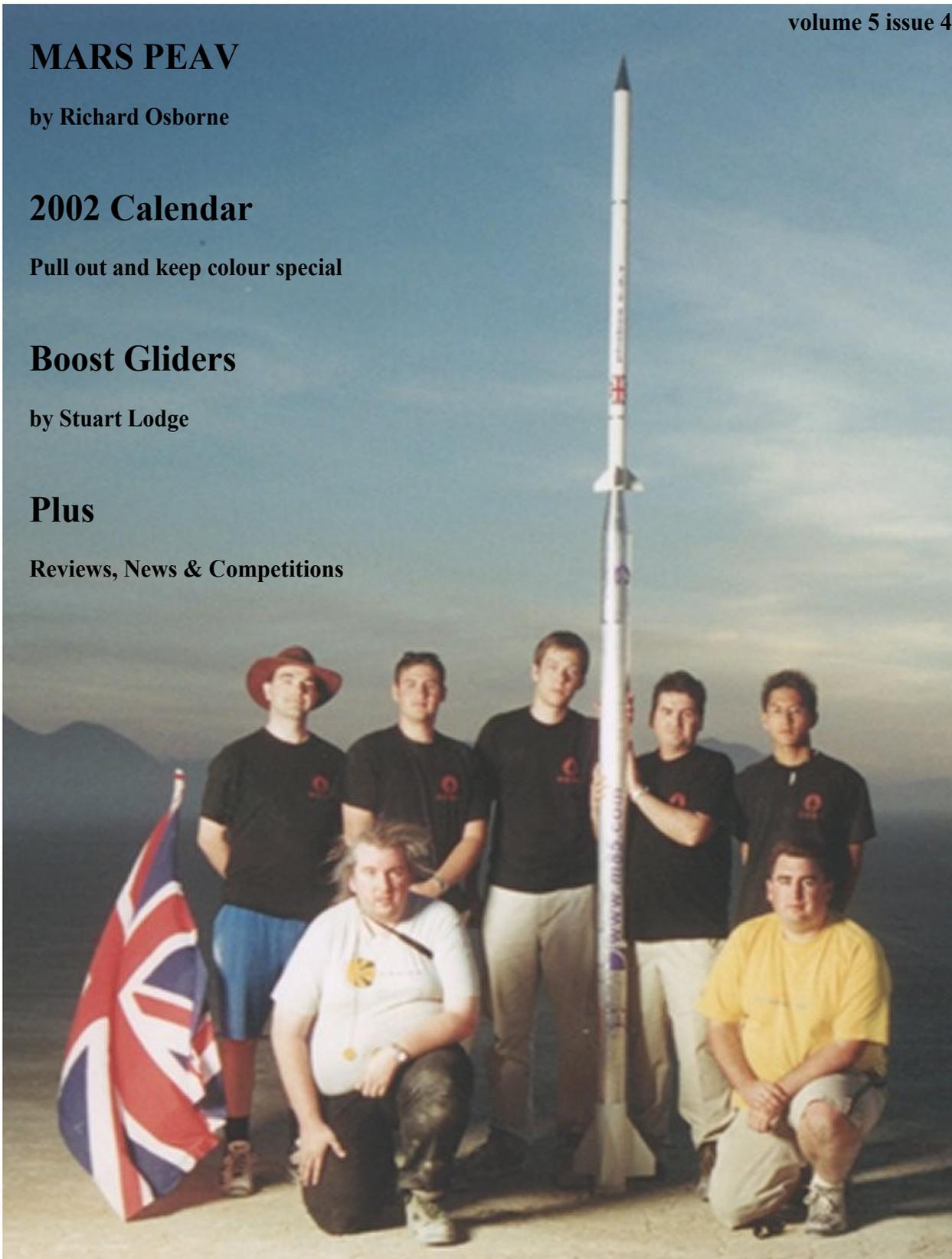
Pull out and keep colour special

## **Boost Gliders**

by Stuart Lodge

## **Plus**

Reviews, News & Competitions



# Editorial

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Welcome to the final issue of 10...9...8... of 2001. It's been an eventful year from Foot & Mouth to the fire at Aerotech, but rocket flying continues. UKRA membership continues to grow, and the UKRA Council have worked hard to maintain and extend the facilities that provided for the membership. The UKRA annual event found a new home and was successful, despite the weather. The IRW went ahead, with an alternative HPR field. K-Lob was very wet, but the Saturday afternoon flying session was excellent. The second Canterbury Cup was a success, attracting visitors from mainland Europe, and is a very welcome addition to the annual event calendar.

A brief note about the minutes that are published in 10...9...8... These minutes are not verbatim copies of the minutes taken at each council meeting, but edited excerpts. The full minutes contain much minutiae relating to the progress of action points assigned to individual council members, and details organisation of events. This is quite dull and repetitive, and would take up far too much space. Additionally, there are subjects discussed by the council which must remain confidential, such as disciplinary matters. If you have any comments to make on this subject you can either use one of the contact methods listed below, or email the UKRA Chairperson at [chair@ukra.org.uk](mailto:chair@ukra.org.uk)

Our printers have a special offer on colour printing at present. Last issue we took advantage of that with a full colour centre page. This issue we've taken it a step further with a double-sided, colour, pull out calendar for 2002. Take it to work, put it on the wall, and use it to spread the word about the best hobby around - rocketry!

Finally, we wish everyone the season's greetings and best wishes for the New Year.

The Editor

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## Cover Photo:

MARS Flight Crew, Black Rock, October 2000. *(Photo courtesy of Richard Osborne)*

## Contents Photo:

Pete Waddington's 2 x Mars Lander, UKRA 2001. *(Photo courtesy of Darren J Longhorn)*

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# MARS PEAV

## *Or, how to recover an 010,000 powered rocket without a shovel*

*by Richard Osborne*

On the 1st of October, 2000, at 12:15 pm PST (8:15 pm GMT), the UK Phobos-EAV rocket, built by the MARS Advanced Rocketry Society (MARS), successfully blasted off from the Black Rock Desert, Nevada, U.S.A. setting a new verified altitude record for a UK built amateur rocket, of over 10.5 kilometres (34,579 feet), or over 1/10th of the way to space.



PEAV Launch

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

The recovery parachutes worked flawlessly, lowering the 7.5 kilogram, kevlar, fibreglass and aluminium dart section of the rocket back down intact in two sections, both on reinforced ballistic high speed parachutes - a Rocketman Ballistic streamer (deployed by a triply redundant AED R-DAS, a Cambridge Instruments IAX-96 and a Black Sky Research ALTACC), and a Rocketman R3C Pro-XP Parachute (deployed by the altimeters above). The upper section of the rocket was recovered within 30 minutes of launch, approximately 3 miles downrange. The booster section of the rocket was recovered within 3 hours of launch, 5 miles downrange. The dart section of the rocket carried 2 Walston retrieval systems tracking transmitters.

The rocket reached a peak velocity of 1350 miles per hour (600 metres per second), with a total flight time of 330 seconds (5 1/2 minutes). The booster section alone, reached 27,158 feet, and a Rocketman R3C Pro-XP Parachute was deployed from the booster by a G-Wiz LC Deluxe and Timer-2N.

The aluminium, kevlar and carbon fibre booster motor section of the rocket, powered by a 22,000 Newton second Kosdon O-10,000 reusable motor, has been sent to the motor testing labs of the U.S. rocketry organisation, Tripoli, since it is the first time in the world that this particular class of motor has ever been recovered successfully after launch. The flight also resulted in yet another first, with it being the first time that accurate thrust data was obtained for this class of rocket motor.

The altimeter data was checked when the rocket was recovered by Ken Mizoi, a Tripoli Prefect and Level 3 TAP Committee Member, and Ron Zeppin of Access Rocketry. All stages from recovery to altitude data checking were videoed for consistency by MARS, as well as by the accompanying TV film crew.

