



AERONAUT

The Newsletter for the Association of
Experimental Rocketry of the Pacific

Tripoli Rocketry Association, Inc.
Prefecture No. 23

January 1992

Vol. 4 No. 1

CHANGES ON AERO-PAC BOARD OF DIRECTORS

During the past launch season, several changes were made to the AERO-PAC Board of Directors. The changes were necessary due to other obligations of the elected members. The available positions have been filled by appointment. The terms of these appointees will be the current two-year term which ends in 1992, with an election of new officers to take place in 1993.

Filling the position of Second Commissioner will be **Pius Morozumi**, who is a pediatrician at Santa Teresa Hospital in San Jose. His training in public contact and his organizational skills will be useful in planning future events and meetings for AERO-PAC.

Ron Devine, of Castro Valley, will be our new Launch Director for the 1992 season. Ron has already demonstrated his willingness to help with launch resources, and he was instrumental in making the Black Rock III and Fireballs launches successful events.

Beginning in January, 1992, **Peggy Gearhart** will be AERO-PAC's new Treasurer/Purchasing Agent. Peggy brings to this position experience in the banking industry, where she currently holds a position as Business Development Officer. Peggy and Jim Gearhart, our Secretary/Editor, live in Fremont and were responsible for AERO-PAC's cost-free checking account being established at First Interstate Bank.

All three new board members are confirmed Tripoli rocketeers. Ron and Pius were confirmed this past summer at Black Rock III, and Peggy was confirmed at the Octoberfest launch in Lucerne. Please give these new members of the Board your support to make our coming year a success.

TIME TO RENEW AERO-PAC MEMBERSHIPS

It's that time of year again! AERO-PAC memberships expire at the end of January, so now is the time to renew. Continue to be a part of the club that offers you the best in advanced high-powered rocketry at the best rocket launching site in the country, Black Rock! We currently stand at a total of 43 members, and the dues from these renewals will help finance further improvements in our launch system and equipment. A membership application is included at the back of this issue. Mail completed applications and checks to the AERO-PAC Treasurer, Peggy Gearhart, 4806 Canvasback Common, Fremont, CA, 94555.

CLUB NEWS

Launch Equipment

Due in part to the success of our Black Rock III and Fireballs 001 launches, AERO-PAC has paid Dana Gass the \$750.00 originally committed to in 1991. This is the finest launch equipment available because of Dana's commitment to providing a highly reliable, rugged, and aesthetically pleasing set of equipment. A detailed technical report of the system will appear in a future issue of the *Aeronaut*.

Rocket Mail Fundraiser Project

The Rocket Mail Fundraiser, the first for AERO-PAC and Tripoli (as featured in the June 1991 issue of the *Tripolitan*), was a resounding success! The \$236.62 profit made from the sale of 68 covers did wonders for AERO-PAC's bank account. Jeff Boyle and other members of the fundraiser team deserve a round of applause for getting this project literally off the ground. Bill Lewis has discussed a second rocket mail launch to

commemorate the International Space Year in 1992, and Jeff has agreed to head the project.

The remaining covers from the May 1991 launch may be purchased for \$5.00 each plus \$1.00 postage and handling. Send your payment to the AERO-PAC Treasurer, Peggy Gearhart, 4806 Canvasback Common, Fremont, CA, 94555, or purchase a cover at one of the general membership meetings.

New AERO-PAC Members

Welcome to the following new members who joined since May, 1991:

Marvin Lord	Jim Schoenberg
Rod Howden	Daniel Boone
Walt Rosenberg	Jon Kelly
Mike Rosenberg	Tim Nicholls
Pius Morozumi	Wilma Nicholls
John Morozumi	John Queen

FINANCIAL STATEMENT

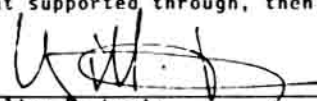
SUMMARY - SIX MONTHS ENDING 6-31-91

BALANCE	BROUGHT FORWARD -YEAR ENDING 1990	\$260.12	
JANUARY 1991	Credit- check printing from bank	\$ 7.08	
	Deposit- membership, 5 @ \$13, 2 Fam @ \$5,	\$ 79.00	
	1 Stability Tech report @ \$4		
	Balance January Statement	\$346.20	(1)
FEBRUARY 1991	Paid- Check 101 Jan. AERONAUT (J.Gearhart)	\$-22.75	
	Paid- Check 102 Gen. Bus. operating cost	\$- 58.73	
	(B. Lewis) last half 1990		
	Deposit- Memberships 2 @ \$13	\$ 26.00	
	Deposit- Memberships 4 @ \$13 + \$25 Launch	\$ 77.00	
	equipment donation (P. Krieger)		
	Balance- February Statement	\$367.72	(2)
MARCH 1991	Deposit-Memberships 4 @ \$13	\$52.00	
	Balance - March Statement	\$419.72	(3)
APRIL 1991	Paid check 105 March AERONAUT (J. Gearhart)	\$-23.31	
	Deposit- membership 1 @ \$13, 1 @ \$15	\$ 28.00	
	Balance -April Statement	\$424.91	(4)
MAY 1991	Paid- Check 104 oper. cost, 1st quarter 91	\$-26.81	
	(B. Lewis)		
	Deposit-Memberships @@ \$13, 1 @ \$15, 2 assoc.	\$ 76.00	
	@\$10, 1 B.R.II Patch @ \$5		
	Balance -May Statement	\$473.60	(5)
JUNE 1991	Paid-check 106 Porta Potties AERO.2 (T.Brown)	\$-65.00	
	Paid-check 107 AERO. 2 Patches (B. Kelly)	\$-294.07	
	Paid-Check 108 1990 Launch expenses(P.Hayton)	\$-68.93	
	Deposit-membership 2 @ \$13, Launch reg. fees	\$198.00	
	AERONAUT 2		
	Deposit-Rocket Mail Covers, AERONAUT 2 and	\$76.00	
	Black Rock II Patches		
	Balance -June Statement and first half 1991	\$319.60	(6)

