



# MASA Planet

Volume 5, Issue 1

March 2002

**Safety First!**

## Following Procedure

*Because We're Only Human...*

**Ted Cochran**

I work at Honeywell Labs, where, among other things, I study human reliability in complex systems. Over the years I've collected a lot of examples of "human error", which is the label that is too easily given to a situation that, when assessed with 20/20 hindsight, could have been prevented. I've also collected similar examples from rocketry. We can't learn from our mistakes unless we collect and analyze them, and I hope you'll agree that the examples here are worth learning from!

### The loss of Clipper Graham

The DC-XA [a.k.a. Clipper Graham] was a prototype vertical take-off and landing rocket that relied almost completely on thrust to maneuver--it had no aerodynamic surfaces to speak of.

It was lost July 31, 1996, at the end of its fourth flight, when one of the four landing gear legs failed to deploy. It landed on three legs, fell over, exploded, and burned.

The leg failed to deploy because the hose to the

*Procedure, continued on page 2*

## Welcome Back!

**MASA Starts Its Fifth Year**

At the inaugural meeting of what was to become MASA, a handful of people decided to meet to talk rockets, and meet to fly rockets, on a regular basis.

Four years later, MASA has become an established NAR section, with scores of members who are collectively ready, willing, and able to launch as many as 200 rockets on a summer Saturday [to say nothing of launching a couple of dozen in the middle of winter!]



*MASA's inaugural launch: January 24, 1998. Calm winds, 26 degrees. Perfect weather!*

## ALSO IN THIS ISSUE

- 3** Event Schedule
- 3** President's Corner
- 4** Full Scale Models: Atlas IIIB
- 5** Planet's Plans: MASA Patriot SS
- 7** MASA Members: 2002 Officers

The picture above, retrieved from the MASA historical archives, shows the MASA's first launch as a club, at the White Bear Lake site we still use. If anyone has other pictures from the early days, send them in, and we'll publish them as we build up to our Quintennial Celebration!

Given the growing size of MASA, and the diversity of interests of our members, 2002 should see some spectacular successes. 🚀

*Procedure, continued from page 1*

actuator of its landing gear was not connected. The gear preparation procedure was not followed correctly. The DC-X preparation absolutely relied on people not making a mistake, and unfortunately, someone did.

There were several reasons:

- Landing gear stowage was never identified as a "critical process" requiring detailed review. The procedure that was developed was not complete.
- Those following the procedure apparently did not check off steps upon completion, nor did another person crosscheck the work of the first. Thus the procedure was not well executed.
- The technician carrying out the procedure was interrupted in the middle of it, and he lost track of where he was when he got back to it. Thus the environment in which the procedure was being executed was not supportive.
- DC-X was a fast track development, in which there was "strong reliance on good people but not a lot of margin for human error afforded by the vehicle preparation process." But good people make errors, too: There are limits to human performance.

This all happened despite the fact that the organizations involved had expertise in the relevant human factors, and there had been a near miss on *exactly the same procedure* on the previous flight.

So the DC-XA died.

## Lessons

The lessons for us are significant. If you have a lot of effort invested in something, you want it to succeed. Even if you don't have a lot of effort in something, you want it to be safe.

Make a good checklist, and use it!

The aviation community has learned the hard way that, no matter how many times pilots do checklists, whether they've memorized it or not, whether the weather is foul or fair, continued success depends on pilots continuing to say, see, touch, and crosscheck every step, every time.

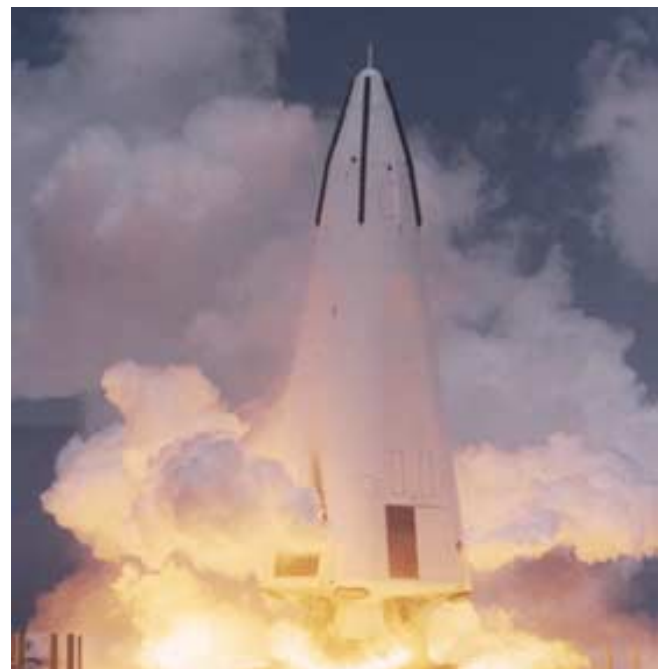
The stuff we fly doesn't deserve any less! 🚀

