

## Blast testing debrief

### Blast 1

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200 gram 50/50% PETN/TNT

Pick prod #1

Back hand clean, maybe do not need rear hand shield

Front hand rubber glove split down the side

Rear handle bent, most likely based on hitting the wall in the mine

Prod is bent somewhat but is fully connected

Hand shield is damaged in multiple places on the outside

Inside is clean, Kevlar leaking out near bottom, stitching and seams coming apart a little bit

Shield is sliding is down on handle

### MIT clipper #1

Metal anvil free part is missing

Arm support cuff is folded over and dinged up on the back edge, possible due to wall hit

Hinge bolt is gone, this one was a through hole, not threaded, so blade was released

Vegetation holder is mostly gone, torn off

Mushroom head on pull rod held and pull rod head, so blade was retained

Fixed blade is bent back 90 degrees or so, pull tore through part of main tube

Tape over back end of tube blew out, suggesting blast ducting

Fixed handle is almost torn off completely, unclear if this is a result of blast ducting or wall hit

Spring stayed in place

Hinge bolt stayed in place

The pull rod pin stayed in place, but is somewhat exposed, perhaps overlap with pin and wall could be better

Blast shield is completely gone, nylon exterior ripped open, Kevlar came out, need to stitch through outer shell

Hand was shredded, no more piano playing

### German clipper

Main tube bent, may be due to wall hit as well as direct blast coupling

Lost the serrated vegetation retainer, bolts stayed but heads are missing, threaded bolts tend to stay in their holes

Piece of plastic at the head mount disappeared

Kink in the tube at the rear adjustment slot

Retaining clip on the handles was lost, may be due to wall hit

Handles were bent over some, may be due to wall hit

Main tube leading edge is somewhat damaged

Tube is dirty inside

Clipper generally did well

### Blast 2

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240 grams

Pick prod #2

Much like the first, but bent more

Some seam ripping at the bottom edge

Some stitching coming apart on the back face

Rear hand is OK

Front hand is missing two pieces of rubber, quarter sized and JFK half dollar sized, rubber is missing, this parts of the hand were not behind the blast shield and might have been hit

### Visor

Anti fog clip came off and was lost

Roll bar was pushed up to the top of the visor just over the edge and stopped  
Visor is pitted and scratching  
Pretty dirty  
Fog deflector is marked up somewhat, but is fully intact

Vest  
Velcro opened up  
Numerous small holes in the outer fabric layer  
Apparently no holes in the black fabric on the shield layer inside  
One plastic clip broke apart

Head  
Some dissolving of foam and flat nose are from solvent spray and from shipping  
Lots of pitting on the neck  
Pink foam in the neck hole is damaged  
Pink foam is cracked in many places, possibly from rapid expansion

Blast ducting tests  
1 Control - open tube  
Tape blown out and round disk is gone  
Half tube bent somewhat

2 drilled holes  
Tape blown out and round disk is gone  
Did not bend at all

3 cut and pressed vents  
Tape blown out and round disk is gone  
Bent at all of the slits, were pointed up or might have torn in half

Blast 3  
-----  
100 grams

MIT Clipper #2  
Polycarbonate is completely gone  
Rivet holding it on is gone too  
Threaded hole on fixed blade is cracked to outside edge but held  
Spring vegetation holder is attached but straightened out, flying in the wind  
Clipper head bent up 90 degrees  
Nut is loose but retained (polycarbonate was missing)  
Duct reducing shield on front of tube stayed  
Tape over back end of main tube is blown out, tape was masking tape  
Free handle smashed into the back end of the main tube and was bent and creased somewhat  
Back handle separated, welds on gussets ripped off, handle pushes up tearing the bottom of the weld first  
Spring came out, probably because parts separated, spring might be used as a secondary attachment  
Hand has 4 holes or tears on the back, these may have been where the hand was not covered by the shield  
Some char on hand near the blast ducting  
Shield came off completely, but was probably there protecting the hand, might not have been bolted through the plastic  
Shield took many hits and was very dirty even though it separated  
Plastic from the shield came out and was gone  
Velcro tore right off

Blast 4

-----  
50 grams

MIT Clipper #3

Head is bent up 90 degrees

Polycarbonate anvil and rivet are gone

Vegetation holding spring is completely gone, looks like a bad weld, could be a real QC issue

Bolts hold, rivets do not, welds mostly do if done right

Ducting tape is mostly intact and is in place, cut along half of the edge, possible from sucking back in

Stuff blown out maybe give flaps so all tape was sucked and cut

Plastic is missing from the hand guard

Hand is intact

No blast ducting marks

Frames intact but is somewhat twisted

Remaining 6 duct tests

All tape blew out again, including one mostly covered, not clear that ducting was the problem or the low pressure wave pulled them off

Other notes:

Next time, if we do these small charge sizes, we can do them outside the mine

Figure out what bolts are, they came from Fred's shop

Try a bent tube to see if the blast can be ducted around a bend

Try filling the tube with material

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