NOTE:

- 1) Separate statements regarding detailed membership, detailed AERONAUT 2 Launch and Rocket Mail Cover Fundraiser-supplied to each Board of Director Member and posted in Financial Book.
- 2) This statement supported through, then Treasurer/Purchasing Agent Dave Cook.

SUBMITTED BY:


 William D. Lewis
 November 3, 1991

BLACK ROCK III - FUN IN THE SUN

by Bill Lewis

AERO-PAC's Black Rock III Launch was held on the weekend of July 20-21, 1991. With LDRS-X scheduled so close to this event, one would have expected a rather small turnout. Certainly, this would be a different type of event from last year's Black Rock II, where rockets were launched with giant N, O, and even P motors. No, this year's Black Rock wasn't big, but it wasn't small either. It was two days of near-perfect-weather rocketry: warm and sunny, with clear blue skies.

The launch was also an opportunity to launch rockets with "legal" motors that would soon be unapproved, since Tripoli was requiring that only tested and approved motors be utilized at all sanctioned launches after August 1, 1991 (since then modified). Judging from the potpourri of motors being announced at the LCO stand, several rocketeers took advantage of the opportunity. Frank Kosdon tested new propellant grains in reloadable motors, and Jerry Irvine of U.S. Rockets was observed handing out expendable motors for testing a new grain.

For the first time, AERO-PAC's new launch control system was fully in place. Tim Brown, Dana Gass, and Bill Breeding set up a "T" system on a ten-pad configuration. A tour of the

system was conducted and filmed by Kyle Shurge and will be made available as part of a future "Rocket Men" video. The launch system worked flawlessly throughout the weekend and many favorable remarks were heard.

The Sport Launch of the two-day event was the huge-scale Little Joe II rocket that Dave Bucher had prepared for this launch. This was the third Little Joe II that Dave had built. It stood approximately 6 feet tall and required separate chutes for the Apollo capsule and main body. The liftoff, under K power, was spectacular and realistic. Unfortunately, a stuck chute in the main body led to a spectacular crash. Knowing Dave, this rocket will be back, with an improved deployment system.

Although there was no optical altitude tracking available, several rocketeers took advantage of a new service being offered by Rick Loehr of Space Dynamics, namely the use of a calibrated electronic altimeter that could be launched aboard a rocket and used to transmit altitude data back to Rick's receiver and recorder on the ground. "Uncle Bob" Baker launched several L-motored vehicles in this manner and achieved altitudes in the 15,000 to 22,000 foot range.

Black Rock III Summary - 118 Flights

<u>Name</u>	<u>Rocket</u>	<u>Motor(s)</u>	<u>Comments</u>
Christopher Smith	Photon Disruptor	Aerotech E25-7	sport
Stan Cooke	LOC Caliber	Kosdon TRM J300-12	transmitter from LOC
Tim Collins	USR 265 Super	USR K500-12 FS	Space Dynamics altimeter
Christopher Smith	LOC Starburst	(2) Aerotech G42-x	sport
David Cook	LOC Graduator	Aerotech H70-x	sport
Frank Kosdon	Frank's Express	Kosdon TRM G150-15	new bulkhead & delay test
Rod Howden	Dragon & His Tail	Aerotech F80-10	sport
Tim Collins	Condom 1	Space Dynamics H25-12	sport; nozzleless motor
Christopher Smith	Little Fart 29mm	Aerotech G125-10	sport
Bill Lewis	Eclipse 1	Aerotech G125-10	sport
William Joe	LOC Ultimate Max	(5) Aerotech I95-10 WL	sport
Christopher Smith	Little Fart 29mm	Aerotech G42-8	sport
Charlie Savoie	Spaceplane	Aerotech G55-10	sport
Rod Howden	Swarm Jr. (copy)	(12) Estes D12-7	sport
Charlie Savoie	Spaceplane	Aerotech G55-10	sport
Bill Dennett	ISP Mirage	Vulcan H100-12 SS	motor demo
Chuck Mund	Aerotech Initiator	Kosdon TRM G80-10	motor demo

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Black Rock III Flight Summary (continued)

