The Gazette of

THE MARDEN HISTORY GROUP

Despatches

Issue 8 March 2014

Inside this issue:

Archive content (records):

- Catalogue: 5,163
- Baptisms: 16,590 - until 1954
- Marriages: 4,002 - until 1967
- Burials: 10,470 - until 1907
- Cemetery: 1,615 - until 2013
- Trade Directories: 2423
- Electoral Registers: 9,260
- Tithe records: 2,358
- Poor Law: 1,264
- Journals: 2,853

NEW

- 1911 census – 230 records
- Assizes from 1500s to 1600s: 110 records
- Heath Tax of 1664: 607 records
- Non-probate records of 1250 – 1650: 424 records
- Property news: 2012 -14: 274 records
- *see shop for new books*

COMING

- More of most categories!
- *with the proviso that this is dependent on volunteers*

Heritage Centre News

Life is very busy here with so many volunteers beavering away at their own projects. One fascinating project is the exploration of The South Eastern Gazette for any Marden news. George is painstakingly identifying the articles, copying them and pasting them in date order. Finally will come the cataloguing when the snippets which bring glimpses of by-gone life show the human side of the past will become available. Vince Greene is continuing with the modern equivalent and also looking to catalogue them.

We're sure that you appreciate the way we keep adding to our catalogue and tables. One visitor remarked that she had thought we would just be showing a few mementoes of Marden life and hadn't realised what a wide resource of information and documents we have gathered.

Bill Green from Spokane has completed the non-probate records of 1250 – 1650 (see under tables). These show some of our history not much seen before. It's so interesting to see how the names have carried on down the centuries, even with such changes of spelling. Pattenden, Sherenden and Murzie remain the same but Chyvene (Cheveney), Sipherst (Sheephurst), Steylbregge, (Stilebridge) are just about recognisable. I'd love to know where Lucylands, Flud-duckfield, and Lambewesles were!

Sian Burr has also added the Hearth Tax records – your wealth was estimated by your number of chimneys.

Rob is still managing the website himself – but could do so much more to freshen up the site if you out there could find something to contribute (don't be shy). See Vincent Tickner's request for fellow family researchers. We have not managed to find funders for web management or a co-ordinator for the Centre. However The Friends of Marden's Heritage keep us afloat with their fund raising. 2014 has seen a very successful quiz evening and recently a St Patrick's hooley night – horse racing (wooden), Irish jokes, quizzes and songs not to mention Irish stew and soda bread enjoyed by everyone wearing green. It was delightful to see our Italian intern, Gianluca, who was with us for six months, come for a weekend visit. We rounded off the reunion with a great lunch in the Unicorn. Gianluca is now working in the archives of Pisa for a two year internship.

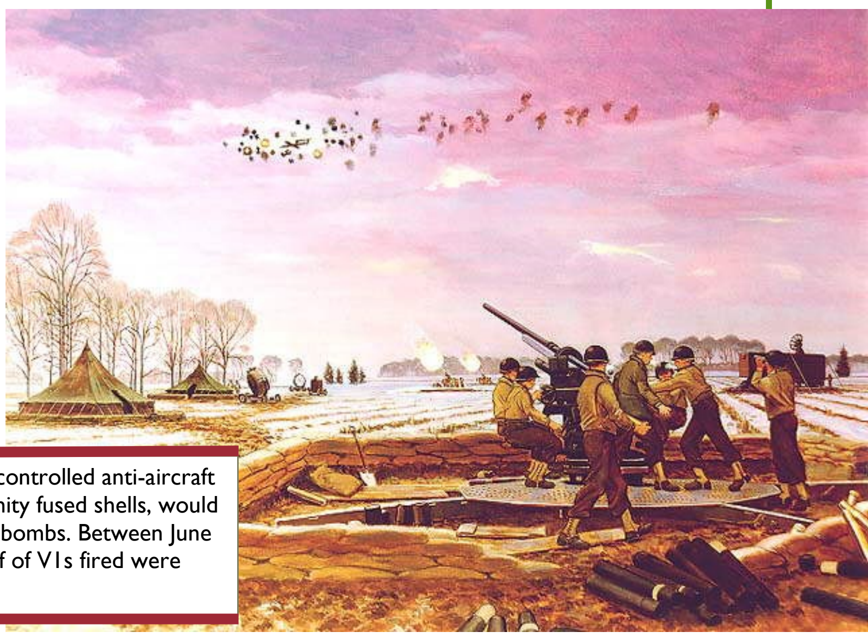
A very wet, windy and fairly warm winter is now giving way to Spring in Marden.

