SECTION 10

BLAST

1001. Composition of Blast

a. **Shock Waves**. When a bomb explodes in air, a sudden shock is transmitted to the surrounding atmosphere and shock waves are formed. These are similar to sound waves and pass outwards through the air without actually moving it. The first shock wave is the only one of appreciable size and the only one to be considered.

b. **Pressure Phase**. As the front of the first shock wave move outwards through the air, the pressure of the atmosphere behind it is suddenly raised far above normal. The wave, therefore, applies a sudden and considerable thrust against any obstacle in its path. The period while the atmospheric pressure remains above normal is known as the pressure phase.

c. **Suction Phase**. The pressure phase lasts only a fraction of a second and the pressure rapidly decreases to a point below normal. Fig 10-1 shows that the fall below normal is not as marked as the rise above, but it also shows that the period of low pressure lasts must longer. This period, while the atmospheric pressure is below normal, is knows as the suction phase.

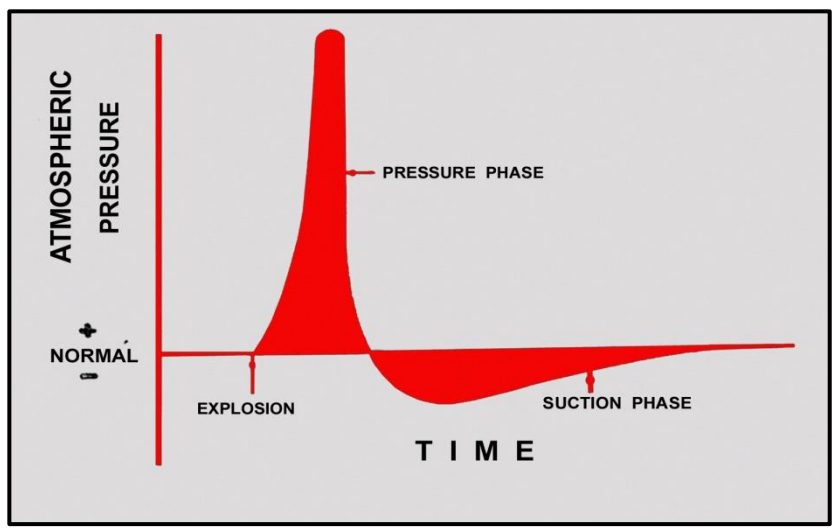

Fig 10-1: Effect of Explosion on Atmospheric Pressure

d. **Wind Force**. The rapid expansion of the air caused by the sudden rise in temperature creates a movement of air outwards from the explosion. This wind force rapidly loses power, however and is a comparatively minor cause of damage.

The Action of Blast (Fig 10-2)

1002. A house near a bomb explosion is first given a thrust on the side facing the explosion. As the pressure on the inside of the house remains normal the excess pressure on the outside tends to buckle one side of the house inwards. Then the suction begins. During this phase the pressure is lowered not only on the side facing the explosion but all round the house. The pressure on the inside still being approximately normal, the whole house tends to expand outwards. The difference between the inside and outside pressures during the suction phase is not as great as in the pressure phase but as it lasts longer the suction effect can be just as damaging especially as houses are so constructed that they withstand an inward better than an outward pressure.