Later the same day, at 4:15 pm PST on the 1st of October, the MARS team also flew a modified version of their backup vehicle, Phobos-3, on a Kosdon M -2240 "Skidmark" (You can see the launch sequence of this flight in this issues pull-out calender - Ed) rocket motor to a verified altitude of just under 16,000 feet. The rocket was designed again as a boosted dart, but due to an insufficiently high launch window on the afternoon of the launch day, the vehicle had to be hastily modified to keep the altitude down! After a number of modifications, components of the separating boosted dart were permanently attached to the booster vehicle. The rocket was recovered successfully on a Rocketman R3C Pro-XP parachute, deployed by a Timer-2N, with altitude logging by a Black Sky Research ALTACC. Present both before, during and after the launch were Sue McMurray and Chet Geyer of Tripoli Motor Testing, and Frank Kosdon.

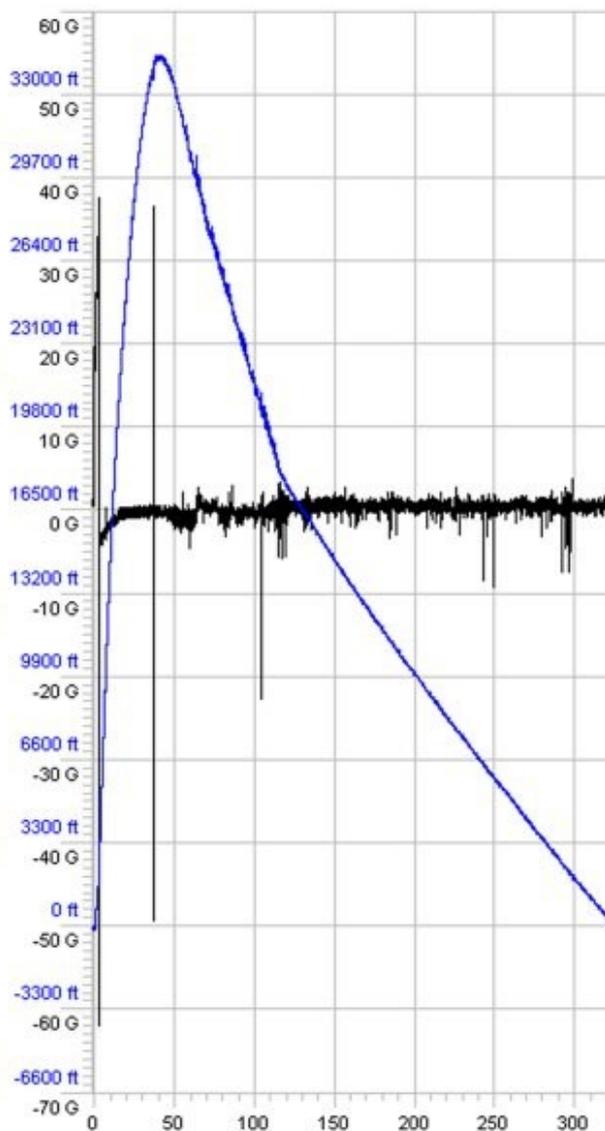


PEAV Recovery

## So, now for the big question

**Given the boosted dart approach, why didn't Phobos-EAV go even higher?** The jury is still out on this, although going on the excellent data obtained from the R-DAS and ALTACC, which were overlaid on each other

for matching, there are 2 reasons that are thought to be responsible:



R-DAS Plot

1) Analysis of the data from the R-DAS and ALTACC altimeter/accelerometer units indicates the apogee altitude was reached at 42 seconds rather than the expected 58 seconds. The data also indicates an anomalous acceleration/deceleration spike at 37 seconds. The ALTACC seems to have fired its drogue charge early at 37 seconds, with it recording apogee 5 seconds later, or at least this is what its data seems to indicate. If this is the case, then it could be due to pressure sensor problems at high altitude, with the ALTACC only supporting 8-bit

quantisation, or it could be due to the problem described in (2) below. Additionally, when recovered, the R-DAS was indicating no continuity on its main and drogue channels, which would be consistent with the ejection charges being fired on the ALTACC before the R-DAS, and the R-DAS then correctly indicating a continuity failure.

There was another acceleration spike event at 105 seconds, at an altitude of approximately 17,000 feet on the descent. This resulted in 10 seconds of acceleration damping, and a significant decrease in the descent rate. This would be consistent with main parachute deployment.

2) The high temperature and acceleration reached by the vehicle during boost, and then violent deceleration at motor burn-out, could have caused the dart to become jammed in its coupling to the booster, with it working itself out somewhat later than motor burnout, and possibly travelling several thousand feet higher under residual momentum. Initially, it was wondered whether the motion was continuous or tumbling. The tumbling is unlikely however, since one would expect severe oscillations in the inertial data, and the data returned shows a typical ascent curve. As such, delayed dart release and stable ascent is more likely.

## Conclusions

The launch was pretty successful; the parachutes deployed successfully, and the rocket was recovered intact (bar scorch marks), much was learned from this flight. Most notably, more practice needs to be undertaken into the use of boosted darts, to ensure immediate rather than delayed separation of the dart at motor burn out. This is something that will come with experience.

The other factor that we learnt to heed in future, is that altimeters can behave in strange ways when operated at the edge of

their design envelope. In this instance, the ALTACC instructions did not indicate that the unit had such a major failure mode above 30,000 feet. The instructions did not guarantee the integrity of the data above 30,000 feet, but at the same time, did not indicate the unit would fail so spectacularly. Conversely, the G-Wiz LC Deluxe unit, rated to 25,000 feet, worked perfectly at 27,000 feet when it deployed the booster recovery system.

The other units behaved flawlessly, and the use of the R-DAS altimeter/accelerometer is recommended for others attempting high altitude flights, simply because of the high quality of the data returned.



PEAV Pre-flight

*For more information about this and other MARS flights, or if you want to join MARS see their website at <http://www.mars.org.uk/>*



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## Constitutional Change

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### Errata

In the 'Proposed Constitution' document, that you will have recently received through the post, there are a few mis-prints, please could you make the following changes to your copy.

### Section 13.3.i

- Item (4) should read: *(4) Recommendation for Suspension of Insurance for four (4) months in addition to Item 13.3 i)1*
- Item (6) should be re-numbered as item (5), and should read: *(5) Recommendation for Suspension of Insurance for eight (8) months in addition to Item 13.3 i)1*
- Item (8) should be re-numbered as item (6)
- Item (9) should be re-numbered as item (7)

The proposed documentation can be found at [http://www.ukra.org.uk/documents/proposed\\_constitution\\_docs.shtml](http://www.ukra.org.uk/documents/proposed_constitution_docs.shtml).

## Council Meeting 15/09/01

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### Location

Cherry Willingham School, Lincolnshire.

### Attendees

Charles Simpson, Pete Davy, Bob Arnott, Mike Crewe, Michael Williams, Mark Turner, Malcolm Ingram, Steve Randall (minutes), Darren Longhorn, Richard Osborne.

### Agenda

- Apologies
- Minutes of last meeting

- Constitution changes/AGM Prep
- K-Lob Prep
- Exam/study guide status
- UKRA 2001-2
- Pete's radical thoughts
- Representation
- UKRA endorsed kits
- Published approved motor list
- Rocket magazine
- UKRA Records

### Apologies

Apologies were received from Apologies were received from John Bonsor, Ben Jarvis, Jim MacFarlane and Ziggy Kklynoski.

### Minutes of the last council meeting

The minutes of the meeting of 13/05/01 were read and approved. The outstanding actions points were reviewed and discussed.

