

Stop-gap weapons of 1940:

the concept of the aerial minefield

"Having released their bombs on the (Kenley) hangars and other buildings on the south side, the bombers skimmed low over the landing ground to make good their escape. Ahead of them lay the line of 9 parachute and cable launchers intended to counter just such an attack. As the operator saw three enemy bombers coming straight for him, he pushed the firing button. With a united 'Whoosh', nine rockets soared vertically into the sky in a salvo, each one leaving a dense trail of smoke.

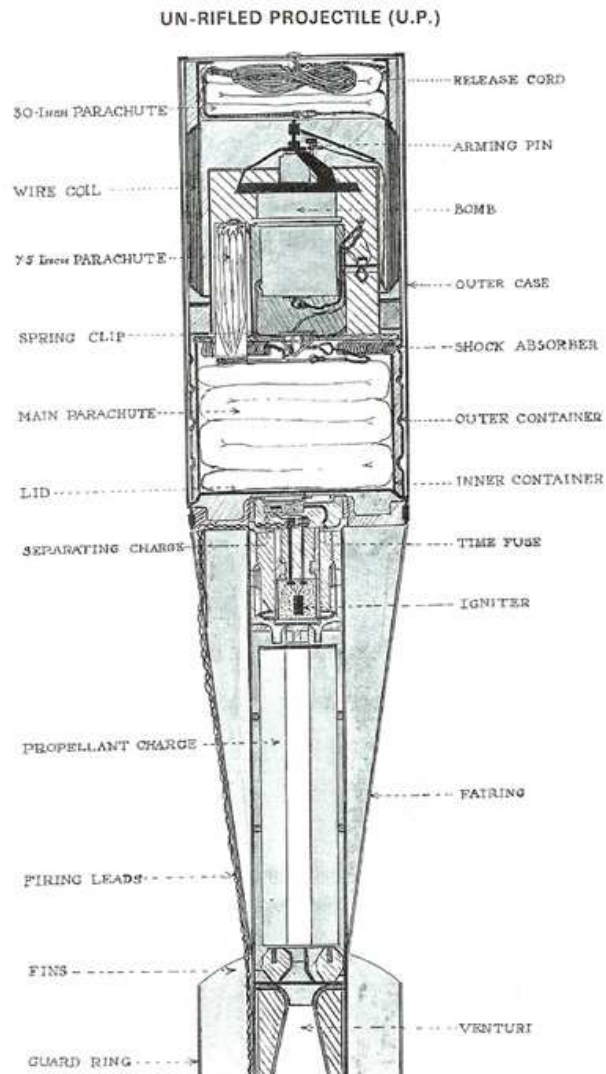
Feldwebel Wilhelm Raab, at the controls of one of the Dorniers, described the strange sight that unfolded in front of him:

'Suddenly red-glowing balls rose up from the ground in front of me. Each one trailed a line of smoke about 1 metre thick behind it, with intervals of 10 to 15 metres between each. I had experienced machine gun and flak fire often enough but this was something entirely new.'

The right wing dropped and the left wing rose, as the pilot aimed the bomber for the gap between adjacent smoke trails. The next he knew there was a hefty tug and his machine yawed briefly, then straightened out. The plane's wing had struck a cable, but close to the tip...the cable slid off the wing before the lower parachute opened and took effect.

Another Dornier was less fortunate. Already hit and on fire, one of its wings struck a hanging cable. The device functioned as intended and the combined drag from the two parachutes on one side sent the bomber down and out of control.

Excerpt From Britains Air Defences 1939-1945, Alfred Price and Darko Pavlovic



The unlucky Feldwebel Wilhelm Raab may have been the first Luftwaffe pilot to experience an attack by parachute and cable (PAC) rocket defences, but the question of whether they succeeded in bringing down a single enemy aircraft in WWII is still open to argument.

When the drums of war started beating in the late 1930s governments across Europe rushed new weapon designs into testing and production. Many of these emerged from the machine shops and labs in time for the Battle of Britain. And many disappeared again after failing spectacularly.

