

# The NEMES

NEW ENGLAND MODEL ENGINEERING SOCIETY INC.

# Gazette

No. 177

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## Editor's Desk

Frank Hills

## What's Up With Space Planes?

What's up with space planes? The idea has been around for, literally, almost a century. Rather than building single-use capsule like spacecraft launched by rockets, build a plane able to fly high enough and fast enough to transition into space. Takeoff and landing on a standard runway would be a nice perk. Reusability has its charm. The possibility of daily space flights is really neat. But the closest we're actually come to realizing this dream is NASA's Space Shuttle, launched by rocket, reusable after an almost three month long rebuild, and in fact, managing only one flight a month with three Shuttles taking turns! Hardly what scientists envisioned when the concept was created so long ago. One might comment, "The X-15 flew more than 50 years ago and many of its pilots qualified as astronauts. We still have SR-71 spy planes capable of flying faster and farther than all the X-planes except the X-15.

—Continued on page 2

## Next Meeting

**Thursday, Jan. 6th, 2011**

7:00 PM. Meetings held at:  
Charles River Museum of Industry  
154 Moody Street  
Waltham, Massachusetts

## Membership Info

New members welcome! Annual dues are \$25 (mail applications and/or dues checks, made payable to "NEMES", to our Treasurer Richard Koolish, see right) Annual dues are for the calendar year and are due by December 31<sup>st</sup> of the prior year (or with application).

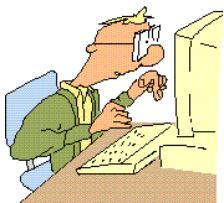
Missing a Gazette? Send mail or email to our publisher.

Addresses are in the left column.

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Please renew your NEMES membership now. See page 3 for the membership application form.



## Editor's Desk

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We've built and flown more than 20 years of Space Shuttles successfully. What's the problem? Why can't we build a real, take off from a runway, dock at the International Space Station and return space plane?" Putting politics, the world economy, and administrative nightmares aside, I have no doubt that it's technically possible. But it is a great deal more complex an issue than it seems.

Starting with the concept of taking off from a runway there are problems. To save the weight of oxidizer for the rocket engines, one would wish to use air breathing jets until high altitude makes them useless. Then the rocket engines would take over. Unfortunately you must either carry the dead weight of those engines into space with you (and jet engines are heavy pieces of machinery), or dump them like a used rocket stage. This was the reason all of the early X planes were dropped from B-52 bombers, to save weight. Even if you designed carefully and kept weight down enough to keep the engines on board, the speed they could attain before shutdown wouldn't be enough to save much rocket fuel. Earth orbit is about 16,000 mph. Even the SR-71 is only capable of about 2000 mph. Most of the task of accelerating the "plane" would still fall to the rocket engine. In addition, jets have only operated to an altitude of about 100,000 feet, only 18.9 miles. A decaying, low earth orbit is 90 miles. Most Shuttle missions were at 300 miles or more. Jet engines just don't get you far. However, that is where the SCRAM jet (SupersoniC RAM) is of value. There is atmosphere above 100,000 feet. It's just so thin you have to use an enormous compressor to collect it (that adds weight) or go fast enough to scoop it up. SCRAMs do this and are light, simple structures compared to turbojet engines, or the more complex turbo/ram engines of the SR-71. And it is true that a few small SCRAMs have been successfully built and tested. But they're still not ready for service quite yet. And SCRAMs aren't a complete answer either. They only work at high speeds, so you still need a

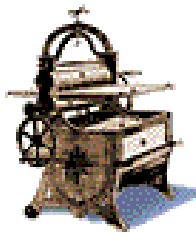
turbojet engine to take off. It's a vicious, maddening circle!

OK, let's be optimistic. Maybe someday we can take off from a runway and keep the turbojets on board. And maybe the SCRAM, with its 4000-5000 mph speed and potential 150,000 to 200,000 operating ceiling will reduce the quantity of rocket fuel required, saving weight. But our space plane still has a long way to go. Eventually it's going to have to slow down to land. Every pound the space plane weighs has to be decelerated by rocket engines that burn fuel. The bigger the plane, the more fuel it takes. One third of the Shuttle is rocket engines and fuel. More importantly, the fuel the Shuttle carried internally (no external tanks) is all for deceleration! We'd like our little space plane to restart its turbojet engines to land. More fuel, more weight! Well, maybe we'll just let it glide like the Shuttle. The vicious circle continues.