## WHAT'S IN A CHECKLIST?

To maximize your chances for success, develop a checklist or a procedure for anything with more than about 5 sequential steps.

- 1) Design it to be simple and specific.
- 2) Design it so that it takes into account every contingency.
- 3) Follow the procedure religiously.
  - a) Follow it every time
  - b) Follow it in a non-distracting environment
  - c) Check off every step
  - d) Consider having someone crosscheck your work as you do it or afterwards.
- 4) Learn from experience
  - a) If the procedure is hard or confusing, fix it.
  - b) If something unanticipated happens, change your procedure from then on.

**Reference for article:** Clipper Graham Incident Investigation Report. A summary is at [http://www.hq.nasa.gov/office/pao/History/x-33/facts\\_65.htm](http://www.hq.nasa.gov/office/pao/History/x-33/facts_65.htm) 🚀



*The DC-X flying at a happier time.*

## MEETING SCHEDULE

### TUESDAY, MARCH 19 (2 WEEKS LATER THAN NORMAL)

Location: [Science Museum of Minnesota, St. Paul](#)

Time: 7pm to 8:30pm

Notes: LCO / RSO training

### TUESDAY, APRIL 2

Location: [Science Museum of Minnesota, St. Paul](#)

Time: 7pm to 8:30pm

Notes: Minnesota Rocket League flight readiness reviews: Help look at the MRL entries.

### April 5 - 7

[NARCON](#),

Austin, TX

### TUESDAY, MAY 7

Location: [Science Museum of Minnesota, St. Paul](#)

Time: 7pm to 8:30pm

Notes: Building session - MRL challenge. Build a rocket to fulfill the Minnesota Rocket League goals.

### TUESDAY, JUNE 4

Location: [Science Museum of Minnesota, St. Paul](#)

Time: 7pm to 8:30pm

Notes: Altitude tracking.

## LAUNCH SCHEDULE

### SATURDAY, MARCH 23

Location: [White Bear Lake](#)

Time: 9 am - 12 pm

### SATURDAY, APRIL 27

Location: [Elk River / Otsego](#)

Time: 10 am - 3 pm

Theme: Oddrocs!

### MAY 25 - 27

[NATIONAL SPORT LAUNCH](#)

Rainbow Valley, AZ

### SATURDAY, MAY 25

**Memorial Day Weekend**

Location: [Blaine](#)

Time: 9 am - 3 pm

Theme: Fly the Red, White, and Blue!

### SATURDAY, JUNE 22

Location: [Blaine](#)

Time: 9 am - 3 pm

Fun Events: Fat Boy Flyoff.



## President's Corner

# Happy New Year!

Alan Estenson

I'd like to welcome all new and returning MASA members to the start of another wonderful year of model rocketry!

Just a few hours before writing this, we held the first MASA launch of 2002. It was a great way to start off the year; more than 50 flights took to the air. For February in Minnesota, that's pretty good!

A number of new faces were present – both flying and watching. It's great to see new people at our club events. I know that they bring with them new ideas and fresh batches of enthusiasm.

If you're a returning MASA member, your dues are payable any time now. If you've already taken care of them, thank you! The schedule of all MASA launches and meetings for 2002 has been laid out on the web site, and an abbreviated version is included in this newsletter. We will be doing our best to have interesting, fun and engaging meeting topics, so I encourage you to attend. As in past years, we will have various fun themes, contests, and events at our launches too.

If you're a new member and have Internet access, I encourage you to browse around the club web site. There's tons of good information there. I bet you'll find the answers to a few questions that have been hanging around the back of your head.