Machine versus Machine: Summer 1944

A V1 flying bomb, flying at over 400mph across Kent toward London

In the skies over the southern Kent coast, in the summer of 1944, a battle between automated systems took place. For the first time in the history of warfare, the weapons on both sides of this battle were primarily controlled by analogue computers; humans playing only a supporting role. German V1 drones, pilotless flying bombs launched from France and mostly aimed at London, were the targets of an advanced computer-controlled Allied anti-aircraft gunnery system. The product of combined Allied ingenuity and bankrolled as part of a development budget second only to the atomic bomb, the gunnery system brought real-time computing to a front line role in warfare that it has retained ever since. The automated anti-aircraft systems took a few weeks to get optimally set up, but by the end of this first battle, they were destroying and disabling 80% of the drones that they targeted.
The general flying bomb story, especially that of the high-speed fighter interception, has been told in many books and websites (please see the bibliography). But in this article, I would like to primarily concentrate on the story of development, deployment and operations of the duelling technical systems that occurred that summer.

Flying from camouflaged launch ramps in France and later dropped from under German bombers, the V1 was a gyroscopically-guided jet powered bomb, the world's first autonomous cruise missile. Radio and wire guided missiles had been used before, but the V1 was fully-independent and self-guided once launched. It carried a single warhead with roughly half the explosive power of a full bomb load from a Battle-of-Britain era German bomber. Although mostly aimed at London, the accuracy of the missile was quite poor. The warhead was armed in flight about 30 miles after take-off. Most missiles "brought down" by fighters and some by anti-aircraft gunnery would explode wherever they hit the ground - all over Kent and some other southern counties of the UK. The warhead had a physical impact fuse, an electrical impact fuse and a clockwork timer delay mechanical fuse. Very few did not explode once armed.
The first V-1s were fired against Britain in the early hours of Tuesday June 13th, 1944. Their deployment had been delayed by about six months due to development problems and Allied bombing of their test, production and launch sites.
The D-day landings in Normandy had happened exactly a week earlier on June 6. Within two weeks of those first landings, almost 630,000 allied troops, 90,000 vehicles and 218,000 tons of stores were ashore. 400,000 axis troops, primarily German would contain them into an increasingly crowded beachhead for another month. Allied fighter bombers and heavy bombers dominated the sky above the battlefield, severely restricting German re-supply and troop movement. The outcome of the Battle of Normandy was near inevitable but extremely hard fought by both sides. Today over 110,000 mother's children of many nations still lay there in 27 war cemeteries. Very many villages and several large French towns were utterly destroyed by Allied bombing and shelling. The breakout from the Calvados and Manche départmentes of northern Normandy finally happened in late July. Liberation of the channel coast, except for a few port cities, was complete by the first week of September. All of the V1 launch sites in France had been captured and were rendered mute 12 weeks after they started firing.
The history of the defensive battle against the V1 assault on tyhe UK would be roughly divided into three phases. In Phase One, the intercept fighters would be the most successful. Stripped of armour and other unnecessary weight, and burning 150 octane fuel, the allied Spitfires, Mustangs, Tempests and Typhoons were still at best only about 50 mph faster than the V1s. The pursuit fighters had no more than 5 minutes to catch the missile and



Radar guided and computer controlled anti-aircraft guns, firing top secret proximity fused shells, would prove a match for the robot bombs. Between June 1944 and war's end, over half of V1s fired were stopped by these guns.

Machine versus Machine: Summer 1944

either shoot at it, or as would become legend: tip the V1 over by using the fighter wingtip or airflow to destabilise the V1. All gyroscopes have a limited range of controlled play. The effect of exceeding that range is called "gimbal lock". The result was that the feedback-controlled rudder and elevators controlling the V1 would move to a maximum setting and the drone would roll and turn and mostly dive earthward. For a fighter pilot, the act of firing his cannons at a just-ahead aircraft carrying a ton of explosive took steely determination. German night fighter pilots were also having to regularly fire their cannons at two and sometimes four ton bombs in the bellies of RAF Lancasters. About 10% of the V1s "shot down" by pilots exploded in the air. The rest headed for the fields and towns below. This first phase lasted for four weeks, till July 15th. 4,361 V1s were launched in that period: 1,851 were duds and fizzed on takeoff or dropped into the Channel. 924 were downed by fighters, 261 by AA fire and 55 by hitting cables strung below barrage balloons close in to London. 1,270 made it through to the target area of Greater London.