### Constitution

Mike Crewe reported that the revised constitution was "just about ready to roll". The method and schedule for distributing the documentation to the membership was discussed. The following votes were taken:-

In addition to email should the documentation also be distributed by post? (thus incurring additional cost):

- <7 for, 1 against, 2 abstain - carried

Should the Consultation and Council meeting be held on Sat 27th or Sun 28th October?

- 5 for Sat 27th, 2 for Sun 28th and 2 abstain. - set as the 27th

It was agreed: Members may submit comments on the constitution by email to the chairman or via post to the UKRA PO box. There will be a 4 day cut-off on postal submissions. That the consultation meeting would run from 12:00pm to 1:00pm - but could be extended at the chairman's discretion. The meeting would just address the constitution and important business. Malcolm reminded the council that he had

previously offered to bear the cost of the 2nd mailing. There was considerable debate over the timetable for publication of the constitution and meetings - the debate centred around how to simultaneously meet the current constitution requirements of a 3 month AGM notification and holding the AGM before the end of the calendar year. There was concern that the letter of the constitution should be adhered to otherwise the council would lay itself open to further challenge at the AGM. A vote was taken on the AGM being set as Sunday the 16th December:

- 5 for, 5 abstain 0 against - carried.

It was agreed: The Constitution and AGM timetable would be set as :-

- 16th September - announce the AGM details on the Website, RMR and UTR..
- 23rd September - Distribute draft constitution and chairman's letter - ask for AGM agenda items and request that those members wanting to stand for council to send bios.
- 27th October - Consultation meeting followed by council meeting.
- 3rd November - Distribute AGM stuff (agenda, constitution changes, bois & voting forms)
- 16th December AGM

The AGM would be held at Cherry Willingham School Lincoln. The start time would be 12:00

A motion was put to reduce council size for inclusion in the new constitution:

- For: 2, Against 5, Abstain: 3 - defeated.

## **K-Lob Prep**

Pete Davy outlined the different field layouts of UKRA2001 and K-lob. Pete reported that the sausage man was in attendance. It was agreed the same facilities as UKRA2001 would be needed at K-lob.

## **Exam/study guide status**

Charles reported answer sheet B was OK.

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

## **UKRA 2001-2**

Pete reported that the Farmers monetary contribution was gratefully received. There was discussion over the need to advertise UKRA 2002 by Christmas 2001. It was unanimously agreed:

- to hold UKRA 2002 at the Davy Farm Lincoln
- the date would be 7,8 and 9th of June
- that UKRA 2002 should be organised by a committee
- the committee would be picked and chaired by Pete Davy
- the committee would be devolved all aspects including financial authority
- the committee should report progress at council meetings

## **Pete's radical thoughts**

Pete proposed that UKRA could rent the shed on the Davy farm. The shed could either be used for UKRA events annually or as a training workshop (e.g. rockets to go) on a permanent basis. It was agreed the council should consider the proposal and discuss at the next meeting.

## **Representation**

It was agreed to avoid confusion it was important that clubs and members should let the UKRA council know of any contacts with national organisations. It was agreed that Charles would place an article in the newsletter asking for clubs and members to share information about any contacts with national organisations.

## **UKRA endorsed kits**

It was unanimously agreed that UKRA would not endorse kits.

## **Published Approved Motor List**

Discussion ranged over the need for a list, how it would be known whether a motor was legal and the method by which the list would be populated and kept up to date. The most

practical proposal for keeping the list up-to-date seemed to be to put the onus on the importers to provide the updates. A motion was put forward to remove the motor list:

- for 4, against 4, abstain 2 - the chairman used his casting vote to defeat the motion

## **Rocket magazine**

Bob reported that the request from the magazine was much more than building a model - it was in fact a proposal to make a rocket in 52 parts. The rocket would be made from injection moulded plastic parts carried on each magazine.

## **UKRA Records**

It was agreed that:

- UKRA class records may be set up to and including M class
- UKRA class records were open to all UKRA members (irrespective of nationality)
- The motor must be legal at the point of launch
- That class and open records may be set by a rocket launched anywhere on earth - on land sea or air

## **AOB**

### **Progress too swift between L1 & L2**

It was agreed to postpone this topic until the next meeting.

## **DVNM**

27th Oct at Cherry Willingham School, Lincolnshire.

# **Council Meeting 27/10/01**

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## **Location**

Cherry Willingham School, Lincolnshire.

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

## **Attendees**

Charles Simpson, Pete Davy, Mike Crewe, Steve Randall (minutes), Richard Osborne, Hugh Gemmell.

## **Agenda**

- Constitution Consultation Meeting
- Apologies
- Minutes of the last Council Meeting
- Financial and membership report
- BMFA - Kath Watson retires
- Petes Radical Thoughts (continued)
- Council Minutes - what should be in and what should be left out.
- AGM voting
- Aerotech

## **Apologies**

Apologies were received from: John Bonsor, Ben Jarvis, Bob Arnott, Darren Longhorn and Malcolm Ingram.

## **Constitution Consultation**

No UKRA members attended this meeting other than the council members present. Comments were received from Malcolm Ingram, Mark Perman, Hugh Gemmel & John Bonsor.

## **Minutes of the last council meeting**

The minutes of the council meeting of 15/09/01 were unanimously accepted. The action list was discussed and progress noted.

## **Financial and membership report**

Hugh reported that UKRA had made a profit at both events - £288 at UKRA2001 and £35 at K-lob. The current bank balance was £1733.27 - and the expectation was that the balance would be similar at the end of the year. Hugh reported that the current membership totalled 156 (+ 3 associate members).

- 111 Full members
- 33 Family memberships
- 9 Family Non Fliers
- 5 Temporary

Membership appeared to grow approx. 25% per year.

## **BMFA - Kath Watson retires**

Pete Davy reported that Kath Watson (BMFA AGM chairman) was retiring from the position. Pete said that Kath had given strong support for UKRA being the BMFA specialist body for rocketry. It was agreed that UKRA should write to the BMFA giving thanks for Kath's help over the years.

## **Petes Radical Thoughts**

Pete suggested making 6x30" trestle tables rather than hiring for next years UKRA events. These would be £16 for raw material or £25 if made up. Pete suggested a mass construction session rather than UKRA paying for the tables to be made up.

Pete also suggested that UKRA rent the Mission hut at the Davy Farm as an alternative to renting a Marquee at future UKRA and K-lob events. The Marquee costs for this year were approx. £1200. Pete suggested a rental of approximately £90 to £100 per month including insurance. This would include the conversion of the Hut into a building - with level floor, opening windows, sealed ends, heating (probably quartz heaters), lighting and a metered electricity supply. It was agreed that Pete would explain proposal at the AGM to gauge general membership reaction.

The use of range radios at UKRA events was discussed - it was agreed to purchase a pair of PMR 446 radios from the link at a cost of £50.

## **Council Minutes**

What should be in and what should be left out. It was agreed to keep the existing minute procedure:-

- Minutes would be taken and sent to those present by email
- Items could be removed before sending to the full council if agreed by those present
- Items could be removed (e.g. disciplinary proceedings) before publishing in 10,9,8 if agreed by the council

## **AGM voting**

Every UKRA member will be given a 10 digit random voting number. Each voting form will be marked with the members random number and mailed to them. The list of members names and their allocated random number will be sealed in an envelope. A separate list of valid voting numbers will be held to enable counting. Members wishing to vote may either return their voting form to the UKRA PO box or Bring it to the AGM. Spoiled voting forms may be exchanged (the voting number will be replicated). Fraudulent voting forms may be discovered by:-

- Duplicate numbers on forms
- Numbers not in the valid number list

The AGM documentation should include:

- The bios of those standing for re-election
- Those not seeking re-election
- The bios of those standing not currently on the council
- Chairman's Remarks
- Financial Review

John Bonsor wrote saying that he would not be standing for re-election. This was primarily because of the difficulty and expense in travelling from Scotland. All those present expressed what a loss to the council this would be. It was agreed that the council would ask him to reconsider.