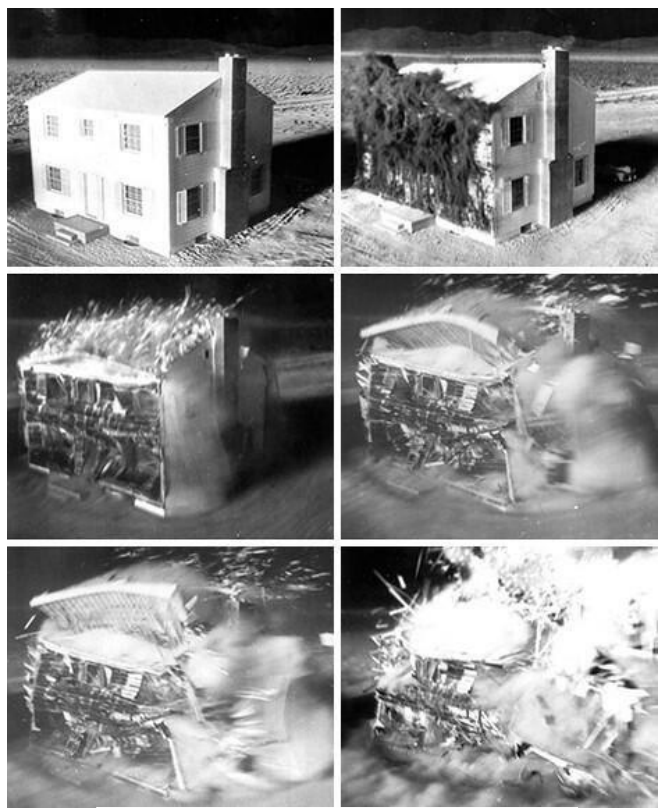

Fig 10-2: Action of Blast on a House

Fig 10-3: A Wall Pushed Inwards in the Pressure Phase

Effects of Blast

1003. a. **Normal effects**. Blast can seriously damage buildings particularly light structures over a wide area. Walls, windows, doors and roofs may be forced either inwards during the pressure phase (Fig 10-3) or, outwards during the suction phase (Fig 10-4). Independent walls or fences such as those surrounding gardens may be toppled over. Trees are often stripped of their leaves and branches but tree trunks, chimneys and other well anchored objects of small surface area around which the blast can easily flow are frequently left undamaged quite close to the explosion (Fig 10-5).

Fig 10-4: A Wall Pushed Outwards in the Suction Phase.

Fig 10-5: Chimneys by-Passed by Blast

Roofs and walls have been forced inwards but the chimneys being made of small surface area remains undamaged

b. **Freak effects**.

(1) **Shielding**. During the pressure phase when the blast acts only away from the explosion objects shield one another. Even very light structures close to the centre of explotion may be undamaged if shielded by something substantial (Fig 10-7).

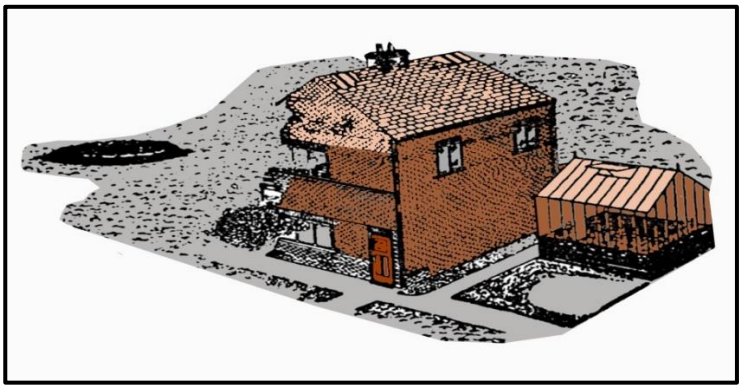

Fig 10-6: Shielding Effect

(2) **Reflection**. On the other hand blast often causes damage well outside its normal range while structures similar to those damaged although much closer to the explosion are unaffected. In a single street, certain housed at intervals may be damaged and others in between them be untouched. Most of such freak effects are caused by the focusing of different parts of the wave front by reflection (Fig 10-7).

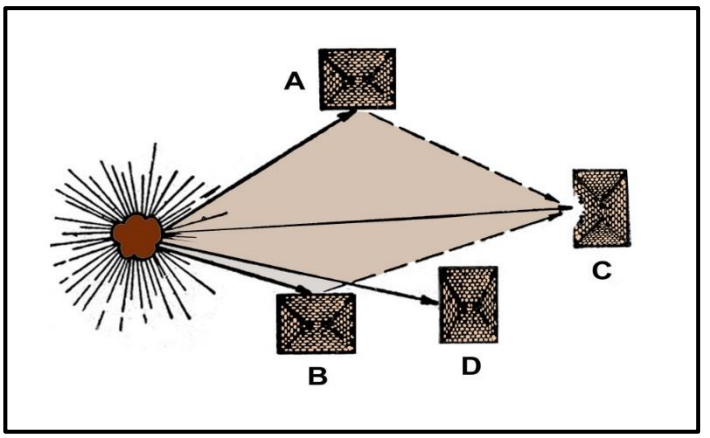

Fig 10-7: How Freak Damage is Caused by Reflection

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