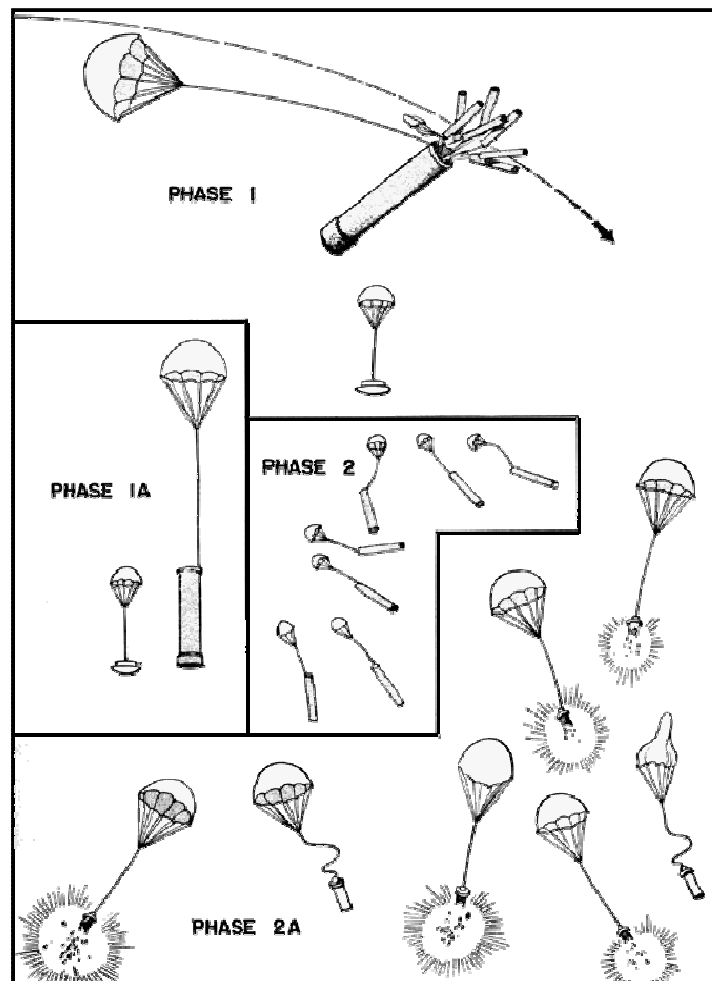
One of the most interesting and bizarre ideas which emerged in 1940 was a range of anti-air weapons which can broadly be labelled 'aerial mines' - a desperate attempt to fill a gap in low-level air defence against fast moving aircraft.

German engineers were among the first to experiment with the concept of launching multiple small contact mines to high altitude, suspended by parachutes, creating a virtual minefield for the aircraft to fly through.

While it sounded fearsome, the idea was abandoned as both impractical (the mines drifted uncontrollably and didn't stay aloft long enough) and dangerous, as the contact mines also exploded on their return to earth!

This didn't stop German propaganda films referring to this new super-weapon in newsreels in the early 1940s, though it was never deployed.

US Army intelligence in 1940 did report the deployment of German 86mm and 152mm cable rockets containing either 300ft (86mm) or 3,000ft (152mm) of cable.



The Japanese (see illustration at right) also fielded an 'AA mine discharger' – a rocket with multiple warheads intended also to lay an aerial minefield. The device was a simple tube like an infantry mortar of 70 mm or 81 mm caliber. Instead of a standard mortar bomb the projectile was a tube containing the 7

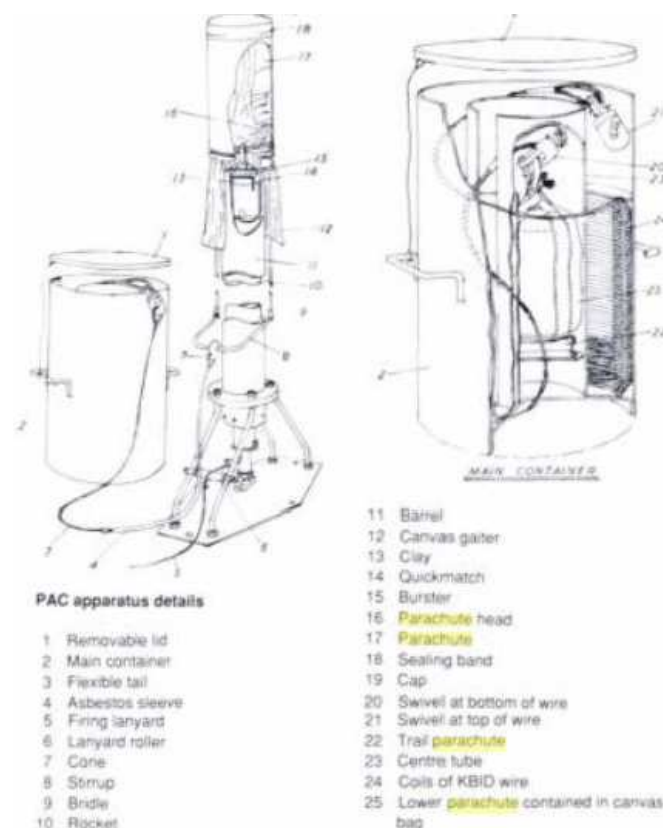
individual mines each approximately 11/16ths of an inch in diameter (18 mm) and 3 inches long (75 mm).

