SPECTRA

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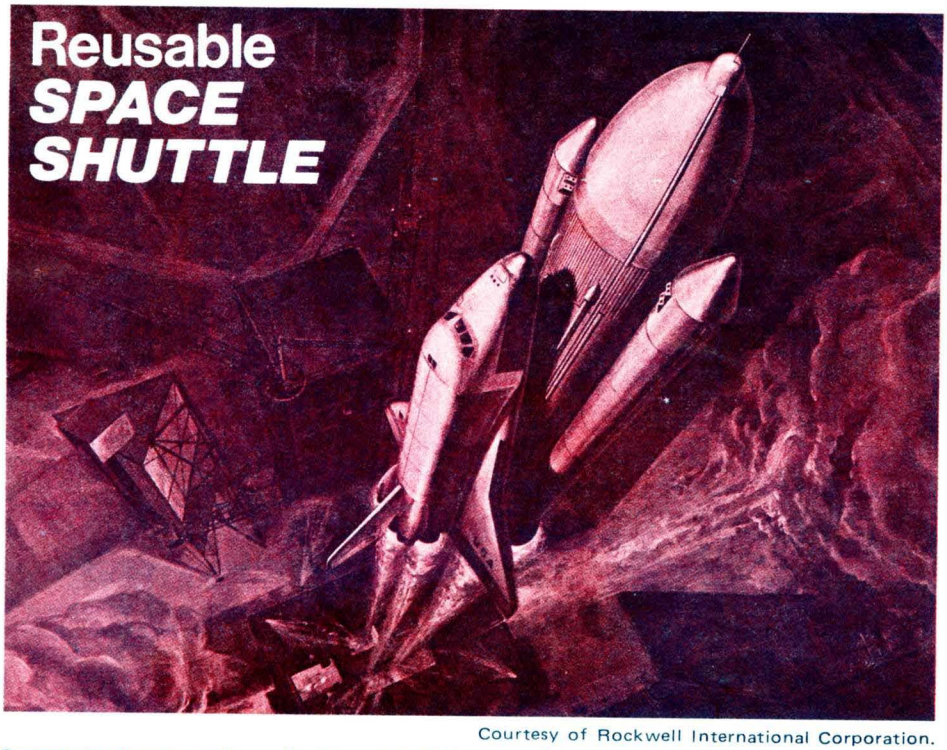
OFFICIAL NEWSLETTER OF THE ESTES AEROSPACE CLUB

Reusable SPACE SHUTTLE



Courtesy of Rockwell International Corporation.

Spectacular launch of Space Shuttle, with Orbiter and booster engines all firing, is visualized by Rockwell International artist. Twin boosters flank the Orbiter's huge external fuel tank.

If you think our space program is rapidly going out of style, you are wrong. And if you believe that after the spectacular successes of Apollo and Skylab, U.S. space flights will henceforth be limited to unmanned activities, you are wrong again.

Starting in 1979, a new concept in the U.S. space program should drastically reduce the cost of space operations. For the following 12 years, from special launch sites at Cape Canaveral's Kennedy Space Center and Vandenberg AFB in California, manned reusable spacecraft will be rocketed into earth orbit.

During that period, some 725 launches, averaging about one a week, are expected. Bus-size payloads weighing up to 65,000 pounds-including weather, communication, earth-resource, military, pollution-control, scientific, and navigation equipment—can be carried into orbit by the Space-Shuttle craft now being developed for NASA by Rockwell International. If the payload is an unmanned satellite, the shuttle will return at once. If manned experiments are involved, the four-man flight crew and up to six passengers may stay in orbit up to a month. The 83-ton, delta-winged vehicle is designed to survive scorching reentries through the atmosphere, landing like an airplane on a runway.

After landing, Shuttle craft will quickly be readied for another mission. Each vehicle can be orbited 100 or more times. This reusable aspect of the Shuttle program lowers the cost per flight to $10.5 million. Orbital transportation cost for each pound of orbital payload will be about $160, compared to $500-$1000 with conventional expendable rockets.

