

Principles of OME Exam.

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Luke Penny 1810356

A) 1) Combustion is a release of energy without any significant change in pressure. Propagation by thermal conductivity and hot gas.

Deflagration is a violent combustion with a release of hot gas and flame.

Detonation is a reaction by means of a supersonic shockwave within the material.

A detonation of a high explosive is a much faster detonation / shockwave causing a much higher explosive velocity. The chemical reaction within the explosive compound reacts at a much greater speed.

2) The rate of propagation may accelerate, if the explosive is sufficiently energetic and the heat of combustion is not lost to the environment. If the propagation rate increases to the speed of sound in the material, we are now at detonation.

3)

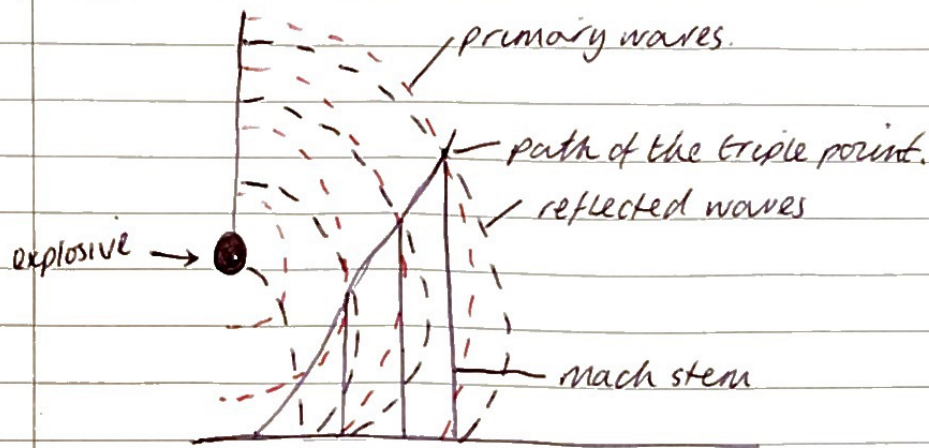
- Etched casing or pre-drilled, to create fragmentation
- Liner to hold explosive in place during flight/launch.
- Fins for stabilisation
- Spinning the round on launch / in flight.

A) 4) Primary explosives detonate by some means of ignition from flame, spark, impact, ~~electricity~~ or other means that produce heat of a sufficient magnitude. Secondary explosive require a detonator and in some cases a supplementary booster. The main purpose of a booster is to provide a sufficient energetic pulse to the secondary explosive to achieve an optimum velocity of detonation.

5) The perforation to propellant grains is there to alter the performance / burn rate of the material. The more holes the greater surface area thus a more rapid reaction. The varying perforations and grain size will affect the rate of gas generation thus selecting the correct format differs for ~~each~~ each munition type.

6) Varying the particle size of the fuel will change the ~~rate~~ speed and output of the reaction. The smaller the particle size, the greater surface area ~~available~~ when reacting with the oxidiser making a more violent reaction. Increasing the particle size will reduce the ~~surface~~ surface area and the reaction will be slowed down.

B. i). Detonation in air.

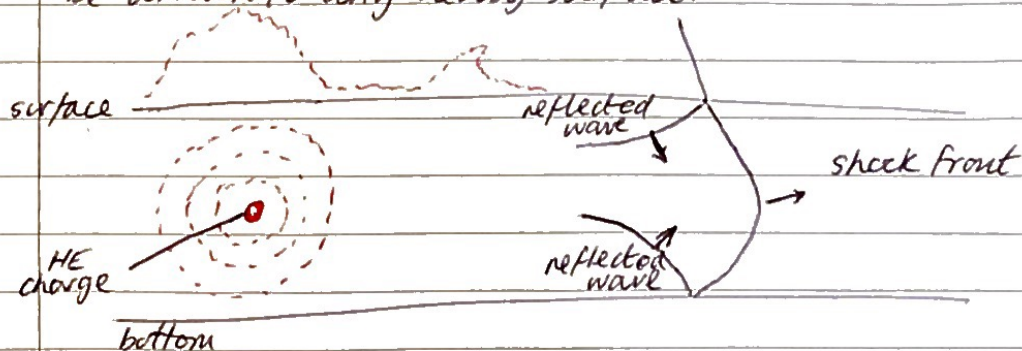


from the above image, when the explosive is detonated above the ground the shock wave propagates through the air until it is reflected off the ground and thus ~~reflect~~ reflects over the initial primary wave and create a path of triple point where all the shockwaves meet. The mach stem ~~is a shock wave formed from the reflective shockwaves catching up with the primary shockwaves.~~ is a shock wave formed from the reflective shockwaves catching up with the primary shockwaves. The change in altitude and distance on the explosion can be significant. The higher the explosion in the atmosphere where the pressure is different and less oxygen mean the shockwaves will move quicker and have little to no reflection of shockwaves. The ~~distance~~ lower the distance, the change in pressure will still have an effect on the speed of the shockwave and you will likely have reflected waves bouncing off surfaces creating the mach stem.