<u>Name</u>	<u>Rocket</u>	<u>Motor(s)</u>	<u>Comments</u>
David Cook	LOC Graduator	USR G45-x	sport
Dana Gass	LOC Lil' Nuke	Aerotech H140-10	sport
Bob Baker	Starfinder	Kosdon TRM L1350-20	Sp. Dyn. telemetry alt. track
Perry Rozow	NCR Orion	Aerotech I95-10	sport
Ron Devine	LOC Onyx	Aerotech F25-4	sport
Jim Gearhart	Aerotech IQSY Tomahawk	Aerotech G40-10	sport
Gary Rosenfield	Aerotech Mustang	Aerotech RMS G64-10	R&D
David Bucher	Mega Sprint	Aerotech I65-12	sport
David Bucher	Nike-Cajun	ISP 38/240, G110, G42	sport scale model
Tim Brown	ISP Mirage	Vulcan G210-15	sport
David Cook	Aerotech Mustang	USR F20-4	sport
Paul Krieger	scratch	ISP I284-12, (4) H180-x	sport
Christopher Smith	Solstice	ISP RMS K1100-x, (6) FSI F100-10	sport
Tim Brown	LOC Onyx	F50-4	sport
Jim Gearhart	NCR Hypersonic 2300	Aerotech H45-10	sport
William Joe	Neutrino (scratch)	Vulcan F40-9 SS	sport
Bill Lewis	Eclipse I	Vulcan G200-13	sport
Jerry Irvine	?	USR H120-12 FS	demo
Tim Brown	LOC Mini Viper	(3) Aerotech H140-10	sport
Tim Brown	ISP Mirage	Vulcan H100-12	sport
Gary Rosenfield	Aerotech Mustang	Aerotech RMS G64-10	R&D
Denise Savoie	ISP Chaparral	ISP RMS H97	sport
Tim Brown	LOC EZ-I65	I220-10	sport
Ron Devine	NCR Phantom 1800	Aerotech G25-15	sport, altitude
Dana Gass	LOC Lil' Nuke	Aerotech H140-10	sport
Bill & Jason Breeding	Aerotech Initiator	Aerotech G40-10	sport
Jeff Boyle	LOC Minie-Magg	USR H90-8 FS	sport
Tim Brown	LOC Laser Loc 3.1	ISP J800-18	sport
Dana Gass	LOC Vulcanite	Vulcan I500-15	sport
Randall Redd	(No name)	Aerotech H70-10	sport
Jim Gearhart	NCR Phantom 4000HD	Vulcan H250-10	sport, altimeter watch
Paul Krieger	Chad-Roc	ISP K550-12, (4) H180-x	sport
Rod Howden	(No name)	ISP H180-M	sport
Tim Brown	Vulcanite H76	Vulcan I500-15	sport
Chuck Mund	Aerotech Initiator	Prop. Ind. G8-10	sport
Frank Kosdon	Frank's Pride	Kosdon I500-15	demo, R&D
Stan Cooke	Public Missiles AMRAAM	Kosdon J300-12	R&D
Gary Rosenfield	Aerotech Mustang	Aerotech RMS G64-10	R&D
Chuck Mund	Aerotech Initiator	H225-10 WL	R&D
Ron Devine	NCR Mini Spoil Sport	(2) Aerotech E25-7	sport
Denise Savoie	ISP Chaparral	ISP H128-M	sport
Charlie Savoie	ISP Mirage	Aerotech G40-10	sport
Tim Brown	Magnum (scratch)	Vulcan I500-7	sport
Tom Johnson	LOC Caliber ISP	(2) Aerotech G60-10	sport
Jeff Boyle	Pinocchio (scratch)	Aerotech J355-15	R&D
William Joe	Neutrino (scratch)	Vulcan F80-9 SS	sport
Bill Breeding	Aerotech Initiator	Aerotech G40-10	sport
Tim Brown	LOC Caliber ISP	(7) Vulcan G210-x	sport
Bill Breeding	LOC Laser Loc 2.1	ISP I161-L	sport

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Black Rock III Flight Summary (continued)