The following was unanimously agreed:

- To hold the vote for the council executive immediately following the AGM
- Existing Council members not able to attend the AGM and wishing to cast their nominations and votes should do so to the secretary before the meeting
- Council members not re-elected would have their votes/nominations discarded

Secretaries Note: the following nominations have already been received and seconded:

- Chairman: Charles Simpson
- Treasurer: Hugh Gemmell
- Vice Chairman: Mike Crewe
- Secretary: Pete Davy

## Aerotech

It was agreed that a letter should be sent to Aerotech expressing sympathy with regard to recent events.

## Competition

This issue's competition is a teaser. The following are all anagrams of rocketry related stuff such as manufacturers, rockets, accessories etc.

1. ROTCHAE
2. DRY HIB
3. POTLGFTI
4. RALTI TEME
5. JO TEEN CO
6. CHUPAR TEA
7. YAG NEL RAID
8. TEQUS
9. RAVEN DAVY S PETE NOT
10. THE BUND RULE

Send your entries either to the UKRA PO Box, or by email to [competition@ukra.org.uk](mailto:competition@ukra.org.uk) In the event of more than one entirely correct entry, the winner will be drawn from a hat. The winner will receive a Quest Model Rocket Kit.

## Competition Results

Last week's competition question was: *What is the name and the purpose of the module most recently added to the International Space Station?* The answer is of course the Russian module *Pirs* which will provide outpost crews with a second orbital portal through which spacewalking repair and

assembly work can be performed. Congratulations to James Longhorn. A Quest kit is in the post to you.

## BROHP

### 4th Annual Conference, call for papers

### UK Space History, Education, Policy

The British Rocketry Oral History Programme has established a reputation as the best forum to meet and discuss UK aerospace history and technology. It has been attended by large numbers of aerospace engineers and scientists who worked on the projects discussed. In addition academics particularly historians have made presentations outlining political and bureaucratic dynamics that drove projects. The interaction between technological and policy insights has been very fruitful. We have been fortunate enough to attract a number of distinguished historians such as Professor DC Watt and Dr John Krige who led the European Space Agency History Programme aerospace experts of the calibre of Professor John Allen, Professor Ian Smith and the distinguished test pilot Eric "Winkle" Brown. Perhaps even more important has been the attendance of Postgraduate and Undergraduate students from a number of disciplines. They have been able to discuss both past and present UK government policy with senior civil servants such as the Director General of the British National Space Centre Dr Colin Hicks his Deputy David Leadbeater and senior officials.

The conference has established a deserved reputation for friendliness, enthusiasm and an excellent chance to socialise and discuss issues with scholars from different disciplines and participants in the projects under study. This year papers will be presented on issues such as British Space Policy, the Cold War, Intelligence issues, nuclear weapons and specific projects such as Blue Streak, Black Knight, Black Arrow,

the Polaris improvement programme "Chevaline", and Thor. There will be discussions on the management of UK Aerospace projects during the 50s, 60s and 70s, the future of BNSC, the application of Risk Analysis to Aerospace projects and government policy on Near Earth Objects. We particularly welcome abstracts from postgraduate students wishing to establish themselves in the field.

The conference will take place on April 2nd, 3rd and 4th of April 2002 at Charterhouse School in Surrey. Abstracts of less than 200 words should be sent to [brohp2@aol.com](mailto:brohp2@aol.com) or:

Lesley Wright,  
CMS, John Moores University,  
Byrom Street, Liverpool L3 3AF

## Aerotech's Fire

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*by Pete Davy*

**As I am sure you will know by now that early afternoon on 15th October 2001 Aerotech experienced a small fire at their motor production facility.**

**This first accidental fire was prevented from spreading by the safety procedures and systems that Aerotech had in place. Within 30 minutes the Fire Department declared that the fire was out and that it was safe for the Aerotech employees to enter to collect personnel items.**

**As the sprinkler system was still working, some of the employees got very wet and returned home to change into dry clothing. It was their intention to enter the building after the sprinkler system had been turned off.**

**However it was later on that a second, much larger fire occurred, when some Magnesium powder was handled incorrectly. This caused a much larger fire to start. At this point the Fire Department evacuated the area to a half-mile radius. They then allowed the fire to burn it's self out. The neighbouring businesses were caught up in the fire and at**

least 30 cars were destroyed in the garage premises next door. A neighbouring forklift business was also effected. Explosions that were heard at the scene were the petrol tanks, paints and butane cylinders from the neighbouring businesses.

After the fire Aerotech have been able to identify large portions of propellant that were left intact and have noted that a significant amount of chemicals were not involved in the incident. The safe operating methods and safety procedures that Aerotech had in place were clearly demonstrated in the initial fire and how quickly it was contained and extinguished.

Unfortunately 3 employees were in the facility at the time of the initial fire, two suffered severe burns and the third employee suffered less severe burns. One of the employees has sadly died as a result of his injuries, but the other two are making good progress. A lot of Aerotech's employees are family related members and despite the accident all have expressed a desire to continue working there.

Aerotech are fully insured and at the time of the fire were fully compliant with all the regulatory bodies that are applicable to them.

So what does the future hold? Aerotech have got their administration moved to their kit making facility. They are looking at a new production site and hope to have motors back in production and shipping during the first quarter of 2002. There will be some minor changes to the Econojet range of motors, but other than that things will be as normal along with plans to ship reload kits with a medium delay only. Short and Long delays will then have to be bought separately. This last change is something that Aerotech have talked about for some time and I believe that it will be a good move forward.

I am sure that you will all wish Aerotech and it's employees all the best. Rest assured that they are working to get back into production just as quickly as they can.

# UKRA 2002

## 7th / 8th / 9th June



### **Southview Farm, Heckington, Lincolnshire**

**All Rocket Sizes Welcome From Micromax to M Class**

**Altitude Ceiling of 10000ft\***

**Certification Flights**

**Range Safety Officer & Certification Exam Sessions**

**On-site Vendors Welcome**

**On-site Camping & Local Accommodation**

\* Possibly Higher By Prior Arrangement



# UKRA 2002

# UKRA Calendar 2002

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*Clockwise from top left... Pete Davy's Patriot, Steve Woolhead's Warlock, Mike Horloc's Phoenix, Gary & Amanda Blinco's BAc Meteor (Photos By Dave Hart, Adrian Hurt, Mike Horloc & Steve Moore)*

## January

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

## February

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		

## March

S	M	T	W	T	F	S
						1
						2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	26	28	29	30
						31

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Roy Trzeciak-Hicks' L3 attempt, EARS, July 2001 (Photo By Richard Osborne)

## April

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

## May

S	M	T	W	T	F	S
		1	2	3	4	
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

## June

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	26	28	29
						30

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*Rocketry, the next generation. Clockwise from top left... Trevor Seabrook, Louis Williams, Robin Seabrook, James Longhorn (Photos By Steve Moore & Darren J Longhorn)*

## July

S	M	T	W	T	F	S
	1	2	3	4	5	6
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14	15	16	17	18	19	20
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## August