Each mine was equipped with its own parachute. When fired, the mortar threw the shell to a range of 3,000 to 4,000 feet (900 to 1,200 m) and a maximum altitude of approximately 600 m. The shell ejected the mines at the top of its arc. They would then float down on their parachutes. They were fused to detonate on contact or after a fixed time period, damaging nearby aircraft.

It had more success used a simple cluster bomb fired over enemy troops.

The British parachute and cable projectile was developed by the team of Sir Alwyn Crow who was the director of the Projectile Development Establishment at Fort Halstead. In November 1939, Winston Churchill as First Lord of the Admiralty asked Dr. Crow to produce urgently a means of laying an aerial minefield and to consider other methods of protecting ships against aircraft.

A specification for three high-altitude barrage systems was developed: the *PAC* or parachute and cable, an aerial minefield up to 19,000 feet (5,800 m); the *FAM* or fast aerial mine up to 2,000 feet (610 m) with PE fuse up to 18,000 feet (5,500 m) and the *UP* with range of 20,000 feet (6,100 m). The specs were not entirely met, but the various systems were deployed.



It is likely that Churchill was influenced in his request by his friend and advisor Frederick Lindemann who had previously advocated a scheme for "dropping bombs hanging by wires in the path of attacking aircraft". The basic design was delivered in 1940, by physicist PI Dee, who later was instrumental in the development of radar.

All three services, including the Home Guard, used the PAC in various forms.

The ground based batteries were installed by Royal Air Force electricians, as described in the account of one such electrician below:

We finished up on Norfolk at Horsham St Faith, where we had to lay out electrical lines, consisting of a canister which had a parachute inside,

connected with strong piano wire. So in a line you could have 10 or 20 of these canisters. There would usually be 3 lines, so if you were unlucky with one there would be 2 more.

These lines would be laid out for defence for, eg a bomb dump, or other places the enemy would be likely to approach. The rockets were sent up electrically to a height of up to 600 feet. Should enemy aircraft be coming down less than 600 feet, the operator would send up one line of rockets in anticipation that the enemy aircraft would fly in and probably pick up one or two of these cables on the wings which when the parachute was opened on the cables would create a pull on the wings of 1 ton. This would automatically mean that the pilot would lose control eg a dive bomber diving on its target is already in a steep dive and picking up 2 or 3 of the cables it would automatically lose control.

The only confirmed aircraft killed by a land based PAC system was a Wellington bomber used in prototype trials, while the navalised UP system claimed 9 kills. The Do17 kill at Kenley mentioned in the opening paragraph must be classed as an 'assist', as the aircraft had already been hit and badly damaged by AA fire. Postwar examination of Luftwaffe records showed some pilots did report wire entangling their aircraft, which was noticed after landing, and attributed at the time to barrage balloons.

All British systems used the same basic concept – a ground to air rocket which launched a long wire cable into the air, suspended at each end by a parachute and intended to foul the control surfaces of attacking aircraft, if not rip whole wings off. Variations included attaching an aerial contact mine to the cable.

The opinion of the British forces about these systems is summed up by a former British merchant seaman, Jack Frearson:

These fiendish contraptions were fitted one on each side of the bridge.

We are told: "The P.A.C. Rocket is a device for placing a strong wire, 480 feet long, vertically over the ship in the path of an attacking aeroplane. There is a parachute at each end of the wire, and the effect of an aeroplane striking the wire should cause a violent swerve and possible dive into the sea"...not to mention a dive and crash onto the deck of our own ship with bombs and all !!

"The general rules to be followed are :-

- (a) Fire the rocket five seconds before it is estimated that the aircraft will be right overhead - it is better to be a little early than too late.*
- (b) In rough weather the rocket should be fired when the ship is roughly upright.*

Safety Note: When firing do not stand near to the rocket or wire box. Apart from the blast of the rocket the wire is inclined to whip about. (And could take the operator up in front of the enemy aircraft!! This might have serious

consequences particularly if the enemy airman is unsportingly firing his machine guns at the time !)

A further quixotic invention was the KITE...a 20' box kite (mine) to be flown on a wire from the truck of the mainmast! Imagine trying to get this aloft when blowing a gale - or in a calm ?