<u>Name</u>	<u>Rocket</u>	<u>Motor(s)</u>	<u>Comments</u>
Tom Johnson	Exper. Glass (scratch)	ISP K550-18	R&D
Charlie Savoie	ISP Mirage	Aerotech H128-M	sport
William Joe	Vanishing Act (scratch)	Aerotech I65-10	sport
Gary Rosenfield	Aerotech Mustang	Aerotech RMS G64-10	R&D
Jim Gearhart	USR Warp (modified)	Vulcan G200-10	sport
Pius Morozumi	Cotriss Ionosphere I32	Aerotech H65-x	confirmation - YES
Tim Brown	LOC Laser Loc 1.5	Vulcan I500-18 SS	demo
Paul Krieger	THOY Phoenix	ISP I284-10	sport
William Joe	One Shot (scratch)	(2) FSI F100, FSI F7-6	sport - no 2nd stage ignition
Rod Howden	LOC Graduator	Aerotech H70-10	confirmation - YES
Charlie Savoie	ISP Mirage	Aerotech G80-7	sport - tangled chute
Frank Kosdon	Aerotech Mustang	Kosdon G110	demo, R&D
Chuck Mund	Aerotech Initiator	ISP H97-M	R&D
Perry Rozon	NCR Orion	Aerotech I95-10	confirmation - YES
Dana Gass	LOC Caliber	ISP K550-L	sport - cato on pad
Stan Cooke	LOC Caliber	Synerjet H192-8	confirmation - YES
Jim Gearhart	LOC Onyx	Aerotech G40-10	sport
Ron Devine	NCR Mini Spoil Sport	(4) Aerotech E25-7	sport - partial ignition failure
Rod Howden	LOC Graduator	Aerotech RMS H97-10	sport
Paul Krieger	Mini Ultimate (modified)	(7) Aerotech G42-7	sport
Christopher Smith	SGR 38mm	USR I880-16	R&D, cato @ 100 ft altitude
Jim Gearhart	Aerotech IQSY Tomahawk	Aerotech F50-9	sport
Pius Morozumi	Cotriss Ionosphere I32	USR I70-6	sport
David Pacheco	LOC Vulcanite	USR H97-8	sport - burned on pad
William Joe	Black Arrow (scratch)	Aerotech J125-15	sport
Tom Johnson	LOC Caliber ISP	(2) Vulcan G80-10	sport
David Cook	Estes Mean Machine	Estes D12-0/D12-7	sport
Bill Breeding	LOC Laser Loc 2.1	ISP I284-9	sport
Paul Krieger	ISP Nostromo	ISP H180-10	sport
Gary Rosenfield	Aerotech Mustang	Aerotech RMS G64-10	R&D
David Bucher	Stubby (scratch)	Vulcan G200-5	sport
Bill Dennett	ETO (scratch)	Vulcan G210-10	demo
Charlie Savoie	ISP Mirage	Aerotech H140-10	sport
Jeff Boyle	LOC Minie-Magg	Aerotech H125-15	sport
Tom Johnson	LOC Vulcanite	Aerotech H45-10	sport
David Cook	FSI Excalibur II	Aerotech E25-7	sport
Bill Breeding	LOC Vulcanite	ISP I284-9	sport
David Bucher	Estes Saturn 1B	Aerotech G42-10	sport
Daniel Gada	Public Missiles AMRAAM	Synerjet H192-6	sport - altimeter on board
Christopher Smith	LOC Starburst	(2) Aerotech G42-8	sport - altimeter watch
Randall Redd	Terror Tank (scratch)	Aerotech H65-2	sport, experimental
Bob Baker	Starfinder (scratch)	Kosdon L1350-20	altitude - altimeter on board
Tom Johnson	LOC Vulcanite	Aerotech H45-10	sport
Tim Brown	ISP Mirage	Vulcan H100-12	demo motor
Pius Morozumi	Aerotech Initiator	ISP RMS G104-6	demo - smoke charge
Bill Breeding	LOC Laser Loc 1.5	ISP I284-9	sport
David Bucher	Little Joe II	Aerotech K900-8	sport - large scale model
Dana Gass	LOC Vulcanite	Vulcan I160-12	sport
Charlie Savoie	ISP Mirage	ISP H128-M	sport
Paul Krieger	LOC Vulcanite	Vulcan I160-12	sport
Ron Devine	NCR Patriot	Aerotech RMS H97-9	confirmation - YES

RESEARCHING INFORMATION ON ROCKETRY SUBJECTS

by Bill Lewis

The following two sets of reviews are the result of some of my research activities. In the future, as part of Tripoli's Education Committee, it is my intention to have this type of data made generally available as reference material, to aid all rocketeers in finding the information they require for the development of their current projects.

Book Reviews

Over the years I have purchased books on various rocketry subjects through "normal" channels, i.e. available from major publishing companies. Recently, however, I have acquired two books through advertisements in the back of such publications as *Final Frontier*, *Popular Science*, and *Modern Electronics*. I am sure that AERO-PAC members and other readers of this newsletter have seen some of these ads, but either did not want to risk the money or time, or were skeptical about the value of these publications. Others may be simply unaware of the existence of these items. The following reviews reflect my opinions and findings on two recent acquisitions.

1) *Solid Propellant Rocket Systems*

by Rene Sabatini, Spacelab, 1991

\$7.95 from Spacelab, P.O. Box 16 Stn Z, Toronto, Ontario, Canada M5N 2Z3

This publication is, in my opinion, a very good basis for learning rocketry from a conceptual and scientific perspective. Subjects covered are:

- Principles of solid-propellant rocket propulsion (thrust, impulse, exhaust velocity);
- Solid propellants (parameters governing propellant selection, classification of solid propellants, combustion of propellants);
- Grain geometry (design parameters, propellant failures attributable to grain aging);
- Rocket structure (combustion chamber case, inhibitors and insulated case liners, nozzles);
- Ignition (very basic information);
- Appendix A - Rocket formula symbols;
- Appendix B - Solid propellant rocket design formulas; and
- Bibliography (unfortunately with many references from the 1950's and 1960's).

Well written, each topic is adequately illustrated to convey the concept, then the mathematical expressions are developed to help the novice develop full appreciation. The expressions are applicable to experimental rocketeers

and a wide range of interests, from learning about how high and far a rocket will theoretically travel, to more in-depth subjects such as building one's own solid propellant motor, based on the formulas presented. This guidebook is well worth the cost. For a current price, send a SASE to the address listed above or check the latest issue of *Final Frontier* (under rocketry) or similar publications.