The best way to reach me with your questions, comments, and ideas is by email, but my email address just changed. Please note that my new address is [aestenson@attbi.com](mailto:aestenson@attbi.com). I can also be reached by phone most evenings at (651) 639-8019.

This morning, I performed one of the four flights that are required for achieving the NARTREK bronze level when I successfully flew a Maniac on a D12-5. In the next issue of the Planet, I'll be talking to you more about NARTREK. In the meantime, I'd like you to read about it on the NAR web site at [www.nar.org/nartrek](http://www.nar.org/nartrek).

Hot jets!

Alan Estenson, MASA President





*Full Scale Models*

# Atlas IIIB Flies!

*A new prototype for NAR scale competitions*

The newest addition to the nation's rocket fleet became operational on Thursday, February 21, 2002 with the launch of the Lockheed Martin Atlas IIIB. The Atlas IIIB flight was the 570<sup>th</sup> of an Atlas, and delivered an EchoStar commercial TV broadcasting satellite into a transfer orbit.

The Atlas IIIB uses a stretched "Common Centaur" upper stage, which at 38.5 feet is 5.5 feet longer than the Centaur previously flown on Atlas II and Atlas IIIA missions. Like the Atlas IIIA, the Atlas IIIB uses the NPO Energomash RD-180 engine, a kerosene and LOX-burning motor that has roots in the Buran shuttle.

The successful launch of the Atlas IIIB paves the way for the launch of the first Atlas V, now set for early May. 🚀

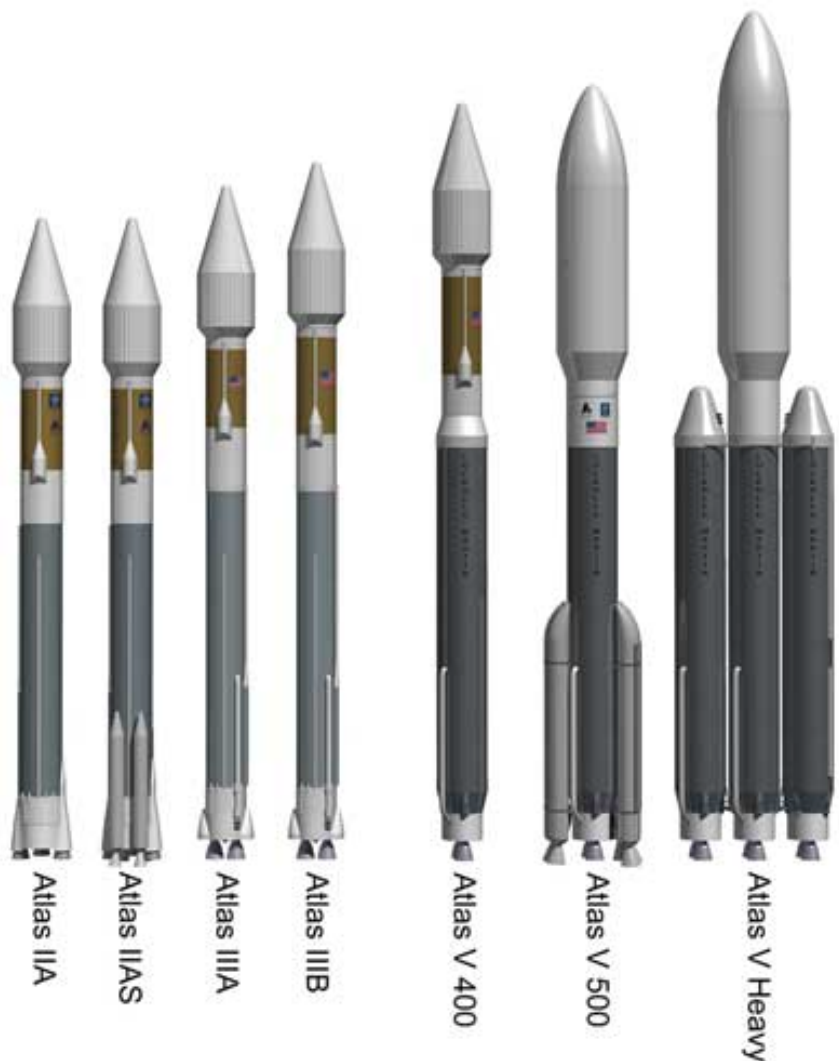
*Inaugural Atlas IIIB Launch*



*Not a pair of A8-3s!*

**Atlas IIIB Vital Statistics**

Length: 174.2 ft (53.1 m) with large payload fairing  
 Diameter: 10 ft (3.05 m)  
 Atlas booster length: 95.1 ft (29.0 m)  
 Centaur length: 38.5 ft (11.68 m)



*The current and future members of the Atlas Family.*

# MASA Patriot SS

A "Sorta Scale" version of the Army's surface to air missile.