The Space-Shuttle program will include three basic types of missions for government agencies and universities, foreign countries, and commercial organizations:

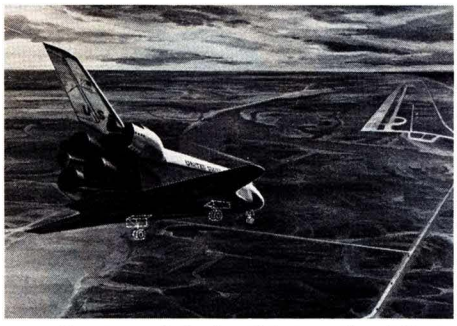
- Manned scientific or earth-related application missions using a modularized spacelab that remains with the Orbiter.
- Transporting unmanned or man-tended spacecraft to low orbit, revisiting them for modifications.
- Tug missions for higher orbits and unmanned lunar and planetary missions. The tug, an extra-propulsion unit, will be carried with the payload in the Shuttle's cargo bay.

Courtesy of Rockwell International Corp.

Shuttle puts payloads in orbit 115 miles up—like earth-survey satellite, on manipulator arm, above.

Prior to launch, the payload will be loaded in the cavernous cargo bay in the center of the Orbiter's body.

(Continued on page 2)



Courtesy of Rockwell International Corp.

Safely past reentry, pilot heads for a more-than-200-mph touchdown on runway, and lowers wheels (dotted lines) just before reaching it.

The Orbiter is a DC-9-size, airplane-like vehicle with a 78-foot double-delta wingspan. The payload bay accommodates loads up to 60 feet long and 15 feet in diameter.

The Orbiter has three 375,000-pound-thrust Rocketdyne engines, but the liquid-hydrogen/liquid-oxygen they consume is not stored in the vehicle. Instead, propellants are carried in a huge external tank—27 feet in diameter and 155 feet long. The Orbiter rides this tank piggyback into space, until, just before orbital altitude, the tank is jettisoned. Also, for the first stage of the launch, two solid-fuel rocket boosters of 2-1/2-million pounds thrust each are side-strapped to the Orbiter's fuel tank.

Early in 1977, the first phase of a flight-test program is slated to begin at Edwards AFB, Calif. An Orbiter will be carried piggyback on a 747 aircraft to the cruising altitude of conventional airliners. The carrier will then begin a shallow dive while the Orbiter nose is raised with a hydraulic jack. This will enable the Orbiter upon release to glide off the back of its mother craft. These tests will be flown by two-man flight crews, equipped with traditional ejection seats.

A second test phase from NASA's John F. Kennedy Space Center should begin in late 1978. Two-man crews will ride a Shuttle into low earth orbit. Then two Orbiters will be refurbished for operational use and the final phase of the Shuttle program will be underway.

Reprinted courtesy of Popular Science, ©1974 Times Mirror Magazines, Inc., November 1974 issue from their article, "Reusable SPACE SHUTTLE..our biggest bargain in out-of-this-world research," by Wernher vonBraun.

Comments from EAC Advisory Board No. 1

The response from EAC Advisory Board No. 1 was excellent. We received many complimentary reactions like those listed below for the "new" Land Rockets. In addition, we also received a number of very helpful comments, constructive criticisms, and suggested improvements which we are currently evaluating. With the assistance of the EAC Advisory Board we will be able to continue to bring you the best performing, highest quality product possible.

Dear Sir,

First I would like to thank you for selecting me for the EAC Advisory Board to try to test the ESTES LAND RACER KIT. At first my impression was—"Oh boy, a little kid's car!" But I was wrong. This car can be enjoyed by anyone. Though I recommend that kids be the main user. I am 16 years old — 7 years in model rocketry and this is the best item Estes has come out with since the SCISSOR—WING TRANSPORT.....

We tested it out like you asked us to, and we think it's super! Now let's see if Estes can come out with ROCKET POWERED BOATS.

Again thank you for selecting me for the EAC Advisory Board. It was a lot of fun working with the car. Thanks again.

Sincerely,
Alan Dalfonso
Henrietia, NY

Dear Sir,

I am very pleased, to have been chosen to serve on the EAC Advisory Board.

I think that the "Estes Land Rocket Race Kit", is a very good idea. It opens up many different aspects of model rocketry that I never knew existed.

Relating back to the race kit, ("Screamin Eagle") I think the design is very good. I love the idea of foam rubber tires, because they help absorb shocks from bumps on the sidewalks, rocks, etc....

Thank you very much.