2) *Rockets' Red Glare* "The Ultimate Rocketry Manual" by John J. Williams, MSEE 1989

\$19.95 from Consumertronics - "Top Secret", 2011 Crescent Drive, P.O. Drawer 537, Alamogordo, New Mexico 88310

Written by a former naval weapons engineer, who also worked as a test engineer at the legendary rocket sled test track, this interesting publication contains information and illustrations on many subjects of rocketry. Its diversity includes a good section on safety warnings, explanations on total impulse, pressure & thrust vs. time curves, how to make your own ammonium perchlorate generator, launch pads, launch station controls, motor test station, warheads, fuse cords & igniters, and more detailed information on propellant formulations.

Overall, I found this publication touching on many emotions - sometimes funny, witty, and fun reading, while other times scary, complex, and the best written information on solid propellant mixing for amateurs found anywhere. For example:

"With time, I advanced to more sophisticated rocketry. At one time, I made my own rocket propellants from potassium nitrate (two cups) and a handful of finely cut-up aluminum foil, mixed with just enough hot asphalt (winter) and light oil (to lower viscosity) or melted brown sugar (summer) to make it castable. We had one mixture blow up on us! But wow! Zowie! What fantastic rockets we made! We bazookaed junked cars, logs floating down rivers, and packs of wild, feral dogs. There is absolutely nothing quite comparable to it! Them were the days!"

This is a hands-on book, written for experimental rocketeers with a flare for the "survivalist". It contains very little mathematics, but manages to inform the readers, through easy-to-read verbiage, how things work chemically and physically. A different approach and fun to read, it is probably (or will become) the most read "underground" rocket manual since Brinley's *Rocket Manual for Amateurs* was released in the early 1960's (for those of us who remember that far back).

Technical Reports of Interest

We live in the Information Age, where we are deluged with information about many subjects and from many viewpoints. In order to cut through this bombardment, many technological companies use information networks such as INFOGATE as a means of overcoming this obstacle. These networks take information, categorize it, then produce abstracts that can be accessed interactively on a computer by subject. The actual report, article, or written briefing can then be ordered for a nominal fee. NASA gives out similar information in the *NASA Tech Briefs* magazine, and will also supply the "Tech Brief Abstract" or "Technical Support Package" to qualified readers. Information that I recently discovered in this manner include the following technical reports:

- 1) "A Computer Code for Aerodynamic Analysis of Sounding Rockets at Supersonic Speeds"
by Naren Vira, Howard University
International Journal of Computer Applications in Technology, Vol. 4, No. 1, 1991

This article presents a practical and low-cost method of computing the aerodynamic characteristics of sounding rockets and other similar vehicles such as guided missiles and projectiles in supersonic flight. The results presented in this work reflect many of the additions, modifications, and refinements made to the Theoretical Aerodynamic Derivatives (TAD) computer program originally developed at the NASA Goddard Space Flight Center.

- 2) "Drag-Law Effects in the Goddard Problem"
by P. Tsiotras and H. J. Kelley

The problem of maximizing the altitude of a rocket in vertical flight in a resistive medium (air), when the amount of propellant is known, has classically been defined as the Goddard problem. In this paper, the case is studied in which the drag coefficient is a function of the Mach number, exhibiting a sharp increase in the transonic region. It is shown that a more complex "switching structure" for controlling the thrust is required than the classical full-singular-coast sequence. Specifically, an intermediate full-thrust subarc is required in the transition through the transonic region.

- 3) "Electromagnetically Launched Microspacecraft for Space Science Missions"
by Rose M. Jones, Jet Propulsion Laboratory
AIAA Journal of Spacecraft, Vol. 26, No. 5, Sept.-Oct., 1989

This article presents the concept of using very small spacecraft, launched by an electromagnetic launcher located in low earth orbit, to perform space science missions. Other uses and resources such as the Strategic Defense Initiative (SDI) are examined.

- 4) "Semiautomatic Design of Zonal Computation Grids"
by Alison E. Andrews
NASA Tech Briefs ARC-12322, NASA Ames Research Center

This paper examines methods of using flow-field zoning in three-dimensional grid generation problems in computational fluid dynamics (CFD). It is intended to provide a future capability for automating the three-dimensional aspects of this method in a manner similar to EZ Grid, a two-dimensional flow-field zoning demonstration system currently in use. The EZ Grid system was developed at Stanford University and contains over 400 rules which enable it to generate the necessary zonal boundary curves for representing two-dimensional aerodynamic configurations. Approximately three man-years were spent on the development of the two-dimensional grid generator.

- 5) "Low Cost Quadrature Signal Resolver"
by Jeff Legg and Larry Phelps, Univ. of Florida
Review of Scientific Instruments, American Inst. of Physics, Vol. 62, No. 6, June, 1991

This paper (with a workable schematic) details an inexpensive embedded controller, the Intel 8751, for use as a flexible quadrature signal resolver. These signals can be generated in the lab by a variety of schemes that provide position and direction of motion, including linear scales, stepper motor controllers, and laser interferometry. For rocketry applications, the ability of the resolver to perform duplex serial communication could be used for intelligent user interfaces or rapid data transfer between the controller and other devices. Another application would be to use the controller's internal timing abilities and the appropriate measurement inputs to calculate a rocket's velocity and acceleration.