The comparatively poor performance by the AA guns, then stretched along the North Downs, led to growing concerns within AA Command. The captured intelligence from the German flight test centre at Peenemünde had indicated the V1 would fly at 6000 feet. The gun radars were set too high to allow the gunners maximum time on their targets. The result of a conference on July 13th was a bold redesign of the whole strategy. The AA guns would be moved down to the coast for what would become known as Phase Two of the battle. 800 guns, 23,000 men and women and 60,000 tons of stores were moved in just 2 days. The vehicles of AA Command drove 2.75 million miles. 3,000 miles of cabling between the individual guns and their battery control centres were rolled up and rolled out again. And, in 1944, there was no M20 or M2 motorways to help! The AA gun radars, now tuned to 2,500 feet and firing out over the sea using the just arrived proximity shells (much more on those later) immediately tripled their kill rate. The guns were given freedom of fire 5 miles out to sea and 2 miles in-land. Also at this time, a small collection of US experts, the very men who had overseen the radar-controlled gun system development in Boston, started to tour the gun batteries giving master-classes on optimising the setup. No longer allowed to fly over the seven mile deep AA band, the chase fighters now had less than two minutes of intercept time on the missiles and their kill rate dropped by a third. The overall improvement was still considerable.

By the last month of the attacks from France, the effectiveness of the anti-aircraft gunnery had increased dramatically and they were destroying the majority of the V1s that approached England. The capture of the launch sites on the French Channel coast ended Phase Two. The third phase consisted of several more months of much smaller numbers of numbers of air-launched and then longer range V1s fired toward England from the Dutch coast. These later arrivals were also mostly successfully stopped by AA gunnery. Tower Bridge in London was the aiming point for most of the V1s

Designed in Boston at the Massachusetts Institute of Technology (MIT) and New Jersey at Bell Labs, the ground breaking SCR-548 radar controlled AA gunnery system was manufactured in great quantities by Chrysler in Detroit and shipped to all theatres of World War 2.

fired from June till September and the maps showing where the bombs landed show both the success of the British defences (in terms of protecting the capital anyway) and the immaturity of the V1 as a guided weapon.

Antwerp, the large Belgian port, suffered a sustained V1 assault from October 1944 till just before war's end. The by-now very experienced AA gunners defended Antwerp in depth and were extremely successful in preventing a very large majority of the missiles reaching their target. Other European towns were also targeted by significant V1 attacks, noticeably Liege and Brussels during the Battle of the Bulge. Air-launched V1s landed and exploded in small numbers in many coastal and some midlands English towns.

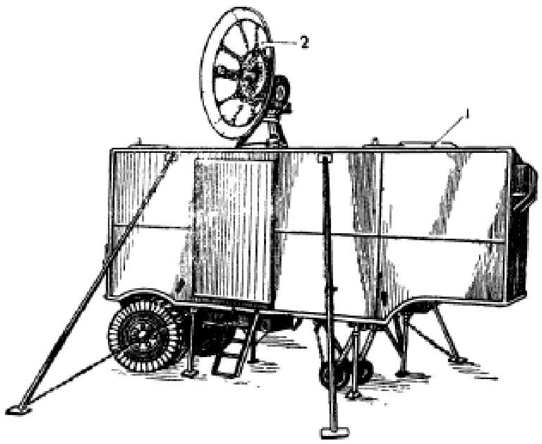


Рис. 1. Станция SCR-584-А на позиции:
1 — кузов; 2 — антенна

The development of the flying bomb.

The German origins of what would become the V1s jet engine began in Munich in 1928, when inventor Paul Schmidt started work on a new design of pulse jet engine. French and Belgian inventors had patented pulse engine variants even before the First World War. Schmidt received a patent on his design in 1931 and some financial support from the Reichsluftfahrtministerium (German Ministry of Aviation aka RLM) in 1933. In 1934, along with Professor Georg Madelung, Schmidt submitted a "flying bomb" idea to be powered by his pulse jet to the RLM and received a development contract. Their prototype was rejected as "technically dubious" however, due to its high cost and poor range and accuracy.