Carlisle Dewitt
Expert Rocketeer
Savannah, GA

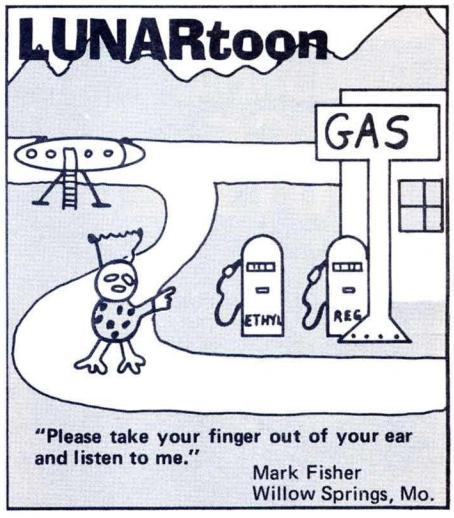
Dear Sir,

I enjoyed building the Estes Land Rocket very much. After I finished it, I ran it many times and invited some friends to watch. The parachute worked every time and was very dependable. This is a great idea because it lets you run the car in a short space if necessary. ....Thank you very much for letting me build and report on this model. I think it is great!

Very truly yours,
George Akers
Montgomery, AL

OHIO ROCKETEER WINS NEWSLETTER NAME CONTEST

Congratulations to Jack Greb of Macedonia, Ohio for winning our EAC Newsletter Name Contest. Jack will receive a $50.00 merchandise certificate for naming our EAC Newsletter, "SPECTRA". Judging was especially difficult in this contest as several thousand excellent entries were received. Thanks goes to all EAC rocketeers for their great support.



"Please take your finger out of your ear and listen to me."
Mark Fisher
Willow Springs, Mo.

ATTENTION EAC ROCKETEERS:

EAC HQ wants you to share your ideas, projects, experiences, and suggestions with your fellow EAC members. Our desire is to make the EAC Newsletter an exciting and valuable publication for EAC rocketeers. Your assistance is needed to make this newsletter the main vehicle for communication between EAC members and chapters.

Send us your contributions for plans, tech articles, cartoons, anecdotes, club news, and other interesting items. If you send us photos, please make sure that you pack them between cardboard sheets so that they won't get creased in the mail. All contributions become the property of the Estes Aerospace Club and cannot be returned. Address all material to: EAC Newsletter Editor, c/o Estes Industries, Penrose, Colorado 81240.

Should your article or photos be used in the EAC Newsletter, we'll reward your efforts and talent with an Estes merchandise certificate, the amount which will be determined by the EAC HQ editorial staff.

Hope to hear from you soon!

Do you believe in beings from outer space? Imagine the strangest creature you can from another planet, solar system, or galaxy. Make a sketch, and send it to us with additional information requested in the rules below. Your alien creation could win you a $50.00 merchandise certificate for first place or one of six $10.00 merchandise certificates for runner-up. We would like to see the weirdest, freakiest, most far-out creepy creature you can think of. Really let your imagination go as this should be a really fun contest. Winning entry will be reproduced for all to see in next issue of the EAC Spectra.

RULES:

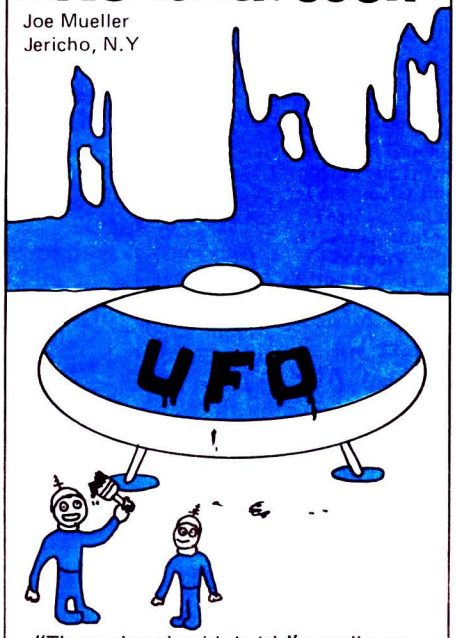
1. You may enter as many times as you like.
2. Employees of Estes Industries or members of their immediate families are not eligible.
3. All entries become the property of Estes Industries and cannot be returned.
4. In addition to a sketch of your creature, tell us his name, where he comes from and any other characteristics you can imagine such as diet, size, life style, intelligence, breathing substance, physical make-up, etc. Why does he look the way he does? This additional information need not be lengthy, just interesting.
5. Entries will be judged for creativity, uniqueness, completeness, weirdness, strangeness, and anything else we can think of since this is the first time we've had such a freaky contest! It really should be fun!
6. Deadline for receipt of entries is midnight April 15, 1975.
7. Decision of the judges is final.
8. Be sure to include your name, age, address, city, state, and zip code with each entry. Also, be sure to include your EAC Skill Level.
9. Mail entries to:

Estes Industries
EAC Creature Contest
Penrose, Colorado 81240

GOOD LUCK!

EAC lunartoon

Joe Mueller
Jericho, N.Y



"There, that should do it! I'm really getting tired of being mistaken for a weather balloon."

Rocket rap

EAC rocketeer, John C. LaMonte of the Rainbow Rocketeers writes: "The Eagle Rocketeers claim to be the most colorful chapter in the EAC.

Each member of the Eagle Rock (Los Angeles) club signs up for his own special color. Spectrum hues ranging from fire red to hot blue are used in distinctive range safety helmets and nose cone to nose cone competition.

Club members who also belong to the EAC — and almost all do — use their exclusive colors on the Viper Mini-Brutes, substituting it for the purple suggested for the Vip's nose cone and fin and body tube stripes.

No other alterations are allowed in Viper competition, and the flight duration times are always close, proving that red rockets are not really faster than green ones!

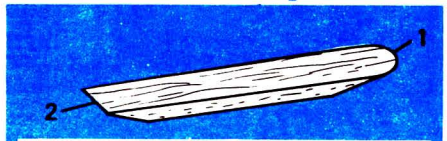
Another use of the individual tints is the target contest. Each member has a stake tipped with his color. After a windage flight, he may place his stake anywhere on the range and launch again.

The rocket landing closest to the appropriate, color-coded stake wins.

So, sign up for colors in your club, keeping in mind that whoever gets purple won't have to Xacto the EAC Viper decals to keep things color coordinated."

John C. LaMonte
Los Angeles, CA

eac tech tip



A handy way to make fillets is to cut a piece of 3/32" scrap balsa into a pick 1/4" wide and 1-1/2" to 2" long. Round one end of pick, then taper underside as shown in Figure 1. Next taper opposite end as shown in Figure 2. Use the round end in Figure 1 for making fillets on 90° angles of balsa. Wider and narrower picks can be made for corresponding angles. Run a small bead of glue where fillet will be and make several passes with pick until desired fillet is reached. After each pass, wipe off excess glue from pick. The flat end in Figure 2 is for removing any excess glue from model that may be left on either side of fillet.

Corey C. O'Roark
Santa Maria, CA

EAC SPECIAL PROJECTS PART 2
acceleration studies

NOTE: This article plus its future installments and our currently available list of "Model Rocketry Science Fair Projects" will provide the basis for our EAC guide to special projects. A new booklet entitled "Projects in Model Rocketry", is now available and features all special project information in one publication. See page 3 for details.

ACCELERATION STUDIES

High acceleration at take-off means both rapid build-up of drag and maximum stress on the structures of the model rocket.

Rate of Acceleration

Studies to determine actual acceleration (with an accelerometer you design), relative accelerations (as by effects such as distances a small, loose weight as a bb will dent a rigid but reasonably soft and dentable structure as soft styrofoam or one or more mounted facial tissues), or theoretical accelerations (through mathematical analysis of predicted rocket performances or analysis of actual data from flights) are possible and can be fun.

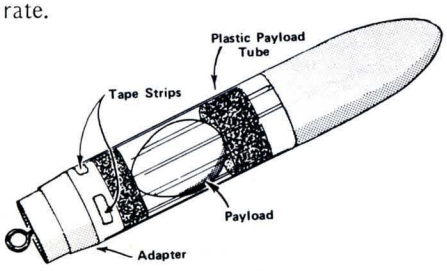
Launches of a rapidly blinking bulb at night or in twilight periods can permit the flight to be photographed by time-exposure and actual velocities determined (if the bulb blinks rapidly and at a consistent rate).

ACCELERATION EFFECTS ON LIVING ORGANISMS

Do not launch an animal unless it is essential to the conduct of a valid scientific experiment.