AERONAUT 2 - SNOW AND COLD WEATHER ROCKETRY

by Bill Lewis

On May 18-19, 1991, rocketeers from northern and southern California, Nevada, Utah, and Washington braved cold, windy, and cloud covered skies in anticipation of getting in a launch at Black Rock before the launches of summer - Black Rock III, LDRS-X, and (Fire)Balls. Although the launch did not materialize into the event planned, several interesting developments did take place, including AERO-PAC's and Tripoli's first rocket mail cover launch, the "unveiling" of AERO-PAC's new launch control system, and some interesting gossip and discussions on rocketry at Bruno's bar and diner while waiting for the weather to clear.

On my way to the Black Rock Desert, as I approached the pass near Donner Lake, made famous by those hearty immigrants about 130 years ago, my thoughts wandered to the pioneer of rocketry, Robert Goddard. Forever embedded in my mind is a vision of that contraption, the first liquid-fueled rocket, and Dr. Goddard standing in the snow, wearing an overcoat, gloves, and boots; well bundled up for this launch in 1903. Did a similar fate await us on this journey back to Black Rock?

I was traveling with Phil Hayton, who was driving. Phil kept saying as we traveled further east, "Things don't look good. . . things don't look good." I answered optimistically, "Well, maybe all the snow got dumped on the Sierras." I thought back again, remembering the phone call from Tim Brown the night before, telling me that he had called the National Weather Service and they were predicting snow flurries in and around Reno and the northwest desert areas. Tim also stated "I have called the Weather Service before every launch I have attended, and they have never been wrong; they are predicting snow flurries." Things did not look good. The Weather Service was right again.

Now, Jeff Boyle is a dedicated AERO-PAC rocketeer. By now, I figured, Jeff was well bundled up and just sipping some coffee or soup at Bruno's, keeping warm, just waiting to haul the portable toilets out to the campsite. Jeff was also responsible for the rocket mail covers and the first rocket mail flight, honoring both the first anniversary of AERO-PAC's first launch and the 30th anniversary of the flight of the first American in space, Alan Shepard. This was a lot of responsibility, but I figured that Jeff, being from Grass Valley, was used to this kind of adverse weather. Little did I know that Jeff had decided to take the first turnout onto the "dry" lakebed that afternoon. Well, needless to say, Jeff and his

traveling companion, Tom Johnson, got his Jeep and the portable toilets stuck in mud up to the wheel wells!

Phil, a few other brave rocketeers, and I spent that night on the desert, at our "traditional" campground. I didn't realize what had taken place until I saw several people removing the portable toilets trailer from its well-entrenched position. My mind flashed humorously to the next *Tripolitan* cover, with Jeff and Tom standing there full of mud with the caption, "AERO-PAC dedicated new facilities at Black Rock," a little humor that Jeff and Tom could laugh at now, but certainly would not have found amusing at the time.

We all gathered back at Bruno's for a meeting. I bravely declared, "A launch will take place, even if it is to just launch the rocket mail covers." We caravanned out to a launch site about two miles from the third turnoff. Tim Brown and Dana Gass set up the new launch console and a small set of launch pads. Dana's impressive handiwork on the console was evident by the engraving, sealed switches, and oiled wood paneling.

The launch proceeded despite heavy winds. Every once in awhile, the wind would die down and a rocket would be launched. These were limited to H power and below. Dave Bucher brought out a whole set of heavy-nosed rockets, and nothing seemed to stop Dana Gass from firing a few. Even a few confirmation flights were initiated. As stated in the *Tripolitan*, Jeff did launch AERO-PAC's and Tripoli's first rocket mail flight. Jeff decided, or was talked into, launching his Magnum with an H motor because of the high winds. Although this seemed prudent at liftoff, the failure of the chute to deploy caused an impact on the desert floor, scattering rocket parts and wadding, which many people at first thought were the rocket mail covers. It turned out that the covers were thrown free and did survive the crash. Jeff and Tom then gathered up the parts, headed into Gerlach to get the covers canceled and made official by space memorabilia standards.

The rest of us brave souls gathered around for a group photo, then packed up and headed home. No, it was not a real launch by certain standards, but I still have this vision of Robert Goddard standing there in the snow. I will always remember the brave rocketeers who survived this launch despite the many setbacks that would have sent other, less adventurous, rocketeers home.