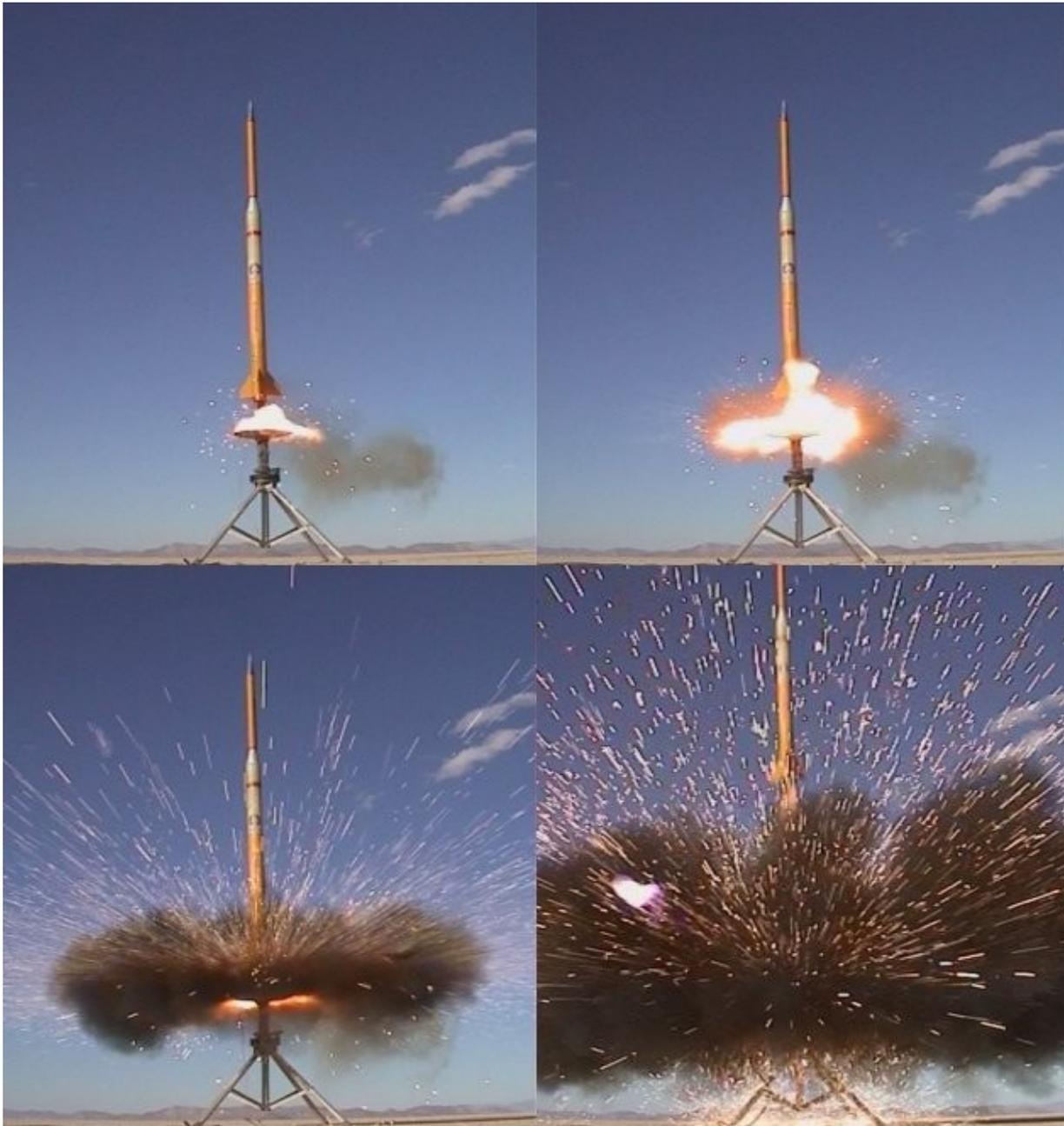
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## September

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15	16	17	18	19	20	21
22	23	24	25	26	26	28
29	30					

# UKRA Calendar 2002

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MARS Phobos 3, Black Rock, October 2000 (Photos By Steve Woolhead)

## October

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

## November

S	M	T	W	T	F	S
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3	4	5	6	7	8	9
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17	18	19	20	21	22	23
24	25	26	27	28	29	30

## December

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
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22	23	24	25	26	26	28
29	30	31				

# Vaughn Bros - A.S.P. Assembly

*by Roy Trzeciak-Hicks*

- Wt: 4.2 oz
- Len: 33.0"
- Dia: 1.33"
- Motor config: (1)24mm

Thomas received an ASP as a present and wanted to build this himself, this little rocket would also be able to lead Thomas to single use Aerotech engines. This is Thomas' 3rd Vaughn Bros kit the first was the Sputnik then the Buzzard.

## Contents

Looking at the contents of this kit I was confident that this rocket would be a good performer, It consisted of quality parts, thin fibreglass fins, light weight tubes, A wire for the shock cord attachment to stop those burnt elastics and an 18" nylon parachute. The one thing I noticed that was on the down side was I was going to have to slot the body tube for the fins myself, I guess I am just use to PML kits too much. My first job was to mark and slot the body tube for the fins, so that Thomas could then start the assembly.

## Slotting the body tube

I decided that rather than cutting the tube with a scalpel, I would try to use the B&D minicraft drill with the cut-off disk. This method proved to be quite good as I had visions of squashing the tube if using the scalpel. Using the minicraft cut-off disk I was able to cut the slots for the fins with minimal squashing of the body tube, the slots came out very neat and only the ends of the slots needed to be completed with the scalpel.

During the assembly of the engine mount and shock cord anchor the crimps that hold the loops in the end of the wire shock cord anchor were noticed to be loose (one end fell apart!) so all crimps were remade (Speaking to another owner of an ASP they have the same problem but their's fell apart during recovery!) I would recommend any one with a Vaughn Bros kit to check the crimps on the wire shock cord anchor.

Assembly was straight forward and Thomas managed to put the ASP together with no real problems it was even his first time of building with epoxy (although I did mix it for him). The one modification that was made to the ASP was not to use the launch lugs provided but instead to use black sky rail guides.



Great rocket for kids moving up

## Flight

So far the ASP has only flown once. For its maiden flight a D12-3 was chosen partly due to not knowing the performance of this slender rocket but also due to the wind on the launch day. Vaughn Bros say that this rocket will fly on up to G class motors, well from its performance on a D I think it would be good to put a radio tracker in it for G class flights as the rocket does perform as expected. This is a slender and lightweight rocket that performs fantastically, A definite good choice for moving up from Estes / Quest size kits for those progressing in the hobby. Not to say that some fun flights can't be had from the experienced rocketeer as well.

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# Booster Roosters *the boost glider*

by *Stuart Lodge*

CHUCK GLIDERS with *Attitude*...that just about sums up Boost Gliders. From the outset, aerospace - both full-size & model - wanted to boost launch vehicles under rocket power and then glide them safely back to earth in order to use them again. *Carl Neubronner* equipped a "stick & string" model aeroplane with a rocket and successfully flew it during the 1920s in Germany. Well known to us all, NASA's *Space Shuttle* - and the former Soviet Union's *Energia-Buran* - are examples of *Boost Gliders*...and represent the global state of play at the turn of the millennium.

## Crawling stage

Remember a bit of theory - rockets are stable because the Centre of Gravity (CG) is ~1 body diameter nearer the nose than the aerodynamic Centre of Pressure (CP). Small gliders are a little different and normally soar gracefully with the CG adjacent to the CP at ~50% wing chord. Ergo, simply attaching a rocket motor to the fuselage of a small glider is tempting a vicious, terra firma seeking, loop and the opportunity to sniff some cyano...there is a circle to square !

Traditional boost gliders resemble free flight hand launch gliders, with ~300sq cm wing area, accommodating the same contradictions in the boost/climb and transition/soaring segments of the flight - what is good on the "fast" part won't be effective when things slow down. So what do we want ? A proven boost glider design, knowledge of model rocket motor *thrust:delay* combinations and a bit of practical help, is a good start.

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



Folding up! Note how tip rubbers are slewed to fit inside fuselage when in folding launch mode.

