

PEAK OF FLIGHT

NEWSLETTER

ISSUE 423 | AUGUST 9th 2016

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Hatch-Accessible Ebay



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PEAK OF FLIGHT

Building A Hatch-Accessible Ebay

By Samer Najia

A few weeks ago I was reading the NAR magazine and saw a great article on building an electronics bay directly into a body tube. I really liked that idea, but I also happen to know how frequently I lose rockets due to various reasons. I wanted to come up with a way to create a payload bay that had the following criteria:

1. Comes down separately from the booster section
2. Can be, therefore, transplanted onto different rockets with the same tube diameter
3. Allow the Ebay to accept any type of electronics, and in my case a camera transmitting video over Radio Frequency (RF), which means no keychain cameras
4. Use as many off the shelf parts as possible
5. The design must be scalable up and down

In this article, I will take you through my build, but keep in mind there is no reason you can't make it YOUR own way. For example, I leave you with different fastening options, the ability to define your payload bay size as well as where it sits on your rocket (in my case, I wanted mine about midway up and out of the turbulence of the nose cone).

The premise behind this concept is to use a tube coupler for the Ebay itself, slide it into your body tube, cut out a hatch, put in bulkheads and a floor and voila...payload bay with permanent Ebay! Seems pretty easy, and it is. Generically, you will need:

- The body tube where the Ebay is going to live
- Tube couplers -- I used 2 for my BT-80 based build, but you would use whatever coupler ap-

plies to your application and as many as you need based on how long your bay should be

- Plywood bulkheads if you can buy them, 1/16 or thicker balsa if you can't. I used balsa and cut my bulkheads with scissors
- Sheet plywood or sheet balsa for your payload floor
- Glue, X-Acto type knife, straight edge, ruler
- Plywood strips (1/8" is fine). You can also use strips of balsa glued together to make a laminate

Decide on the Size of the Ebay

I wanted something that extends into a secondary body tube (payload) to which the nose cone of my rocket is attached. So that meant I needed 2 couplers, although I was not going to use much of the second coupler because part of it was going to extend into the secondary body tube. In your case, make a decision on how big your bay should be.

Trace and Cut out the Access Hatch

Using a straight edge, trace out the access hatch on your body tube (**Figure 1**). I decided I wanted cut a hole out of $\frac{1}{4}$ of the body tube so I actually used a credit card bent around the tube, but you can use a ruler or whatever else. Cut the hatch out with the X-Acto knife, slowly and carefully (**Figure 2, Page 3**).



Figure 1: Trace a rounded rectangular shape onto the tube by using a credit card or ruler for reference.

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Figure 2: Cutting and removing the piece from the side of the body tube.

Test Fit the Couplers

Remember that the idea is that this entire payload bay module can be transported from rocket to rocket. It can also sit between your main body tube and your nose cone. In my case the entire top of my rocket is this module, so I needed 2 couplers. (**Figure 3, Figure 4**)



Figure 3: Sliding one coupler into the body tube for reference.



Figure 4: Placing both couplers flush against each other in the body tube.

Since I was going to keep sliding the couplers in and out several times, I put in some alignment marks (**Figure 5**). Later the couplers will be completely glued in place.



Figure 5: Draw alignment marks on the couplers.

Mark the Couplers

I needed the hatch to rest on something, so I needed to mark the couplers such that I can cut the main hole in them through which you can get to the payload. I drew $\frac{1}{4}$ " from the edge of my body tube cut (**Figure 6**), but for you that could be different depending on what size tube you are using.



Figure 6: Before cutting the main hole you will draw lines $\frac{1}{4}$ " from the edge of the body tube for reference.

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Notice how I heavily marked the area NOT to cut. This way, only the unmarked space in the middle is removed.

Cut the Couplers

I removed the couplers and with a pair of scissors, cut along my lines to make the inner opening of the payload bay. Remember that the alignment marks will be key here, as will the markings when you put the couplers back (**Figure 7**).



Figure 7: Cut out the main hole in the couplers. Make sure that the markings you made in the previous step are aligned.

Install Bulkheads

When I was rummaging through my parts bin, I thought I had bulkheads from another build. I was wrong. So I made a set. I had some balsa sheet and I cut out some disks to fit. I made 2 disks for each side. When I glued them on I made sure the grain on one was perpendicular to the other behind it. This way my bulkhead would be light and strong. At this point I glued the bulkheads into place and let them dry (**Figure 8**).



Figure 8: Gluing in your bulkheads.