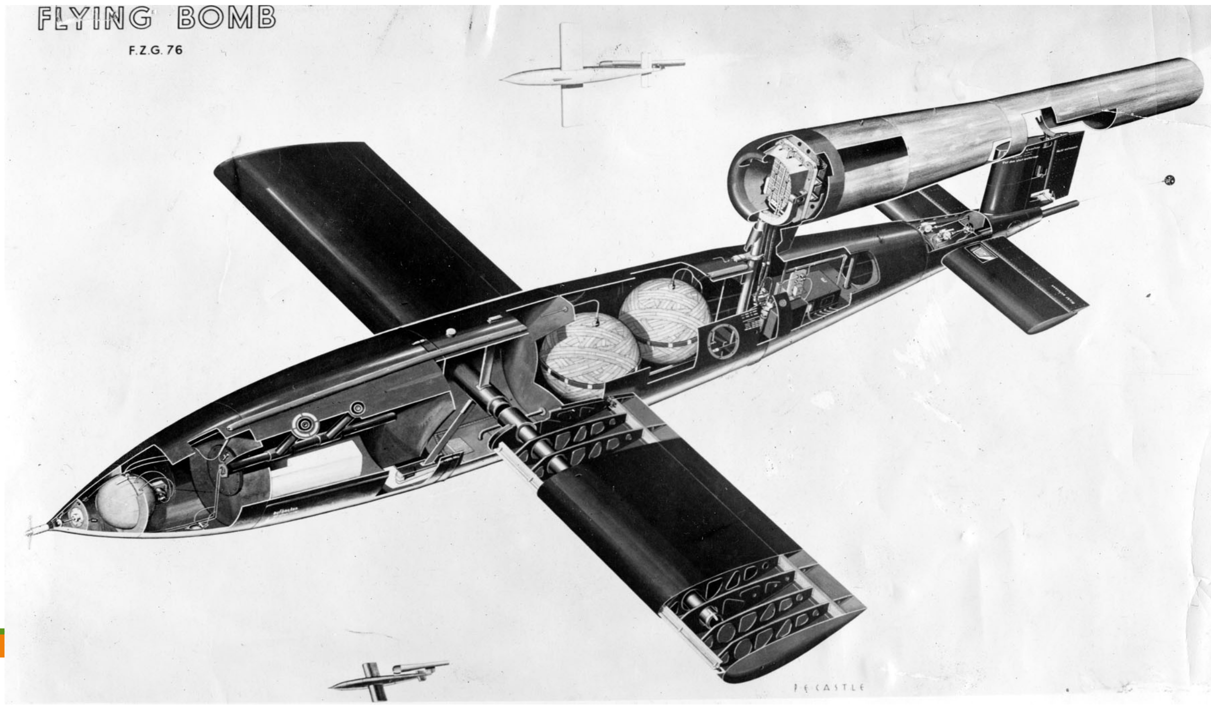
In early 1937, Fritz Gosslau, a PhD graduate from the prestigious Technische Universität Berlin, developed proposals for a remote, unmanned missile for special military use. Initially developed by the Argus Motorenwerk (motor works) as an anti-aircraft gunnery practice target, the aircraft completed its maiden flight on 14 July 1939. In November 1939, he proposed its further development as an accurate radio-navigated wing-mounted missile providing a range of several hundred kilometres.

In 1941, the RLM encouraged the two developers to collaborate. Other German manufacturers who were also working on guided flying weapons were also merged into the project, eventually codenamed Kirschkern (Cherry Stone). In Spring of 1942, Robert Lusser from the Fieseler aircraft company sketched out a design featuring a single pulse jet mounted above the tail. The group's proposal was submitted to the Technical Office of the RLM on 5 June and the project was approved and renamed the Fi 103. The Fieseler Flugzeugbau (aviation works), in Kassel, was to be the prime contractor. Argus in Berlin would develop the motor, named the Argus As 109-014. Another Berlin based company called Arkania would supply the guidance automation. On 19 June, the head of RLM Production - Generalfeldmarschall Erhard Milch - made the Fi 103 production a high priority program. The device was also given a new decoy designation as the FZG-76. FZG is an initialisation of Flakzielgerät (antiaircraft targeting device) harking back to the aircraft's early roots, and meant to hide is design purpose from foreign intelligence agencies.