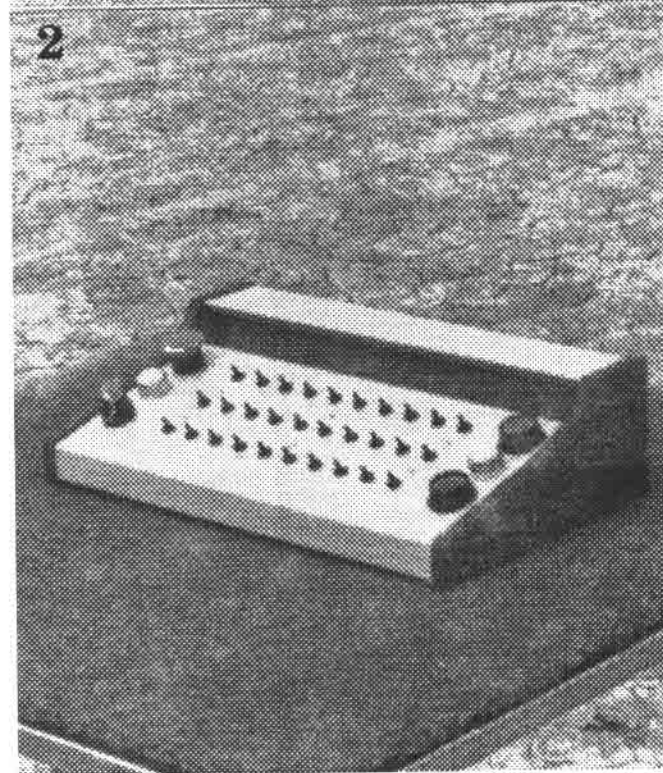


(1) Small group of cold and brave rocketeers arrive on Saturday for launch. Gentlemen with Cadillac and trailer, drove over three snow-bound passes from Washington to come to Black Rock. (2) The new AERO-PAC Launch Control Terminal. Built by Dana Gass and Bill Breeding of Sacramento, CA. Dana and Bill went all out on this system with high reliability & weather-proofing protected hardware. System is capable of controlling 30 launch pads. (3) AERO-PAC Launch Director, Tim Brown, (right) and Dana Gass string cable for launch. (4) Dana Gass sets up pad as Jeff Boyle makes an evaluation for Magnum, Rocket Mail Launch. (5) From Washington with Aerotech Initiator that he confirmed with (signed off by none other than Charles Rogers).

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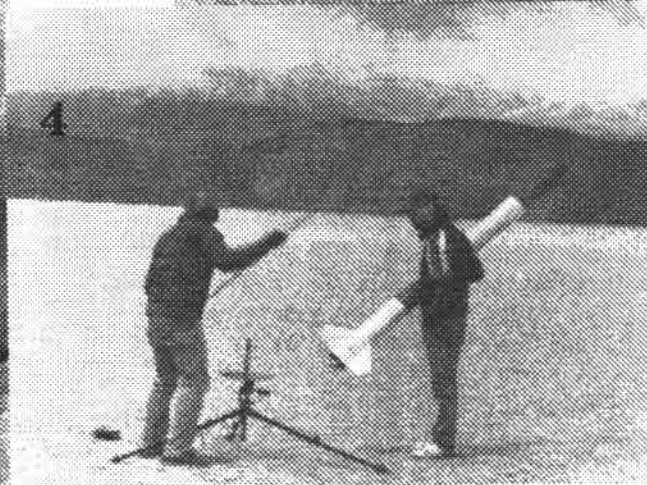
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Photos by
Bill Lewis

Scanning &
Layout by
Ron Devine

4



6



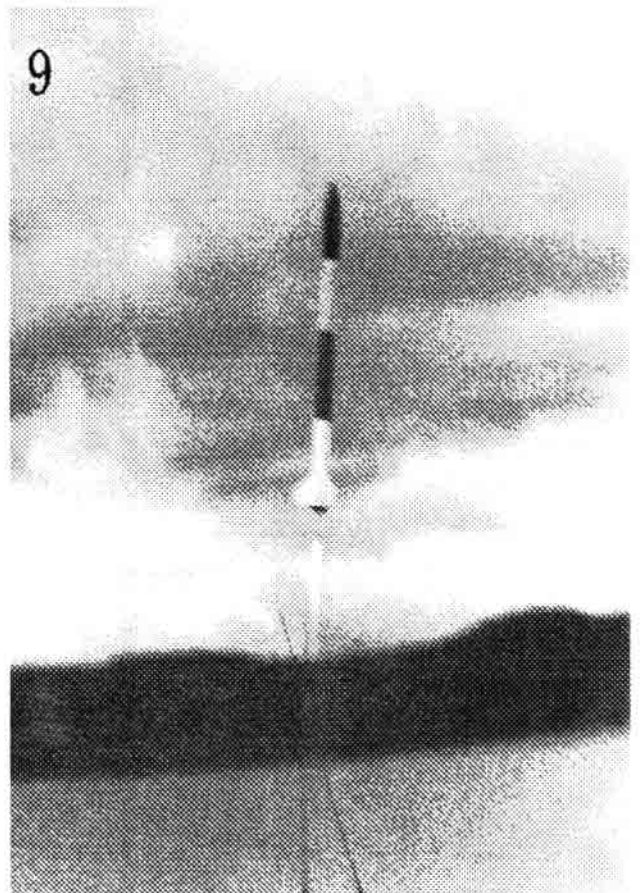
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(6) Tripoli President, Chuck Rogers and AERO-PAC 2nd Commissioner, Dave Bucher. Dave did not launch the upscale Trident, but did send a few "small" rockets skywards. (7) Jeff Boyle, of Grass Valley, CA. (left) and Tom Johnson of Napa, CA, set up Rocket Mail. (8) Jeff and Tom "Release" rocket for windy takeoff. (9) Rocket Mail Magnum lifts off on substituted H power (J power was originally planned).