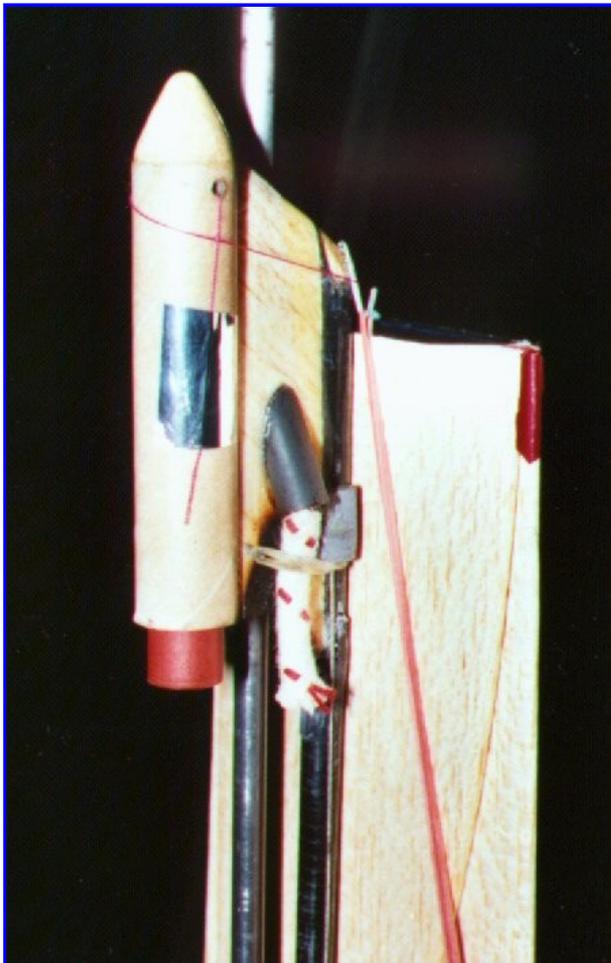
## Little stiffies or big floppies

Boost gliders are usually fired on either 2.5 Newton second (Ns), or 5Ns motors, "A" & "B" power - reason...*Federation Aeronautique Internationale* (FAI) S4-Boost Glider events tend to focus on this impulse range. Not all boost gliders are contest orientated and one of the best introductions to the art is the Estes "Tomcat" - a semi-scale F14, which features wings which are folded for the boost phase of the flight, which flip open at the top of the climb for the glide segment. Tomcats fly on 10Ns and represent one of the most attractive and spectacular boost gliders around, albeit with a limited glide slope.

Back to basics, most published boost glider designs are intended for contests and no one shape seems to have established total ascendancy over another...the one that did, the Rogallo - a flexy mylar hang-glider - was

page 21

re-classified to FAI category S10, outside the S4-Boost Glider regulations. We are left with *rigid gliders* - which resemble the size & shape of a chuck glider, the *canard* - with the tailplane in front of the wing and the *floppy folder* - which folds down into a rocket shape for the boost segment, before performing an avian metamorphosis at apogee. The rocket motor is traditionally ejected from boost gliders, although some designs retain the spent case as noseweight. Related to this, some designs store the motor in a disposable, nose mounted pod; some have the pod permanently fixed to the fuselage nose, ejecting only the motor. Whatever is done, the discarding pod, or spent motor, must be retarded on the return journey by a streamer to satisfy *Safety Code* tenets.



Front and of a "folder"... note cotton thread holding slewed wing in place; elastic ready to swing wing back; dethermaliser assembly. A picture tells a thousand words?

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

## Boosts & Coasts & Glides

What's needed ? Boost gliders weigh approx. 25-30g and flying on either 2.5Ns or 5Ns impulse requires a firm push to get the glider moving, followed by a low to medium thrust level to keep it boosting. At propellant burn-out, the glider will coast upwards briefly to apogee before the ejection charge fires to spit out the motor case/jettison the motor pod/free the wings [delete as applicable..]. Summarised, a medium thrust motor with a short delay.

The front mounted motor performs another vital function, full of propellant it makes the glider nose-heavy, advancing the CG to near the wing's leading edge on a conventional glider. However, this alone may not ensure safe boosts, with a fixed wing boost glider it is normally best for the model to roll gently - usually to the *right* - during the boost & coast phases of a flight. The roll will nullify looping tendencies, making for a straighter climb. A Slovakian approach are *differential flaps* - a flat bottom wing section is good in the boost, but undercamber nice for the glide : Dropping flaps at the top of the climb achieves this. In addition, these models employ "half-flap" on the port (left) wing for the boost, which facilitates the right roll described above. The glider will normally be configured to glide in wide left hand circles...or it will disappear downwind at a high rate of knots and be lost ! The classic *right climb : left glide* has been established in aeromodelling since the beginning of time..

The decalage of boost gliders is a contentious discussion - *zero degrees thrust line : zero degrees wing incidence : zero degrees tail incidence* is a recipe for a straight high boost. But often the return to the ground is just as rapid! A degree or two of incidence on the wing, or a kick-up elevator on the tail, released by the motor's ejection charge, makes living with the conventional boost glider a little less exciting, even if the apogee is a little less.

Interestingly, what works on free flight chuck gliders is applicable to boost gliders and your scribe reckons proficiency in the one will result in success at the other.

## The former CCCP and floppy folders

Around 1980, when the Rogallo glider blitzed the global S4B-Boost Glider scene, some parallel development was taking place in the former Soviet Union. The problem? What's good in the glide segment - Wing Area - is a pain in the boost phase, it stuns altitude potential and causes looping etc. *Sergei Illin* must take credit for the evolution of the "floppy folder", the boost glider which tucks in its polyhedral wing tips and then pivots the wing through 90 degrees - parallel with the fuselage, for the boost phase. These models normally have more wing area - up to 500sq cm - and have a much higher aspect ratio, hence much more efficient. It is also very easy to build in wing incidence to maximise the glide slope. Conceptually, it's also possible to treat the boost & glide segments as separate entities, for easier trimming.

## Go for Launch...

First stop and think, the traditional Estes type wire rod may not be quite enough for a boost glider...and don't forget that the glider needs launch lugs, just like the traditional model rocket. To start with, choose a heavy duty, metre-long piano wire rod and parallel to this, employ dowel wing supports, to prevent the glider flapping around. And yes, the rocket motor is not at the base of the model, but near the top; the electrical ignition wires need to be suspended on an *umbilical*, such that they cannot foul the glider, once the motor has ignited.

But first of all, inspect the glider for soundness - exceeding the *Speed of Balsa* is easy with boost gliders...and confetti the usual outcome! "*Trim the glider on a calm*

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

evening over long grass"etc. etc. A flat glide, with a gentle left turn are what is required. Choose a 2.5Ns motor - an Estes A3-2, A3-4..or failing those an A10-3 - prepare the beast carefully and boost it. And no one really knows what's going to happen first time...so make it a calm day on a big field and then apply trim adjustments carefully for next time. Beware of trees, or the *Rooster* will certainly *Roost..*

Ultimate motors for FAI contest boost gliders have evolved over many years in Eastern Europe. Czech *DELTA* A2-2 & B2-3 propellants are regarded as the market leaders by many, hotly pursued by Slovakian *VYMOPO* and Ukrainian *MRD* products. All feature a smooth thrust delivery and fairly short delays.



Kurt Griem of Switzerland prepares at 2001 Swiss RAK Cup at Oberkuli. Motor and streamer about to be inserted.