- B) 1) design characteristics for maximising the effect on the target.
- Increased payload
 - larger shockwave, quicker propagation of gases.
 - fragmentation
 - directed blast wave instead of being omni-directional.
 - A profiled liner to ~~the~~ localise shockwave and encourage the formation of optimum sized fragments.

Under water blast warhead.

- In an air explosion the gaseous products from the detonation stream outwards (dynamic over pressure). Underwater this can't happen and the gaseous products are trapped as a bubble. The bubble will expand and ~~at~~ over-expand, contract and over-contract and this oscillation will occur for several cycles. The bubble will be drawn to any nearby surface.

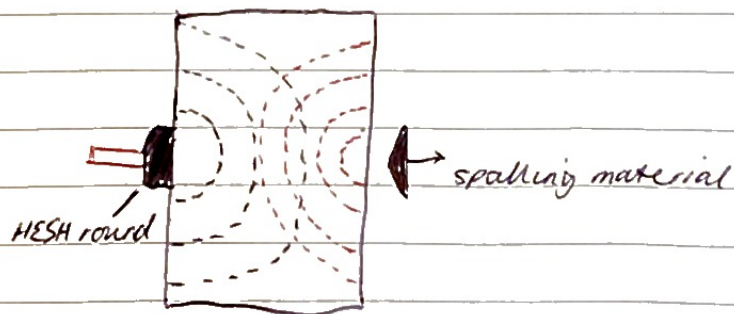


When the detonation occurs the shockwave passes through the water and reflect of the bottom ~~at~~ and surface layers and concentrate the shockwave. The effects on a target are that the bubble formed will draw nearer the target and oscillate for several waves so ~~a~~ more than one shockwave onto the target causing greater damage.

B) 1) Advantages of using blast / frag warhead is they are omni-directional, throwing the shockwaves in all directions and the internal blast is very effective. They are relatively easy ~~to~~ and cheap to construct. The disadvantages one the external blast from being omni-directional is wasteful. There can be increased collateral damage and can be very sensitive to distance and altitude.

B) 2. High explosive squash head.

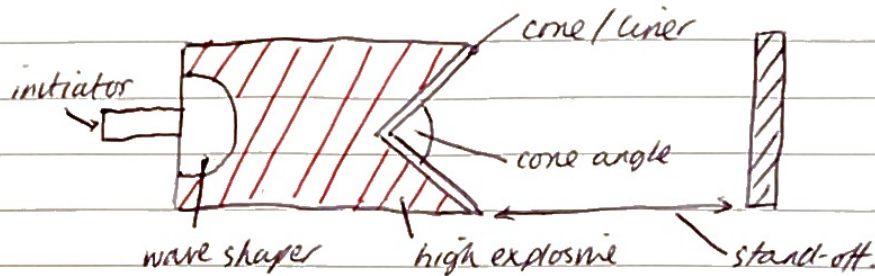
On impact, the shell squashes into a 'compa', the explosive initiates from the rear, and the shockwave from the detonating explosive is passed into the target armour causing spalling from the rear face.



For the HESH round to be effective it must hit the target. For the felling of the round, the fill has to withstand the effects of firing the munition as you don't want the fill to be loose inside. The shell casing needs to be structurally sound to withstand the set back forces from launch. It must be ductile and tough to control the deceleration of the round on impact. The bitumen at the front of round absorbs just enough impact to sufficiently

B) 2) allow the explosive force to pass onto the target.

Shaped charge



Initiation of a shaped charge is triggered at a stand-off, this is to allow adequate distance for the jet to form.

The cone/liner is shaped as such so the tip of the cone in direct contact with the explosive will deform and ~~compress~~ create a slug which is travelling faster than the material behind. The jet is directed at a target with a velocity > 1000 m/s. The jet then erodes itself and is consumed by the target.

The shaped charge creates deep penetration into armour and great damage to other targets.

To achieve the desired outcome and a good effect the system must be axially symmetrical. The liner must be symmetrical and have good flow properties.

The HE filling must be of uniform composition and density. If the stand-off is too little or too much then the shaped charge might not have enough time to form the jet and not create the desired outcome.