Fortunately, it wasn't long after this that the Admiralty started to take matters seriously and my ship "Empire Gazelle" was eventually fitted with a 4" Quick Firing S.A. Gun aft, a 12 Pounder A.A.(Anti Aircraft) gun forward, four Bofors 40mm light A.A. guns port and starboard, several 20mm Oerlikon A.A. guns centrally as well as two banks of Multiple Rocket Launchers amidships for surface defence.

The PAC battery: This fired a 480ft cable into the air, suspended by parachutes, in batteries of up to 3 lines of 9-10 rockets. It was installed to complement low level air defences, such as balloons, against low flying aircraft at British airfields and industrial sites.



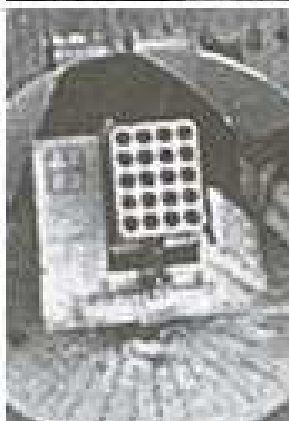
Uniquely, the PAC is actually modelled in the combat flight simulator Battle of Britain II, Wings of Victory, where PAC batteries complement the standard Bofors 40mm low level AA guns.

PAC rockets as deployed in the flight simulator BOBII Wings of Victory.

BOBII players can rest assured though that they are more likely to be knocked down by a migrating grey goose than a PAC rocket – just as in real life in 1940.

The Urotating/unrifled projectile (UP): A truly fearsome looking system mounted on RN warships and merchant marine ships for AA defence (see photograph below).

The launcher comprised a square barrel with 20 bores which launched PAC rockets in 2 salvos of 10 rockets each, armed with 1000ft cables and aerial contact mines. The crew comprised an aimer (an 'UP layer'), who communicated with the fire control officer via telephone, and was located in an armoured control box to protect them from the rocket blast.



Specs: 7" Naval Wire Barrage, Unrotating Projectile (UP) Rocket Launcher

Type: Mark I (as mounted on HMS Hood)

Number of Tubes: 20
(smooth bore)

Rocket: 7 in./178 mm fin stabilised rocket (3 in. / 76 mm motor)

Warhead: 8 oz / .14 kg
aerial mine (CE)

Fuse: No. 700 and No. 720

Rate of Fire: Salvoes of 10

Maximum Altitude: 1,000 ft / 305 m

Elevation Angle (Max. / Min.): ? ° / 45°

Training: 360°

The Fast Aerial Mine (FAM) – a single bore variation of the UP with a contact grenade was attached to one end of a 400ft cable, with parachutes at each end. The shorter cabled was intended to increase the chances the mine would come into contact with the fuselage or wings of the enemy aircraft.

They were not popular with local air defence wardens or home guard units who were tasked with retrieving and disarming the widely scattered unexploded mines. Nor with residents or servicemen sheltering from the mines which also exploded on impact with the ground.

The Holman Projector – No discussion of 'aerial mines' can be complete without mention of this suicidal weapon which enjoyed a thankfully short deployment. A steam or compressed air powered mortar, it required the crew to remove the pin from an ordinary Mills bomb (grenade), drop it in the mortar and launch it at incoming aircraft.



A Holman projector prototype, with anti aircraft sight.

To demonstrate the weapon's versatility, a trial was arranged in Aldershot, Hampshire in front of the Prime Minister, Winston Churchill. No Mills bombs were brought, as it was assumed that some form of ammunition would be provided by the British Army, who were overseeing the trials.

As it turned out, this was overlooked and the trial was delayed until one officer thought to bring out the bottles of beer that had been brought to serve at lunch. The smooth bore of the Projector allowed even these irregular projectiles to be fired successfully, with all striking the target with an explosion of glass and foam.

The Prime Minister commented on the weapon afterwards, describing it as "A very good idea, this weapon of yours. It will save our cordite".

More often than not however, the grenades exploded in or near the launcher and though 9 aircraft kills are cited for this weapon, this number is also dubious.

4,500 units were produced until deployment was discontinued in 1941.

British war cabinet notes of July 1940 show that Dowding regarded the PAC as 'not of any value' and with the advent of more lethal low level AA weapons such as the 20mm Oerlikon (Pom Pom) cannon, production was subsequently reduced from a planned 60,000 a month, to 8,000, and then stopped completely in 1941.

***Primary data sources:** Britain's Air Defences 1939-45, by Alfred Price, Darko Pavlovic, Osprey Publishing; BBC Britain At War, BBC London; Allied Coastal Forces of WWII, John Lambert, Al Ross.*