When finally used in anger in the summer of 1944, the device would be branded by the German Ministry of Public Enlightenment and Propaganda as the "Vergeltungswaffe Eins" or Retaliation Weapon 1, better known now as the V-1. Germany had by then been suffering sustained heavy night and day air-assault for well over a year. Once heard over England, the weapon attracted many allied nicknames, particularly buzz-bomb and doodlebug due to its noisy engine.

In March of 1942, the RAF had begun heavy night bomber attacks on German cities and as the months wore on, the number of aircraft and size of the bomb-load on those raids increased relentlessly. The American USAAF would start flying in force during daylight over Germany in the summer of 1943. Hitler was frustrated that the Luftwaffe (German Air Force), heavily committed in Russia and the Mediterranean, was unable to do enough to stop the rapidly growing deadly threat at home. The RLM senior management hoped that the effects of the new retaliation weapon could reverse their declining fortune.

Development of the missile moved north, up to the Luftwaffe's test range at Peenemünde-West on the Baltic coast. The first unpowered airframe drop from a Focke Wulf 200 Kondor bomber occurred on 28 October 1942 and the first powered FZG-76 flight drop took place on 10 December. A successful launch from a catapult at Peenemünde took place two weeks later. Adjacent to the Luftwaffe test range was the quite separate German Army Research Centre rocketry range, where an Army sponsored group were developing the Aggregat rocket weapon series, the most famous member of which would be the A4, later also branded as the Vergeltungswaffe Zwei aka V2. This geographic adjacency would prove initially confusing to British scientific and military Intelligence groups as they tried to assemble fragments of signal decrypts, smuggled reports and



The development of the flying bomb.

aerial photography into a coherent understanding of the two German long range weapons program over the next 18 months.

The pulsejet choice for a missile engine was an elegant balance of cost and function: a simple minimalist design that would run on motor grade petroleum. It used a very cheap to build air-intake and ignition shutter system that had a short service life. This was not a problem, as it did not need to last beyond the normal operational flight life of well under one hour. The pulse jet generated insufficient thrust for unassisted takeoff of the FZW-76. However, this meant the jet could be started and checked while stationary on the launch ramp. The resonant motor design triggered fuel detonations at a rate of about 50 times per minute. A spark plug was needed during the initial warm up, but the motor was hot enough once running to sustain ignition unassisted. The fairly violent fuel explosions would gradually destroy the intake shutters while in flight. Fuel efficiency and aircraft speed consequently dropped in the last half of the missile's flight, a flaw that was would be leveraged by Allied pursuit fighters in 1944. The missile was fired from a 58 metre long steel launch ramp that used a steam powered piston for acceleration – not dissimilar to the mechanism that would be used to haul jet aircraft off navy carriers 10 year later. To produce the thrust necessary to get the 2200 Kg missile airborne, a contraption called a Dampferzeuger (steam generator) would be clamped tightly to the rear of the ramp after the firing piston had been inserted and the FZW hooked to it. The pulse jet would then be started by a quick release electrical ignition rig and warmed up. The firing crew would retreat to a firing bunker close by. At firing time, a combination of 6.5 gallons of highly pressurised very strong hydrogen peroxide (T. Stoff) and a half gallon of calcium or sodium permanganate solution (Z. Stoff) would be combined in the compression chamber of the Dampferzeuger. The resultant chemical explosion would generate enough steam to push the 135 Kg piston (with an additional 2200 Kg of missile hooked to it!) forward and up a slot the ramp. The aircraft was accelerated to 245 mph in three quarters of a second; the firing piston fell away and landed about 300 yards downrange. The FZW has a stall speed of about 200 mph, but the initial steam launch pushed it well past that. The pulse jet had enough thrust to accelerate the aircraft once airborne and the automated guidance took it up to its cruising altitude of about 2500 feet and speed of near 350 mph. Keeping the catapult T. Stoff and Z. Stoff chemicals well separated while in

A V1 flying bomb is man-handled toward its firing ramp

storage and fuelling the Dampferzeuger was dangerous work. Many launch crew lost their lives in accidents.