Effects of Acceleration on Chick Embryos

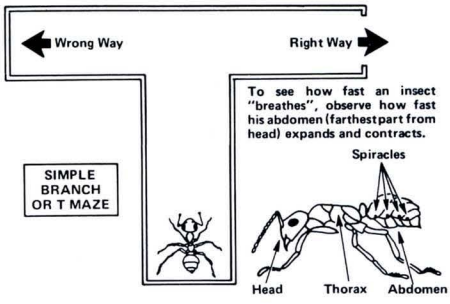
The launch and safe recovery of a raw hen's egg is a good test of payload handling capability. If a passenger is essential to the experiment, conduct payload experimentation using goldfish, reptile, insect, or amphibian, emphasizing the greatest care possible for the passenger's safety, comfort, and well-being. Study the effects of acceleration on its ability to recover equilibrium, on its ability to negotiate a maze, or on its heartbeat or respiration rate.



If you feel the desire to launch a small biological payload, do so with care. Wasps and bees make compact passengers for all but the very smallest payload compartments. However.....

Effects of Acceleration on Insects

Crickets, grasshoppers, and flies may be launched. Even if you goof, these creatures stand an excellent chance of surviving an error on your part. But don't launch them and recover them and expect to learn much by just looking at them. Some rocketeers "train" their passengers to do a simple one-branch maze or something similar, then test their reactions after flight. The results won't mean much if the specimen was damaged by poor handling or packaging in the payload compartment. Another problem can be that the effects you attribute to the g-forces experienced on the flight may be caused instead by a shortage of air in a too-small payload capsule.



The launch of living organisms should never be lightly undertaken. It appears from published reports and from our correspondence that at least nine out of ten launches of living organisms are successful. The few instances in which the "specimen" was lost were nearly always the result of an error on the part of the individuals who made the launches. In addition to the waste of time and effort when a biological payload is lost or damaged, the loss may be a tragedy when someone's pet mouse is the specimen. A good rule to follow, if you must launch a biological payload, is to never launch a "higher animal" such as a mouse or hamster.

Experience indicates that most insects, given a minimum of protective packaging, can safely survive the forces developed during rocket launches. Aquatic animals such as topical fish have been successfully launched in special "aquarium" compartments. Remember that the comfort as well as the safety of the animals is important. Don't let the payload compartment become too hot or too cold. Be sure enough oxygen is supplied for the total time of the mission plus a safety reserve in case the payload compartment has to be recovered from a tree. An animal can use up a lot of oxygen just sitting in the payload compartment on the launch pad, especially if he is excited (as he probably is).

The primary purpose for the launch of a living creature must be carefully analyzed. If this project is to secure information that is useful, necessary, and which cannot be secured in any other way, fine. Proceed with care. Plan every procedure carefully and rehearse before using the living creature. Consider your project from the viewpoint of someone to whom the specimen is a cherished pet. Do nothing to endanger the creature.

Acceleration Effects on Algae

Some projects have been carried out using plant material, usually algae in a water chamber, as payloads. Some researchers report that they have observed changes in the growth rate of algae subjected to the stress of acceleration. However, results reported do not agree.

Always do parallel experiments ("control experiments") in which all conditions are identical except for the one condition being investigated. For example, observe one algae culture identical to the test culture except that it is not launched.

Effects of Acceleration on Maze-Learning Ability

One of the easiest effects to measure as a result of model rocket launches is the effect on growth and reproduction of such things as algae or uni-cellular organisms. The growth of fertile chick embryos can be observed to determine effects, if any, from the forces encountered during the flight. Possibly the easiest to observe phenomena for animals are disorientation effects (usually vanishing shortly after the flight), memory of previously learned "skills," and learning ability (as for mazes). Be careful to try to avoid the effects of "odor trails" on learning rates for solving mazes. Such phenomena as rate of heartbeat and respiration are sometimes hard to measure and generally are phenomena which change rapidly after flights. Additionally, the effects of handling, special restraints, new environments, and similar things are hard to eliminate from test results.

Conditioning of Animals

It is possible that an animal could enjoy the ride aboard a rocket. Experiments to determine if this condition (a sort of thrill-seeking) exists would have to be very carefully planned and conducted.