Why don't we ignore those slight complications? Let's assume we can slow down to land, but we still have to complete the reentry. Imagine aerodynamic friction hot enough to vaporize aluminum, melt steel and soften tungsten. The Mercury, Gemini and Apollo capsules used heat shields made of plastics that burned away and took the heat with them. Capsules were used only once, of course. The SR-71 used a titanium skin cooled by the plane's fuel. But it only flew 2000 mph. The X-15 also had a titanium skin but with a replaceable, thin, ablative coating much like the capsules. This was fine for the relatively slow 5000 mph speeds it attained, but the Shuttle required something different. It's a far cry from 2000 or 5000 mph to 16000 mph, and so a new material was needed. The Shuttle was coated with several inches of what might be described as ceramic marshmallow! It is a terrible heat absorber, which is great, but it's also soft and easily damaged. This weakness killed the Columbia crew when this coating was damaged and the craft burned up on reentry. So what can be done? Reentry is perhaps the most difficult problem to overcome. But there are possibilities. One is the use of advanced aerodynamic braking. The energy that must be absorbed through aerodynamic friction is related to the density of the object. It's much harder to slow down a steel ball going 16000 mph with air than it is a hollow plastic ball of the same size. Our space plane is going to be heavy, but its size can change, and therefore its apparent density. Fighter planes use aerodynamic braking all the time. Large panels are extended into the air stream and create enormous drag. Of course our plane would

require far more, perhaps the entire wing area, or the whole outer surface of the craft. Even more, these surfaces might need to extend further, like the flaps on commercial airliners, and still some kind of heat shield might be required. What a contraption that would be! What a sight it would make! A huge shuttle cock dropping out of the sky with a sonic boom. Slowly it folds up and starts its engines, eventually to touch down at Logan International Airport with Grandma and Grandpa fresh from their vacation at the "Hilton Space Resort". Your suit comes with a built in barf bag!

Next month, "Submarines for the Common Man?"



## **NEMES Gazette Editorial Schedule**

Issue	closing date for contributions
Feb. 2011	January 21, 2011
Mar. 2011	February 18, 2011
Apr. 2011	March 25, 2011
May 2011	April 22, 2011
June 2011	May 20, 2011

## **2011 NEMES Membership Dues are due now!!**

Please use this simple form with a check to pay your dues at the next meeting or by mail so we can be assured that you get credit for paying the dues.

Send a check for \$25.00 made out to NEMES to:

Richard Koolish

212 Park Ave.

Arlington MA 02476

AND PLEASE PRINT NEATLY!

Name\_\_\_\_\_

Street\_\_\_\_\_

City\_\_\_\_\_

State\_\_\_\_\_ ZIP\_\_\_\_\_

Home Phone\_\_\_\_\_

Work Phone\_\_\_\_\_

email\_\_\_\_\_

## **President's Corner**

Dick Boucher



## **The Meeting**

The meeting this month is one of my favorites. It is our semi-annual Poster session, the night we get to bring in some of our projects either complete or incomplete and spend the night talking to each other about the projects and sharing machining tips about the various projects.

## **Miscellaneous Ramblings**

The big ramble this past month was the **First annual, totally unofficial and only slightly organized NEMES banquet at Woodman's Clam Stand in Essex MA** on December 12. It was a great event truly enjoyed by all that attended. Along with the great fried clams, french-fried potatoes and delectable onion rings, a great deal of great conversation was held. It was also great to see the wives joining the group and having a chance to meet each other. Thanks to Errol for thinking of this event and though it was advertised as **only slightly organized**, Errol did a wonderful job of picking a place and time for us. We had 14 folks in attendance this year and if we do have a second annual banquet I hope more will be able to enjoy the event.

The bus trip to the Cabin Fever bus trip is on. We have the required subscriptions to hire the bus. The cutoff for the trip is December 31<sup>st</sup> but if the newsletter doesn't arrive until the first week in

January and you still wish to go after you read this you must respond immediately. Call either Norm Jones or myself to get in on this another great event.

The holiday season will have come and almost be gone as you read this months ramblings, so I hope everyone has had a joyous time during the season and I wish you a Happy New Year. Don't forget the Waushakum Live Steamers first run day of the season and come on out to Holliston to enjoy this premier live steam track hopefully with a little snow on the ground. It sure is a pretty sight in the snow.