Automatic guidance

Radio and radar guidance options had been rejected as a means to guide the weapon, as Allied electronic countermeasures would most likely be deployed. The designers instead turned to an inertial guidance system for the FZG-76. This consisted of three compressed air accelerated gyroscopes (a master and two secondaries). The master gyroscope controlled both the elevators and rudder through pneumatic servos. The secondary gyroscopes provided damping against oscillations. The master gyroscope could maintain its axis of rotation for a fairly long period of time. Any short term deviation up, down or sideways from the pre-set course was detected by the gyroscopes, which moved the control surfaces through the pneumatic servos to correct the deviation. The gyroscope would, however, slowly wander off its initial setting and to counter this effect, a magnetic compass was added in the nose of the FZG-76. Electrical feedback from the compass steadied the longer term aircraft heading. The flying height was set on the automatic pilot by a dial giving a choice of operating heights up to 10,000 ft. The usual height selected was 2,500ft, although some bombs were flown above 5,000ft. In order to measure the distance to the target, a small propeller on the nose rotated in the airstream. Its rotations were measured by a mechanical counter and, once the pre-programmed rotation count was reached, two detonators were fired, locking the rudder and elevators in to a steep dive mode. A side effect was that the fuel supply to the engine was choked off. This was a design fault and lead to the famous "engine cut-off" that the citizens of England would learn to listen for, preferably after the missile had passed overhead! It was corrected in later production models that then dived under full power to the ground.

In May 1943, a review was ordered by Hitler as to whether the

Launch sites and bombing

In May 1943, a review was ordered by Hitler as to whether the Luftwaffe's FZG-76 cruise missile or the Army's A4 rocket would be the preferred bombardment weapon. The FZG-76 was inexpensive and simple to operate, but would be vulnerable to interception. The A4 was very expensive to manufacture and much more difficult to operate, but would be immune from attack once in flight. The review commission decided to proceed with both.

Deployment

The first operational missile launch battalion began to assemble and train at Zempin, about 20 km south of Peenemünde. It was headed by Oberst Max Wachtel and entitled "Anti-Aircraft Regiment 155(W)" for deliberate deception. The guidance, propulsion and launch catapult systems all had their share of production teething problems and the first training launch did not occur until October.

Quantity production began in March 1944, but the device was never fully ready for combat operations. The guidance and range accuracy was still poor. The whole aircraft was being built by labour that was often badly undernourished, brutally treated if foreign and themselves subject to the fear and reality of bombing by the RAF and USAAF. Early V1s were assembled at the Fieseler plant at Kassel and Volkswagen works at Fallersleben. After those plants were both bombed, some assembly was done in the notorious Mittelwerk tunnel works north of Nordhausen. The construction and operation of those underground factories by the SS, after they took over the Vergeltungswaffe missile and rocket program in the last year of the war, is one of the darker stories of the war.

The launch sites

From October 1943, construction had begun all along the French channel coast from Dieppe to Calais, as launch sites for the soon to arrive V1s were being built.

The first design plan, codenamed Wasserwerk (waterworks) consisted of a very large reinforced concrete building, 212 metres long, 10 high and 36 wide. A railway was to deliver the pre-fabricated missiles directly into the building for storage, final assembly and launch. http://www.webmatters.net/txtpat/?id=334