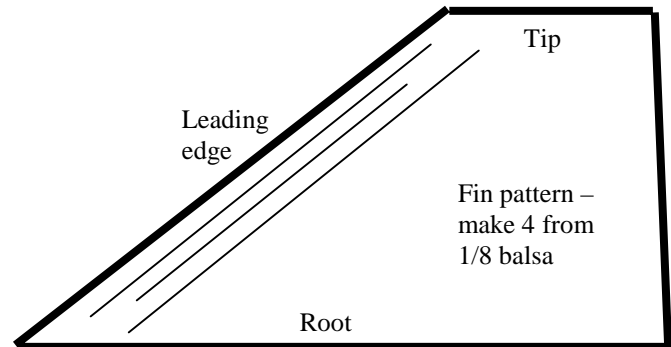
Design MH-02 by Alan Estenson, NAR 69539 SR

## Specifications

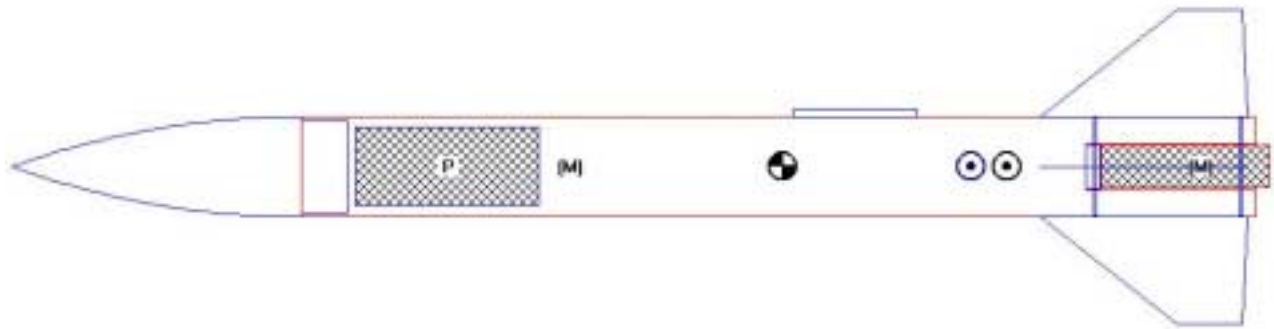
Length: 514 mm (20.25 in.)  
Diameter: 41.4 mm (1.63 in.)  
Weight: 68 grams (2.4 oz.)  
Recommended engines: B4-4: 70 m (230 ft.)  
B6-4: 76 m (250 ft.)  
C6-5: 152 m (500 ft.)

## Parts list

- A. One (1) bt-60 body tube, 394 mm (15.5 in.) long
- B. One (1) 3:1 ogive plastic nosecone (from Estes NC-60A pack)
- C. One (1) bt-20 motor mount tube, 70 mm (2.75 in.) long
- D. One (1) eb-20 engine block
- E. Two (2) cr-20/60 flat centering rings
- F. One (1) motor hook
- G. One (1) 1/8 in. launch lug, 51 mm (2 in.) long
- H. One (1) shock cord – 914 mm (36 in.) of 1/4 in. elastic or Kevlar
- I. 1/8 inch balsa sheet for fins
- J. Two (2) 3/16 x 1/8 x 12 in. balsa strips for external wiring conduits.
- K. One (1) parachute – 14 to 18 inch diameter
- L. One (1) snap swivel for parachute (optional)