Well I guess I have rambled on long enough for this month. It is snowing as I write and the news is about a rough commute tonight but I will be prepared for my Monday evening locomotive group, as I am sure they will be here. The locomotives are coming along quite nicely and we should have at least one running on air by our February show and we will be soon starting on building the boilers.

Dick B.

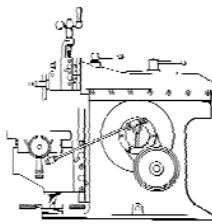


## Shop Tips

### Making Short Screws

Here's a very simple tip, nothing fancy, but it was good enough to work for me. I needed a number of very short, special screws for a project, and they had to be precisely to length. So I found some longer screws and shortened them. If you've ever held a screw in pliers or Vice Grips and shortened them on a grinder, you'll agree that this isn't a precise method.

Instead, I found a scrap of steel equal to or thinner than I wanted for the length of the screw and tapped a hole in it for the screw thread. Then I screwed a screw into the scrap. I added washers under the head so that the length from head to other steel face was the desired screw length. The scrap was large enough to hold, so it was now easy to grind away the protruding excess screw, stopping when I hit the scrap, giving precise length, matching screws. As an added benefit, when I removed the screws from the plate, the plate straightened the deformed last thread, so the screws were ready to use.



## Metal Shapers

By Kay Fisher

### R. G. Sparber's Gingery Shaper - Part 10

#### Fitting the Ram to the Column

It took some effort to get the ram to slide smoothly in its guides.



Ram In Slide    Photo by R. G. Sparber

The bottom plate of the ram must be a good sliding fit on four sides. I chose to use UHMW tape over the slide ways and the clamps. The left edge, as viewed facing the front of the machine, is CRS on cast aluminum. I may change this to UHMW tape later.



Gib on Right    Photo by R. G. Sparber

The right side has a brass gib. Adjusting the gib is easy because of the 5 adjustment screws.

I did my best to set the slide ways at the proper distance from the top surfaces of the side castings but in the end I needed a little more room for adjustment shims. The obvious solution is to reduce the height of each column side casting. However, my mill/drill does not have the headroom to make this cut.

Instead, I modified the clamps. Gingery called for  $\frac{1}{4}$ " CRS but I chose to use  $\frac{3}{8}$ " so the loss of 0.025" of thickness won't matter.



Milling Left Ram Clamp Photo by R. G. Sparber

I set my mill vise and took a clean up cut on the soft jaws. My left clamp was then clamped in place. In the above photo, I am about to cut a step 0.025" deep and 0.600" wide. Note the white patch on the right end of the bar. It is a scrap of UHMW tape.

After making this pass, I took 0.001" off of the 0.400" pad to guarantee that the two faces are true.



Finished Ram Clamp Photo by R. G. Sparber



Jig for Cutting Shims

Photo by R. G. Sparber

I was lucky to have cut that step in the clamp bars. It enabled me to clamp a piece of MDF in my bench vise, fit the first clamp bar against a piece of 0.004" shim stock, and clamp down. I then ran my "F" drill down each hole, through the shim, and into the MDF. The holes therefore are perfectly aligned and undistorted. Without moving the C-clamps, I used an X-acto knife to cut the shim. After each shim was cut, its orientation was marked.



Shims Cut

Photo by R. G. Sparber

I cut one 0.016", two 0.006", two 0.004", and in the end had to cut a 0.0015" for the right side. The left side was fine without it.

In the above picture, the surface that will contact the ram has a strip of UHMW tape on it. Because the tape went onto an elevated surface, alignment was easy. Any tape that stuck out was trimmed off with my knife.

It did take some time to find the right combination of shims. When I got close, I glued the edges and top in order to find where there was a slight binding. A strip of 600-grit backed with a large parallel was used to smooth the trouble spots. I was

careful to wipe off all grit and metal flecks because they can embed in the UHMW tape and cause damage.

My ram now slides smoothly with no play.



Ram with Shims & UHMW Photo by R. G. Sparber

Above you can see the slide ways, brass gib on the right, and top clamps. The shims and UHMW tape are barely visible.

Stay Tuned for part 11 from R. G. Sparber next month.

Keep sending me email with questions and interesting shaper stories.