## Variations on the theme

Most shapes have been tried by someone over the years : No one design is foolproof; some work well a lot of the time. The typical FAI Space Modelling World Cup event and World & European Championship will see more fold-up models than rigids these days. Folders do provide answers to a lot of the problems - but do throw in a few of their own, such as fishtailing in the boost and the omnipresent risk of leaving one or other wing tip tucked under...and splatt !! ... A common feature is some form of dethermaliser, to terminate the flight after a predetermined time, to minimise losses due to thermals and wind. The *American* approach is normally to boost very high with rigid, lightweight models of ~200sq cm wing area : Former *CCCP* countries go for folders of 350-450sq cm : *Mittel Europ* prefers traditional rigids at 250-350sq cm. It's not what you do but the way that you do it - that smelts the metal !!

## Contests

The FAI Space Modelling contest calendar features S4A & S4B events at most World Cup meetings. In common with other disciplines, a three round set - with maximum times (maxes) set at 180s & 240s respectively. Fly offs are employed to break any ties. Although there is more to boost gliders than contests, it is in the competition arena that most of the development occurs and the results published.

## Round up

*Booster Roosters* are different from the traditional model rocket and the skills for making and flying them more common to the traditional *aircraft modeller* than the embryonic *space modeller*. Working with - and of course choosing - balsa sheet, composite materials, wire & finishing materials and using scalpels, sanding blocks & razor planes are skills that are acquired over a great many years. And that's why we should go on reading...



Actually, not a Boost Glider! This is a Radio Controlled category S8E Rocket Glider being launched by Jerzy Boniecki for his son Bartosz, seen at the 2000 Ljubljana Cup.



Jerzy sets up at the 1st Canterbury Cup S8E RC Rocket Glider event.

# K-Lob 2001

by *Darren J Longhorn*

## Egg Lob?

There were a disapointingly small number of ostrich egg lob flights, but this was due to the weather rather than a lack of interest. In the end there were only two flights. Steve Woolhead's in his *Modified Warlock*, and Ben Jarvis' *XR3000 Ovulator*.



Ben Jarvis with XR3000 Ovulator

## My flights flight

I didn't actually get to fly much. I was planning on flying AFoS on a J415, but didn't fancy a long walk. In the end I just flew Tintinique on what proved to be it's last flight. The shock cord snapped at ejection, and most of teh rocket plumpeted to the ground, breaking off a fin. The nose drifted off still attached to the parachute. After a long search I had thought it lost, but Steve Holt spotted in a field on his way home, and brought it back. My son Shaun flew my LP Rapier and his PML Bullpuppy.

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



Mel's camera rocket, Shorty

## Summary

The weather was very disappointing, and probably caused many of the larger flights to be scrubbed, including most of the planned ostrich egg lobs. Every cloud has a silver lining though, and the flying session on Saturday afternoon showed just how many flights can be got off in a short space of time if you apply yourself. There were also several certification attempts, but a fair few of them were failures.

## Statistics

Here are the flight statistics for the event. More data is available on the UKRA website, which includes all the registered flights.

Grand totals:			
	Flights	Total Ns	Avg Ns
Sat	50	12673	253.46
Sun	10	2783.5	278.35
-----			
Totals	60	15456.5	257.61

Motor breakdown:										
C	D	E	F	G	H	I	J	K		
3	5	6	4	14	17	5	7	1		

# The Soviet Manned Lunar Program

(Part 3)

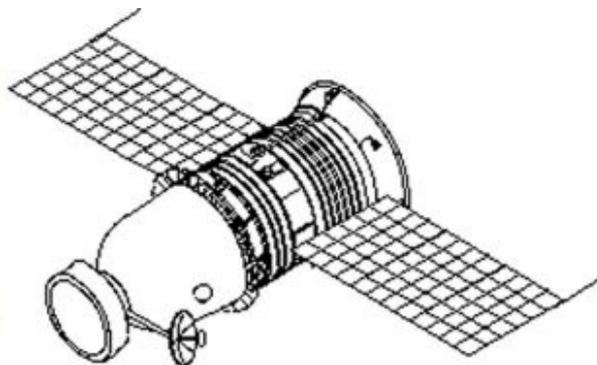
*edited & compiled by Marcus Lindroos*

## The Cosmonauts Miss The Moon

The L1 project became known to the world in March 1968 when a 7K-L1 craft (called "Zond-4" by the Soviets to conceal its true purpose) was placed into a highly elliptical orbit 180 degrees away from the Moon. Zond-4 had to be destroyed when a technical error shifted the landing point into the Gulf of Guinea. A new attempt in April did not even make it to Earth orbit and on 15 July 1968, another L1 launch had to be cancelled when engineers overpressurized the 4th stage oxidizer tank during testing. The resulting explosion killed three pad workers. Such accidents became increasingly common in 1967-69, undoubtedly because overworked engineers were under great pressure to catch up with the Americans again. But the cosmonauts training for L1 flights still wanted to fly. They felt that engineers would take greater care in the testing of equipment for a crewed mission (Pesavento,1993).

Meanwhile in the United States, NASA had successfully managed to overcome a severe crisis when astronauts Grissom, White and Chaffee were killed during testing of the new Apollo spacecraft on 27 January 1967. The new redesigned spacecraft and its giant Saturn V carrier rocket were now ready for manned flight. On 19 August, NASA chocked the Russians by announcing a revised Apollo schedule that included a manned flight to lunar orbit in December

1968, provided the spacecraft's forthcoming maiden flight (Apollo 7) in Earth orbit was successful. Mishin & co. must have thought the Americans to be out of their minds to man-rate a spacecraft for a Moon flight on only its second mission. The Soviet goal was now two completely successful unmanned L1 tests, followed by a manned circumlunar flight in January 1969 at the earliest. Now they had little choice but to move the manned Zond-7 mission to December 1968 instead.



Zond 5

The space race was finally decided in the autumn of 1968. First out of the gate was the unmanned Zond-5 in September. It became the first L1 craft to actually fly around the Moon and caused a sensation in the West when Jordell Bank Observatory picked up a human voice from it! But it was only a tape-recorded experiment to test the communications system. The mission generally went well, although an operator error forced a landing in the Indian Ocean. A ship from the Soviet Navy picked up the capsule the next day and returned it to the USSR. The biological experiments contained on board (turtles and banana flies) had survived. The relieved Russians released information to the West which confirmed NASA's worst fears: 'Zond flights are launched for testing and development of an automatic version of a manned lunar spaceship...'

The Americans struck back on 11 October, when Walter Schirra, Donn Eisele and Walter Cunningham put the new Apollo 7 through its paces during an 11-day mission in Earth orbit. The mission generally went well and Apollo 8 soon received the final go-ahead for a circumlunar mission. But only a day later the

Soviets responded by flying their first manned Soyuz flight since the Komarov accident, when Soyuz 3 (with cosmonaut Georgi Beregovoi on board) practised docking maneuvers with the unmanned Soyuz 2.

Everything now depended on the Zond-6 flight in November. If it was a complete success there was still a small chance that the next flight in December would be manned. The probe was launched safely on 10 November and flew past the Moon three days later, but the landing maneuver went totally wrong. First the spacecraft depressurized because of a faulty rubber gasket a few hours before reentry, killing all animals on board. The capsule descended safely through the atmosphere but then parachute deployment came too early and it crashed on Soviet soil. But the Soviets did not reveal the failure for propaganda reasons, instead saying the mission had been a complete success (Harvey, 1996). Consequently NASA was fearing the worst while preparing the Apollo 8 vehicle in December. Due to the peculiarities of celestial mechanics the Soviets would have been able to launch a lunar spacecraft two weeks before the 'launch window' opened in the US. The L1 cosmonauts did send a letter to the Politburo asking for permission to launch a manned mission. They even travelled to the Baikonur Cosmodrome in order to be ready to fly at a short notice. But the order never came and two weeks later, Apollo 8 astronauts Frank Borman, Jim Lovell and Bill Anders became the first men to fly around the Moon (Pesavento, 1993).