The effects of plain "motion sickness" as a short term phenomenon on learning ability could be studied. Giving the animal a suitable (extremely diluted) dose of motion sickness medicine just before launch or conditioning the animal to become accustomed to pre-launch and post-launch conditions inside its "capsule" as well as to launch and recovery requires expert assistance. Any experiments of these types must be planned well and closely supervised by a competent adult with suitable training (as a doctor, veterinarian, or pharmacist).

NEXT ISSUE: RECOVERY SYSTEMS, TELEMETRY PROJECTS, and AERIAL PHOTOGRAPHY.

Skill Level Achievement Roll

In recognition of their model rocketry accomplishments we have listed the names of EAC members who have achieved our highest and second highest Skill Levels. Congratulations to these Skill Level 4 Advanced Rocketeers and Skill Level 5 Expert Rocketeers. Achievement roll is current through November 15, 1974. For information on skill level advancement write: EAC Headquarters, C/O Estes Industries, Penrose, CO 81240.

EXPERT ROCKETEER Skill Level 5

Steven Aguis
Astoria, NY

Louis Artale
Springfield, IL

Adam Arzt
Baldwin, NY

Jim Barton
Warren, MI

Chuck Bridges
Ft. Walton Beach, FL

Gordon Bugg
Ft. Gordon, GA

Tom Carbone
W. Simsbury, CT

Marty Ciara
Worth, IL

Rick Craig
Greensboro, NC

David Cummings
Modesto, CA

John Czach
Houston, TX

Al Dampf
Montrose, NY

Richard Debler
Charlotte, MI

Thomas Dembawski
Portland, CT

Carlisle De Witt
Savannah, GA

Jeff Difib
Woodland Hills, CA

Jeff Dunker
Sandy, UT

Fred Ebetino
Waterloo, IA

Scott Edick
Syracuse, NY

Jon Eismann
Brooklyn, NY

Ray Fehrenbach
Augusta, GA

Richard Fero
Memphis, TN

Mike Fields
Pueblo West, CO

Garrett Fowler, Jr.
Ft. Walton Bch, FL

Tom Frantz
Baden, PA

Robert Girard
Mt. Clemens, MI

Howard Goldstein
Brooklyn, NY

Joey Grove
Placerville, CA

T. Gryiswicy
Milon, IL

Don Guenther
Ballwin, MO

Nicky Herthel
Springville, IN

Bill Hogan
Greenwich, CT

Tim Hurst
Richardson, TX

Kenneth Inghram
Esperance, NY

Eric Jappe
Wakefield, MA

Norman Jen
Scarsdale, NY

Thomas M. Johanneck
St. Louis Park, MN

David Kaminsky
Belle Harbor, NY

John Kasper
North Brook, IL

J. Kastrinos
Trenton, NJ

Leonard Kay
Oceanside, NY

Sheldon M. Kornick
Des Plaines, IL

Brad Kushner
Roslyn Hgts., NY

David Labie
Boston, MA

Mark Laiuppa
San Diego, CA

Paul Lonstein
Ellenville, NY

Robert Lopez
Merced, CA

Kevin Lougheed
Moorhead, MN

Kenneth B. Mais
Edwardsburg, MI

Mike Marshall
Troy, MI

Bill Martello
Milwaukie, OR

Paul Mead
College, AK

Bruce Meyer
Shaker Hgts., OH

Mark Minot
Los Angeles, CA

Ken Montanye
Butler, NJ

Bradley Moore
Northglenn, CO

Douglas Morrison
Newport, PA

R.J. Mullane
Harrison, NJ

Bill Munns, Jr.
Steamboat, NV

Vernon Musselman
Royersford, PA

John McKeon