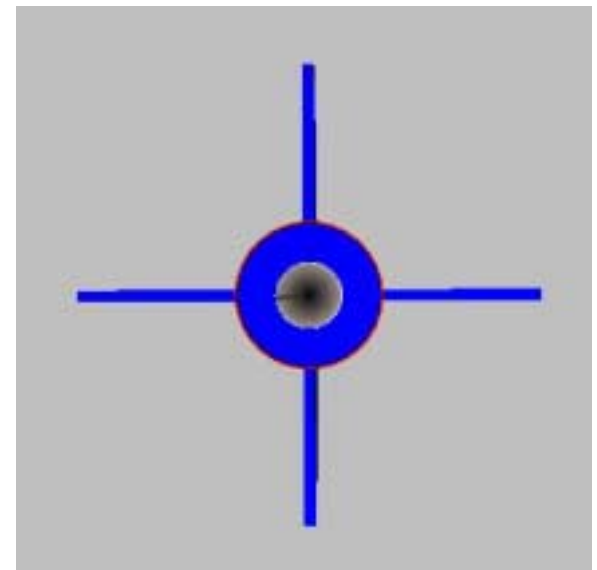
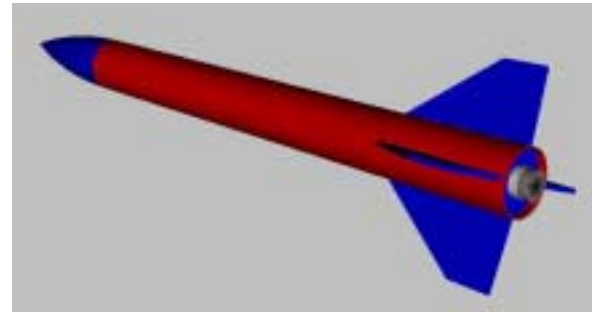
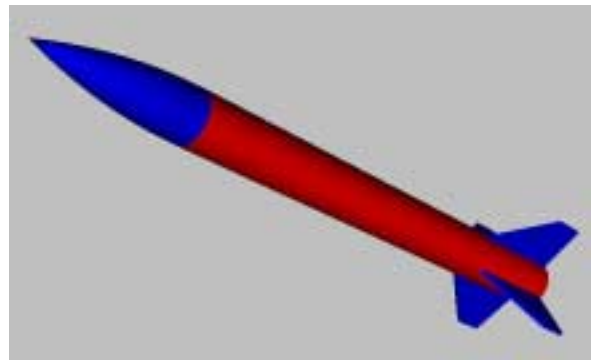
All sides of this square should be 1 inch long



## Notes:

1. For construction techniques, the Estes Big Bertha instructions provide a good example.
2. Place bottom of launch lug 5.5 inches up from bottom end of body tube.
3. Slightly round ends of wiring conduit strips. Place them between fins on opposite sides of the body tube 1 inch up from its bottom end.
4. Fins should be glued to body tube so that trailing edge is 1/8 inch up from its bottom end.
5. Center of Pressure is approximately 4.6 inches forward from the bottom end of the body tube.
6. Cut four fins from 1/8 inch balsa sheet. Make sure wood grain is parallel to leading edge. Check the dimensions of your fin pattern to make sure it printed correctly: root 3.4 in., tip 1.1 in., height 1.75 in.

Patriot, continued on page 6



Pictures from Alan Estenson. Drawings from RockSim v5.

Copyright 2002 by Alan Estenson. All commercial rights reserved.

## **2002 Officers**

### **Alan Estenson, President**

As I begin my second year as MASA President, I've been asked to share a bit of my background with you. I've been flying model rockets almost continuously since 1982 when I purchased my Der Big Red Max starter set with a Bigfoot launch controller. I not only still have both rocket and controller, but also the original Estes invoice framed and hanging on my workshop wall.

My current rocket interests are varied; I fly everything from tiny MicroMaxx rockets up to "J"-powered beasties. You'll see me with rockets of all shapes, sizes, types, and, err, wackiness. I've been around MASA since its first meeting and was the fourth official club member. In addition to my duties as President, I'm also the club webmaster, and I'm also the creator of the Minnesota Rocketry Network web site. ([www.mn-rocketry.net](http://www.mn-rocketry.net)) I also fly rockets with the Minnesota Tripoli prefecture.