Install the Ebay Floor

Put the couplers back into your tube (**Figure 9**), align them and measure out a sheet of material (plywood, balsa or fiberglass) and test fit it into your Ebay. The idea is to have this sorted out now and glued in before you make the ebay a permanent part of your body tube.



Figure 9: Pre-assemble the coupler back into the body tube so that you can measure the length of the Ebay floor.

Remove the couplers and install the floor. I set the floor on one coupler first (**Figure 10, Page 5**) and then put that back into my tube before adding the second coupler. You do not need to glue the coupler into the body tube yet.

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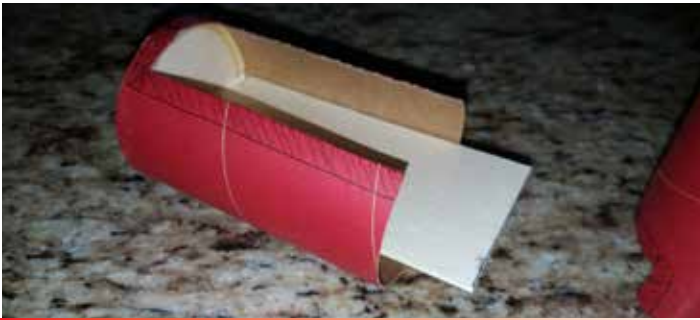


Figure 10: Setting the floor on one side of the coupler first.



Figure 11: Adding balsa to reinforce the sides of the bay.

In my case, I added some reinforcing balsa on either side of the bay (**Figure 11**). I only did this because I suspected I might need to put something heavy on that side, which may not be the case for you.

Install the plywood Strips under the Ebay Lip

I installed strips of plywood just under the lip of the Ebay in anticipation that one day I would need to use counter sunk screws to hold my hatch down, although in this article I did not do so. I instead opted for blue-tape hinges and restraints because in the field I wanted to be able to quickly open and close the hatch without too many tools. So for this design the plywood strips served a different purpose. They connected the 2 couplers together at the lip and helped to keep their edges aligned (**Figure 12**).

Glue the Ebay in Place

Now you can remove the joined couplers (when all the glue is dry) and put some white



Figure 12: Using plywood strips to keep the coupler edges aligned.

glue inside your body tube and secure your Ebay (**Figure 13**). Once the glue is dry, you can install whatever telemetry you want using Velcro or other means. In my case, my entire package is on a separate sled that can be removed from the bay at any time and is secured with Velcro. Because I wanted a camera that uses a transmitter, the camera itself sits under one of Apogee's shrouds on top of the hatch, while the transmitter, altimeter and power supply are inside. Feel free to drill holes in your hatch so that your altimeter can read air pressure properly. You can also put in holes into the side below the hatch so that the hatch is not compromised. Be careful though, because if you'll notice in the next step, I use tape to create hinges and a closing restraint for the hatch, and the tape could cover the holes.



Figure 13: Glue the Ebay into the body tube.

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Install Hinges

As I mentioned, I wanted quick and easy access to the entire payload in the field AND while on the launch rod/rail. So I used tape hinges (**Figure 14**). Yes, the looks aren't there and you are indeed looking at a partially painted rocket forward section, but once you are done here, you can do all the painting you want. Use tape to cover one of the longer lengths of the hatch and overlap onto the body tube to create a hinge. You can also use something more permanent, like fabric tape.



Figure 14: Adding tape to create a hinge for the hatch door.

You should have a hinged door now that you can access at any time.



Figure 15: Testing the tape hinge.

Finalize

A strip of tape opposite to the hinge holds the hatch in place during flight (**Figure 16**), and can be replaced easily in the field with just about anything you can get your hands on. Don't forget you

can also use screws, plastic rivets or anything else that suits your fancy. I always carry a roll of blue tape or Frog tape when I go fly, so this works for me.



Figure 16: Taping the other side of the hatch to seal it into place.

Finally, here's my finished rocket before painting with my camera shroud on the hatch (**Figure 17**). This rocket is 9 feet long!



Figure 17: Completed rocket

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About The Author:

Samer Najia was trained as a Mechanical Engineer (Fluid Mechanics) and was bitten by the 'flying bug' when he was a child. He started flying rockets as a teenager when rocketry where he was growing up (Europe) was largely unheard of. He started building scale models when he was 6 and hasn't stopped yet, but rediscovered rocketry about 6 years ago and hasn't looked back, and since has built bigger, faster and higher powered rockets. He is also a flight instructor flying around the DC metro area and is building an airplane in his garage. Needless to say if it flies, he want to know about it, work on it, fly it. He and his kids fly rockets out of Great Meadows with NOVAAR and continue to work on trying to get rocket videos from higher and higher altitudes.

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