Anaconda, MT

Tom Neale
New Canaan, CT

Bill Norton
Pleasanton, CA

Patrick W. Obear
Peoria, IL

Clint H. O'Connor
Houston, TX

Robert Orr
Lordstown, OH

Richard Packer
Rye, NY

Ralph Parillo, Jr.
Milltown, NJ

Glen Peterson
Solon, OH

Robert Piekiel
Marcellus, NY

Jon Randolph
Cleveland, OH

Michael Rausch
Fairfax, VA

Ken Riggins
Longmont, CO

Alan Rollow
Wynnewood, OK

Murray R. Roth
Laurel, MD

George Ryan
Village, OK

Jeff Scott
Scotia, NY

Steve Shabram
Carmel, CA

Bret Simpkins
Albuquerque, NM

Andy Smetana
Raleigh, NC

David Smith
Grand Prairie, TX

John Spofford
Chicago, IL

Harvey Stoker
San Manuel, AZ

Bill Stoller
New York City, NY

Eddie Szekeres
Pittsburgh, PA

Joseph A. Tanner, Jr.
Eldred, PA

William R. Tantlinger
New Florence, PA

Joseph Taschetta
Wakefield, MA

L.M. Taylor
Rapid City, SD

Mark Temple
Houston, TX

Edwin Teruga
Honolulu, HI

Roger Uzun
Wood Dale, IL

Danny Wheeler
Chester, VA

Ken Wood
Inver Grove Hgts. MN

ADVANCED ROCKETEER Skill Level 4

Ken Aaron
Alamagordo, NM

Anthony Abbatanton
Harrison, NY

Mark Abent
Avoca, PA

Shawn K. Aiken
Marshall, MN

Bill Alexander
Walhalla, SC

Domenic Ali
Brooklyn, NY

Jim Amos
Mission Hills, CA

Michael Arthur
Yorktown Heights, NY

Paul Artz
Aberdeen, SD

Mark Bambach
Springfield, PA

Ray Banegas
Las Cruces, NM

Tim Barila
Bethesda, MD

Steve Bassett
Lima, OH

Tom Beach
Waterville, MN

James E. Beggs, Jr.
Rochester, NY

Tim Benchkini
Coopensburg, PA

Mark Benner
Selinsgrove, PA

Paul Bernheimer
Mansfield, MA

Frank Bisser
Garland, TX

Michael Black
Brockport, NY

Mark Blue
Indialantic, FL

Torin Blumst
Orinda, CA

Marc Boddewy
New York, NY

Edward Boogaerts
New Orleans, LA

Donald Boss
Fairfax, VA

Chip Botti
Greenlawn, NY

Edward Bowes
Brookpark, OH

Ronny Bradburn
Chesapeke, VA

Steven Breite
Brockton, MS

Tim Brewer
Waterford, CA

George Brody
Costa Mesa, CA

Dale Broehm
Columbus, OH

Stephen Brook
Dix Hills, NY

Roger Brown
Farmington Hills, MI

Jon Broyles
Kirksville, MO

David Brummel
Corpus Christi, TX

Paul Buckingham
Ft. Worth, TX

Richard Bunt
Glenmont, NY

Mike Carraway
Gillette, WY

Rick Carrico
Louisville, KY

Clancy Carroll
Milwaukee, WI

Mark A. Chaney
Heath, OH

David Chapel
Springfield, IL

Dave Chapman
Hacienda Heights, CA

Jim Chapman
Merced, CA

Dan Cheng
Dix Hills, NY

Herman Chien
Bellevue, WA

Gunther Chin
Calexico, CA

Michael Claprood
Mt. Morris, NY

Ray Cleaveland
APO San Francisco, CA

Tim Cochran
Greenwich, OH

Joe Colangelo
Port Chester, NY

Dennis Cooper
Hunlock Creek, PA

Bob Costello
Middletown, NJ

Bret Costin
Shalimar, FL

Richard Cox
St. Thomas,
Ontario, Canada

Pat Crerand
Pittsburgh, PA

Bill Crosby
Kensington, MD

Tom W. Crowell
Manchester, MA

Jim Cunningham
Dayton, OH

Bob Dafferrn
Hust, TX

Richard Debler
Charlotte, MI

Fred DeMey
W. Redding, CT