In real life, I'm an aerodynamic test engineer. I work for Aero Systems Engineering at their FluidDyne test laboratory in Plymouth. In case you're wondering, I hold bachelors and masters degrees in Aerospace Engineering. (I proudly wear my "rocket scientist" T-shirt.) In hobby life, I'm the rocket guru on staff at Hub Hobby Center in Little Canada. 🚀

### **Ted Cochran, Vice President**

I flew my first rockets in the 1960s, lapsed a bit, flew a couple more in the 1970s and 1980s, and then got back into the hobby with a vengeance in 1996 when my son Seth did a science fair project on rockets. Since then, Seth and I (with occasional help from David, Dara, and Kevin) have built more than 80 rockets and flown them over 550 times. Last year I flew everything from Micromaxx to a two-stage, J350 to I218 powered PML Quantum Leap with two altimeters and dual deployment. [The Micromaxx rockets are way cheaper!]

I've built sport rockets, scale rockets, competition rockets, rocket gliders, boost gliders, odd rocs (a flying refinery, for example), launch pads, launch controllers, launch towers, and even (in earlier days when I didn't know any better) a 1/12 scale rocket-

powered milk carton boat. If all goes well, this year I'll fly both a K550 and three new scale model rockets, among other projects.

I was with Alan during MASA's first meeting. I also spend quite a bit of time on various outreach activities, doing lots of build-and-flies and assisting with school launches. This year I'm the Director of the Minnesota Rocket League, a science competition for fourth through ninth graders. And, of course, I get to edit this Newsletter!

I work at Honeywell Labs, where I am a Six Sigma Black Belt consultant and a program manager, focusing on projects involving human interaction with complex systems. 🚀

### **Dave Fergus, Secretary/Treasurer**

I grew up in eastern Colorado. I barely got into Estes for a couple of years or so as a kid. I remember launching an Alpha on D engine and losing it. I also had a Sprite that flew a couple of times. I think I had an Interceptor that I never finished, but my Mom disavows all knowledge of what happened to a lot of my old toys.

I had a Trident that a lot of allowance and time went into and it blew a transfer tube off at ejection and came down in pieces. That, my Dad's lack of interest, and the launch system that relied on 8 D cells inside the red box was enough to discourage me. My Mom saved a Goblin and a SAROS that I had finished but never launched.

Five years or so ago, I bought an Estes starter set "for the kids", and currently, with the kids, have finished and flown 75 different rockets with another 20 or so kits not started but in inventory. Our family has had 304 flights since we started flying in November, 1997. I currently have five medium power rockets that have flown, with another two under construction. I am also building a scratchbuilt 2X Big Bertha using mostly PML components for a potential Level 1 certification flight this summer.

I spent 10 years in the nuclear submarine service, and am a Commander in the Naval Reserve, drilling in Milwaukee once a month. My wife Susan and I have two children, Sarah 11 and Brian 9. I am an engineer by background, and currently manage a small manufacturing company in Elk River. 🚀

The *MASA Planet* is the official newsletter of the Minnesota Amateur Spacemodeler Association, Section 576 of the National Association of Rocketry. It is published bimonthly as a service to its members.

MASA's web site:

<http://www.mn-rocketry.net/masa/>


**MASA's 2002 OFFICERS:**

<b>President</b>	<b>Alan Estenson</b>
<b>Vice President</b>	<b>Ted Cochran</b>
<b>Secretary/Treasurer</b>	<b>Dave Fergus</b>
<b>President Emeritus</b>	<b>Russ Durkee</b>
<b>MASA Planet editor</b>	<b>Ted Cochran</b>

Submissions may be made to the editor at: [mrl@hightechkids.org](mailto:mrl@hightechkids.org). (Volunteer quickly, lest you be drafted to write an analysis of the impact of recent changes to NAR's pink book, a detailed history of NAR-TRA cooperation, or other choice topic.)

**Answer Box**

***Kit Trivia Quiz, Volume 4, Number 3***

1. A motor block positioning tool.
2. A motor mount.
3. Quest HL-20.
4. 12.
5. SRX, Manta, Shuttle starter kit, F-22. 



*Rocket ships in the Age of Steam, or, "Won't it be easier for the crane to reach the hull plates if we **back** the train down the siding?"*

*This web page excerpt is from a MASA member site.*

*Whose web site?*

*Answer next time!*



**MASA Planet**  
**4235 Dupont Avenue South**  
**Minneapolis, MN 55409**

PLACE  
STAMP  
HERE

**Mailing Address**  
**Street Number and Name**  
**City, State 98765-4321**

**ADDRESS CORRECTION REQUESTED**