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(10) Ill fated H powered Magnum lies scattered on the desert floor. Rocket Mail Covers were miraculously thrown clear (in brown double wrapped bag). (11) Phil Hayton, snagged one of Dana Gass's rockets. Rocket was "snaking" along the desert floor being pulled along by the parachute.(note drag marks) (12) Group of bravest, coldest rocketeers in the west.

1992 LAUNCH & EVENT CALENDAR

January 19	General Assembly Meeting at Round Table Pizza in Sacramento, CA (12 noon)
January 31 - February 2	Winterfest Launch (Lucerne Dry Lake)
February 23	Board of Directors Meeting at Pius Morozumi's house in Morgan Hill, CA (10 AM)
March 29	General Assembly Meeting at De Anza College in Cupertino, CA (12 noon)
March 31	Deadline for submissions to April issue of <i>Aeronaut</i>
April 15	Publication date for <i>Aeronaut</i>
May 16-17	Aeronaut-3 Launch (tentatively scheduled for Black Rock Desert)
June 12-14	USXRL Summerfest Launch (Lucerne Dry Lake)
June 30	Deadline for submissions to July issue of <i>Aeronaut</i>
July 11-12	Black Rock IV Launch (Black Rock Desert, obviously...)
July 15	Publication date for <i>Aeronaut</i>
August 13-16	LDRS-XI Tripoli National Launch (Black Rock Desert)
August 17	Fireballs 002 unsanctioned experimental launch (Black Rock Desert)
September 30	Deadline for submissions to October issue of <i>Aeronaut</i>
October 15	Publication date for <i>Aeronaut</i>
December 31	Deadline for submissions to January issue of <i>Aeronaut</i>



Association of Experimental Rocketry of the Pacific
469 Heatherbray Ct. San Jose, CA 95136

PROJECT REPORTS

Static Test Stand

by Bill Lewis

I am developing a static test stand to be utilized in rocket motor design and evaluation programs for AERO-PAC and Tripoli. The test stand will be developed independently, and as such will be owned by the builder/designer. It will be consigned to AERO-PAC for motor development and evaluations.

Two components of the system have been procured for the test stand at this time. These items are the load cell and the front-end processor interface board. The load cell, which is a BLH Electronics CZM1 compression-type cell, has a 100 to 5000-pound capacity, and has already been encased in a holder/adaptor that will be further developed to preload the test stand under operational conditions.

The front-end processor will consist of a Pro-Log 7805 8085A processor board that will be used as a front-end to record and transfer data between the (yet to be developed) analog-to-digital converter board and a standard RS232 serial interface on an IBM-compatible computer, using the buffered 16-pin DIP serial bus interface to the 8085A processor. The 7805 contains sockets for two 8 x 2 kilobyte RAM chips (4096 bytes) and four 8 x 2 kilobyte ROM chips (8192 bytes), with memory mapping control that will be used to control and record before buffering the output to the serial port, while the 8085A is under control of the PC.

Additional work includes the power supply, remote start and record signaling, and other "box" electronics, as well as some more hardware construction for the stand. Software will also have to be developed to allow control and interfacing between the PC and the 7805 board, as well as EPROM program(s) - (I have access to a "burner").

To any individual that would like to contribute time and effort in order to move this project along, I am most interested in hearing from you!

HAMMER - V1

High Altitude Min-Max Engineering Research Vehicle 1

by Bill and Dean Lewis

HAMMER-V1 is intended to be a minimum-diameter/optimum-weight amateur world class altitude rocket. It is being designed to reach an altitude of between 18,000 and 22,000 feet as a single-stage vehicle. With this rocket, the builders hope to move into the top ten of "substantiated" tracked altitude rockets, as recorded by the *Rocket Newsletter*.

The vehicle will use a Vulcan L750 motor with Smokey Sam propellant, which has a moonburner grain and is 2.06" diameter by 34" long, with a burn time of 5.14 seconds. (The U.S./Tripoli motor designation is 5.1 KS 170). This motor has been used by others to climb into the top ten in the past, including Tim Brown's 65" long by 2.3" diameter rocket launched to an altitude of 3.08 miles in 1989, and Bruce Kelly's 58" by 2.3" bird which reached 3.37 miles, also in 1989. The built-in delay element will be plugged and replaced with a redundant electronic timer, for optimum ejection at peak altitude.

Before flight, the following engineering calculations will be performed: design for optimum weight (expected to be approximately nine pounds), static and dynamic stability profiles, and fin/airframe stress and vibration dynamics to determine stress concentrations and vehicle tuning.

Several electronic payloads are being considered to monitor and report performance. The selection of payloads will be constrained in order to meet the optimum weight condition.

AERONAUT

Editor: James W. Gearhart
4806 Canvasback Common
Fremont, CA 94555
(510) 713-9254

Contributors: Ron Devine, Peggy Gearhart, Bill Lewis