Alex Dininno
Sewickley, PA

Terence Dobronyi
Miami, FL

Wayne Doernev
West Orange, NJ

Larry Dolton
Los Altos, CA

Brian Downey
Barrington, IL

Brian Doyle
Nashua, NH

Fred Duda
Darien, CT

Jeff Dunker
Ephraim, UT

Michael Dunn
Scarborough,
Ontario Canada

Michael Dunn
Grand Rapids, MI

Paul Dutkiewicz
Utica, NY

Jeff Duvall
Millbrae, CA

Jeff Eaton
Ft. Worth, TX

Carter Edwards
Lincoln, NE

Randall Edwards
Dunlap, KS

Thomas Elausky
Canton, OH

Cilon Enloe
Florissant, MO

Vincent Eqarian
Yonkers, NY

Bob Farley
Almont, MI

Scott Michael Fate
Hoosick Falls, NY

Mark Ferree
Ft. Worth, TX

David H.A. Fitch
Coventry, CT

R.D. Fox, Jr.
Rosedale, IN

Craig Frank
Frankfort, NY

David Freed
Royersford, PA

Lew French III
Pearland, TX

Dave Fritsma
Grand Rapids, MI

Larry Fugate
Eureka, IL

Alan Funk
Peoria, IL

Chris Gangi
Cresskill, NJ

Tom Ganse
Hershey, PA

Steve Gardner
Joplin, MO

Jim Gazur
Rocky River, OH

James Gearhart
Rochester, NY

Frank H. Gee, Jr.
Woodland Park, CO

Craig George
Rochester, NY

Joseph R. Gerusa
Pacifica, CA

Brad Gilbert
Fleminton, NJ

Tim Gilbert
Luray, VA

Russell Gillenwater
Muscatine, IA

Mark R. Glammeier
Sioux Falls, SD

Ted Glenson
E. Grand Rapids, MI

Richard Glossop
Stamford, CT

Paul Goewey
Wilbraham, MA

Derek Gordon
Kinnelon, NJ

James Hageman
Livingston, MT

Will Hall
Ballwin, MO

Alan Hammond
Rochester, NY

John Hanafin
Milton, MA

Peter Hand
Simsbury, CT

Arlen Hanson
Owatonna, MN

Carson J. Hardacre
Alameda, CA

Al Hargas
Chicago, IL

Charles Harmison
Ames, IA

Steve Harper
Kaufman, TX

Douglas Harris
Farmington Hills, MI

Mark Harris
Northridge, CA

Greg Harter
Belvidere, IL

Gordon Hartgrove
Greensboro, NC

Rick Hawkins
Earlville, NY

David Hawthorne
Hazlet, NJ

Gary Haynes
Bell Gardens, CA

Geoff Hayton
Redlands, CA

B. Heaphy
Brewster, NY

Brian Helmuth
Aurora, CO

Larry Henderson
Northglenn, CO

Roy Henderson
Portage, IN

John Henn
Quakertown, PA

Pat Hester
Little Falls, NJ

Bob Hickle
North Syracuse, NY

Carl Hides
Baton Rouge, LA

Greg Hilger
Concord, NH

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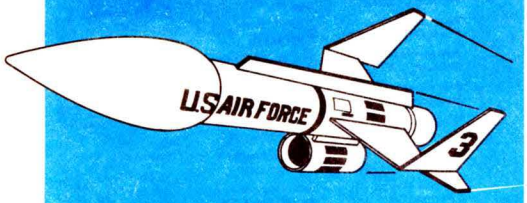

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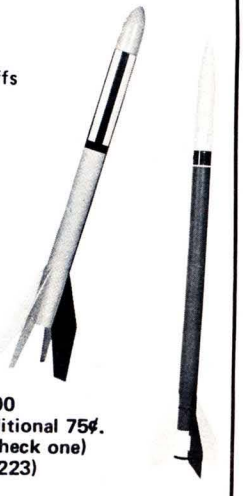

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The EAC Newsletter is published by Estes Industries, Penrose, Colorado. This publication is written for members of the Estes Aerospace Club to promote safe youth rocketry, distribute current technical information, and make model rocketry more enjoyable and educational. Current issues of this Newsletter are distributed free of charge as a service to all active EAC members.

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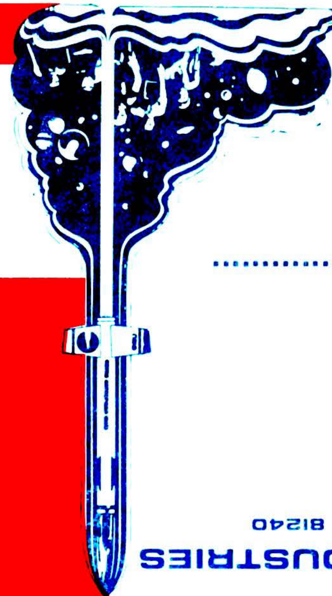

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