My email address is:

[KayPatFisher@gmail.com](mailto:KayPatFisher@gmail.com)

Kay

### NEMES Shop Apron



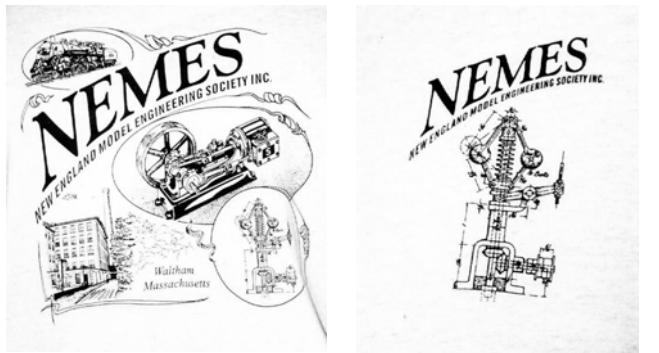
Look your best in the shop! The NEMES shop apron keeps clothes clean while holding essential measuring tools in the front pockets. The custom strap design keeps weight off your neck and easily ties at the side. The apron is washable blue denim with an embroidered NEMES logo on top pocket.

Contact Rollie Gaucher 508-885-2277

### NEMES Tee Shirts

NEMES tee shirts and sweat shirts are available in sizes from S to XXXL. The tee shirts are gray, short sleeve shirt, Hanes 50-50. You won't shrink this shirt! The sweat shirts are the same color, but long sleeve and a crew neck. Also 50-50, but these are by Lee. The sweat shirts are very comfortable!

Artwork by Richard Sabol, printed on front and back:



Rear

Front

Prices:

	Tee Shirts	Sweat Shirts
S - L	\$12.00	\$22.00
XXL	\$14.00	\$24.00
XXXL	\$15.00	\$25.00

Add \$5 shipping and handling for the first tee shirt, \$1 for each additional shirt shipped to the same address. Sweat shirts are \$7 for shipping the first, and \$1.50 for each additional sweat shirt. Profits go to the club treasury.

Mike Boucher  
10 May's Field Rd  
Lunenburg, MA 01462-1263  
[mdbouch@hotmail.com](mailto:mdbouch@hotmail.com)



## For Sale



Prazi Lathe - small bench model approx. 5X12  
Very little use. Complete with all accessories  
including gears for metric and US threading.  
Also have quick change tool holder.  
Call in the evening 603-746-7722  
Carl Goodman [electricarl@yahoo.com](mailto:electricarl@yahoo.com)



## Upcoming Events

Bill Brackett

To add an event, please send a brief description, time, place and a contact person to call for further information to Bill Brackett at  
[thebracketts@verizon.net](mailto:thebracketts@verizon.net) or (508) 393-6290.  
*Bill*

Jan 1<sup>st</sup> New Years day run  
Waushakum Live Steamers  
Holliston MA  
<http://www.waushakumlivesteamers.org>

Jan 6<sup>th</sup> Thursday 7PM  
NEMES Monthly club meeting  
Charles River Museum of Industry  
Waltham, MA 781-893-5410  
<http://www.neme-s.org>

Jan 15<sup>th</sup>-16<sup>th</sup>  
Cabin Fever Expo  
For bus trip, call Dick Boucher ASAP 978-352-6724  
<http://www.cabinfeverexpo.com/>

Jan 29<sup>th</sup>-30<sup>th</sup>  
Amherst Railway Society Big Railroad Hobby Show  
Eastern States Exposition, West Springfield, MA.  
<http://www.amherstrail.org/>

Feb 3<sup>rd</sup> Thursday 7PM  
NEMES Monthly club meeting  
Charles River Museum of Industry  
Waltham, MA 781-893-5410  
<http://www.neme-s.org>

Feb 19<sup>th</sup> 10AM-4PM  
14<sup>th</sup> Annual NEMES Model Engineering Show  
NEMES Monthly club meeting  
Charles River Museum of Industry  
Waltham, MA 781-893-5410  
<http://www.neme-s.org>

Feb 26<sup>th</sup>-27<sup>th</sup> Snow Movers Winter Transportation Festival  
Demos from Model T snowmobiles to 1914  
Lombard Log Hauler  
Owls Head Transportation Museum Owls ME  
<http://www.ohtm.org/>