## The L1 Program Tapers Off

The L1 naturally ceased to be a high priority program after the successful Apollo 8 flight and all manned flight were put on hold. It was instead decided to fly a few more test missions in 1969-70. A probe launched in January 1969 failed to reach orbit because of problems with the UR-500 carrier. In August, Zond 7 became the only completely successful L1 mission, passing the Moon at a distance of 1500km before safely landing in the USSR. Three months later, one of the

two man-rated L1s was launched on an unmanned test flight to test the Block-D systems in Earth orbit, but the launch ended in yet another failure (Clark, 1997). A second circumlunar test in December followed by a manned voyage for Lenin's birthday celebration in April 1970 with the single remaining crew-rated L1 was briefly considered but never approved -- possibly because the program was delayed yet again (Hendrickx, 1997). Instead, the Soviets launched a final unmanned test in October 1970, but the mission was only a partial success. Zond 8 ended the lunar flyby program by making an unplanned ballistic reentry into the Indian Ocean after an attitude control sensor failed. The final L1 capsule (equipped for manned flight) was then launched unmanned as Cosmos 382 in December 1970, successfully testing the Block-D stage in Earth orbit (Clark, 1997).

## Preparing For The First Manned Lunar Landing

As the L1 program was winding down in early 1969, the focus shifted to the N1 program. The first flight-ready N1 carrier rocket had been installed on the newly constructed launch pad as early as 7 May 1968, but had to be returned for repair when cracks (possibly caused during installation of the payload) were found in the first stage. It was rolled out again in the mid-January 1969 after a brief test period on the pad in November 1968 (Lebedev, 1992).

The N1 rocket's path had been a long and difficult one. Mishin had to wait until 4 February 1967 for the government to commit significant resources to the project. A new resolution ('About the course of work in the creation of the UR-500K-L1') specified test flights in September 1967 and a first manned lunar landing in 1968. The latter was upgraded to 'an objective of national significance', and initial assembly of the first N1 boosters were started at the Baikonur Cosmodrome in late February (Harvey, 1996). Work on two launch pads 500 meters apart was also completed, and in November an N1 mockup was placed on

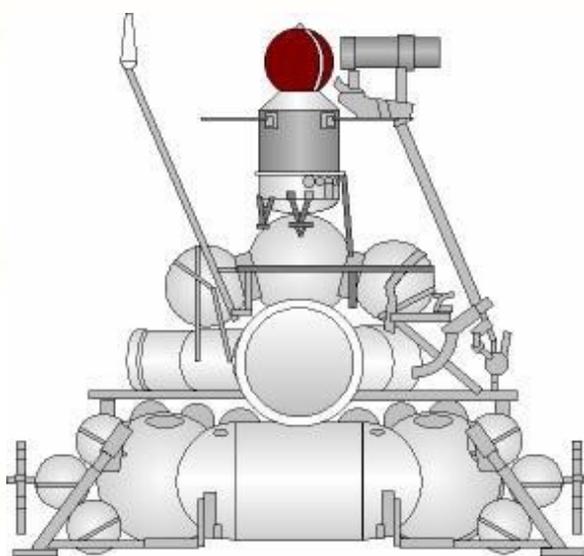
pad 1 for three weeks of tests, checks & ground crew training. It was returned to the assembly building in mid-December (Lebedev, 1992).

In March 1968, the cosmonauts started training in preparation for a Moon landing at Star City, Moscow. A moonwalk simulator was installed in the gymnasium, and the cosmonauts practised lunar landings with a modified version of the Mi-8 helicopter (Pirard, 1993). But they still had no L3 spacecraft to fly a year later - the constant Soyuz and L1 troubles in 1967-68 apparently had prevented the Soviet engineers from devoting their attention to the manned lunar-landing spacecraft. Consequently it was decided on 1 January 1969 to test the N1 by launching an unmanned L1 craft, to perform high-resolution photography of potential landing sites from lunar orbit. The L3 spacecraft (LOK and LK) would be tested later, for a first landing in 1970-71. The first lunar-landing mission would be commanded by the Voskhod 2 veteran, Alexei Leonov, with Oleg Makarov serving as the LOK pilot in lunar orbit.

## New Objectives

Although the Soviets were still hoping that an unplanned setback might delay the Apollo program long enough to permit a Soviet cosmonaut to get to the Moon first, they were forced to prepare for the worst after Apollo 8. The Babakin bureau had completed work on the new third generation Ye Luna series (the older E-6 probes had performed three missions after Luna 10 in 1966, and Luna 14 had mapped potential landing sites in 1968). To guard against the (increasingly likely-) possibility of further failures in the manned program, the government accepted Babakin's proposal from early 1967 to prepare an unmanned sample return probe (Hendrickx, 1997). This would recover a few grams of lunar soil and return it to the USSR before the first American landing. This probe was called Ye-8-5 and used the same lunar descent propulsion module as the other Ye probes, but replaced the rover with an Earth return vehicle plus soil sample capsule (Hendrickx, 1995). Design work on the "standard" Ye-8 was finished in late 1967.

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



Ye-8-5

The man-in-space program also got a new fallback option when Chelomei's Almaz military space station was confirmed. Chelomei had also developed a large cargo spacecraft called TKS using elements from the old LK-1 program, and we also know that he proposed a manned Mars flyby using an UR-700 heavy-lift rocket with a new nuclear upper stage (the LK-700 lunar landing project had been cancelled a year earlier). Mishin also was proposing a similar manned flight to Mars for the early 1990s (Clark, 1992). The MK-900 Mars mission finally died in 1971 but the Almaz/TKS program was eventually merged with the Soyuz program in 1970, becoming the civilian 'DOS-1' Salyut space station that dominated the Soviet space scene well into the mid-1980s.

The next two manned Soyuz flights would practise spacewalks and dockings, finally achieving the goals of the failed Soyuz 1/2 mission almost two years earlier. Soyuz 4 was the first to go, launched on 14 January 1969 with Vladimir Shalotov on board. On the 15th, Soyuz 5 carrying three more cosmonauts (Boris Volynov, Yevgeni Khrunov and Alexei Yeliseyev) joined Shalotov in Earth orbit. Following docking, Khrunov and Yeliseyev tested the new moonsuits by performing a spacewalk to Soyuz 4. The Soviets claimed the Soyuz 4/5 linkup represented 'the world's first space station' and denied they had plans to go to the Moon at the moment (Harvey, 1996).

# 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.

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

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

### CROCK

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

Contact: Tony Betts

Email: [y2ksoftware@btinternet.com](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

Tel: 01473 649454

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

Web site: [www.spackington.com/](http://www.spackington.com/)

### HART

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

Contact: Peter Barrett

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

Tel: 01708 458463 or 07866 314371  
(mobile)

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

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

## MARS

Tel: 0141 8842008

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)

Web site: [www.angelfire.com/on/DATSCOPE/nwr.html](http://www.angelfire.com/on/DATSCOPE/nwr.html)

## NSRG

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

Contact: Darren J Longhorn

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

## SARA

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

Contact: Paul Timoney

Email: [sarauk@rocket-science.co.uk](mailto:sarauk@rocket-science.co.uk)

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

## 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

Contact: Mike Williams  
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.  
*See [page 2](#) for contact details.*

## 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)

## WRS

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

Contact: Martin Sweeney  
Tel: 0151 335 5415  
Email: [WRS@i12.com](mailto:WRS@i12.com)  
Web site: [www.WRS.i12.com/](http://www.WRS.i12.com/)

## UKRA Regional Rocketry Contacts

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

## Ayrshire

Contact: Bobby Wark  
Email: [bob@scotroc.force9.co.uk](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)

## Worcestershire

Contact: Mark Perman  
Email: [liz.mark@virgin.net](mailto:liz.mark@virgin.net)