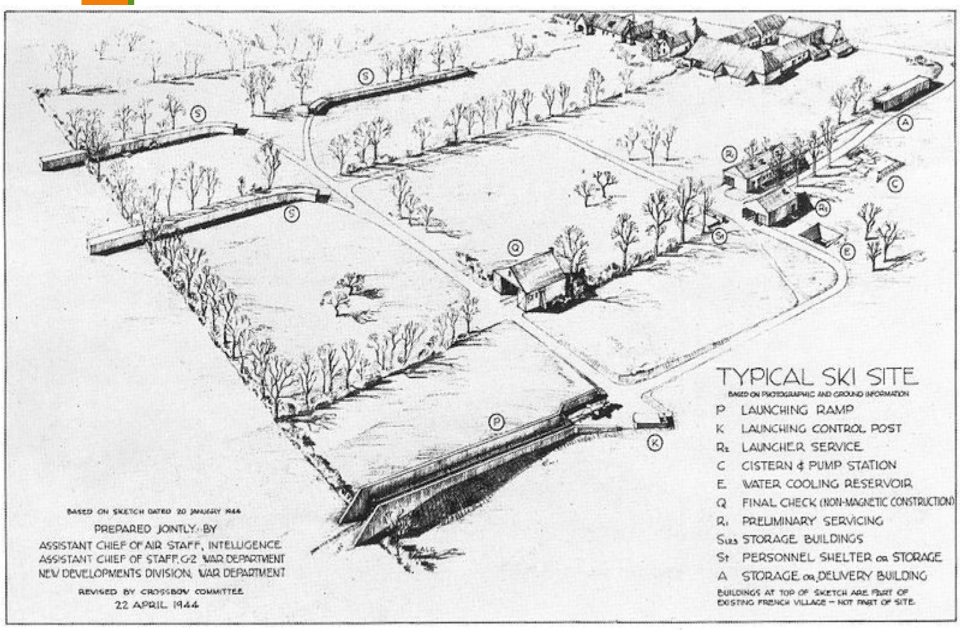
Construction was started at four sites, but none were completed. In fact, one historian suggests that these building were in fact always decoys: http://www.bcmh.org.uk/archive/articles/WasserwerkSiracourtLivesey.pdf

The second design plan consisted of a complex of buildings, several storage buildings with a curved ends (hence they were nicknamed "ski" sites) and numerous dedicated concrete buildings. These were readily noticeable by photo-interpreters combing through the increasing vast output from Allied reconnaissance aircraft studying the soon to be invasion coast. A strong hint was a launch ramp, most of which were pointed at London. The French resistance was also successful at infiltrating staff into the construction sites and sending plans and progress reports to London. A few of these sites remain today in fair condition: http://coalhousefort-gallery.com/V1-flying-bomb-Vengance-weapon-site-Hazebrouck

Crossbow and Noball.

In late November of 1943, the same ski site type structures were noticed on aerial photos from Zempin and Peenemünde, now already well known by the Allies to be cruise missile development sites via Ultra decrypts (the decoding of encrypted German radio telegraphy, primarily at Bletchley Park near modern day Milton Keynes) and smuggled reports from some of the forced labourers there. The main Peenemünde Army rocket development site had been bombed heavily by the RAF in mid-August 1943, but the A4 development efforts there were close to finished and so the program had only been delayed a few months. The labour camp that had been the source of intelligence reports was also accidentally bombed and 600 labourers killed. Another outcome of the raid was that the SS seized the opportunity of the reorganisation that followed to start to take control of the missile and rocket program away from the Army and Luftwaffe. The effects of this change of management on the conscripted foreign labour and prisoners that would assemble the rockets and missile a year later were deadly to tens of thousands.

A huge Allied bombing campaign was initiated from late 1943 to destroy the launch sites in France before they became operational. The program of detection and attacks on the ski sites was called CROSSBOW. Bombing attacks began on December 5 with a code name of NOBALL and a number used for each target: e.g 'Noball No. 93' was near Cherbourg and 'Noball No.147' was at Ligescourt. A number of committees and review groups had been set up in London as more and more fragments of intelligence about a new German threat had been collected and intercepted. The groups were to address the intelligence collection, interpretation and decision making related to the rocket and cruise missile threat to England. Several scientific advisers and government



A 1944 British sketch of a V1 "ski site". These sites were too heavily bombed and so not used.

Launch sites and bombing

administrators with rather precious egos played out a complicated Whitehall turf battle, vying for seniority and relevance as the patchwork of available data was slowly and successfully brought together. A significant proportion of intelligence had been sourced from Enigma decrypts and so was not able to be fully disclosed to any but a few "Ultra"- (most secret) cleared committee members. Concerned about the threat to the massing D-day armada still in Southern England, the US military leader George C Marshall ordered the US intelligence forces in London to form yet another committee under General Stephen Henry. A full size replica of a ski site was built at Eglin Air Force base in north west Florida and used for bombing technique tests by the USAAF. It remains there today, as a registered historic site (and apparently not very damaged!) The RAF & USAAF attacked all of the locations identified as potential launch sites and also factories and towns in France, Belgium and Germany known to be involved in the production of components and propulsion products related to the FZW-76 & A4 programs.

In April 1944, at the request of the British War Cabinet, the overall commander of Allied forces in Europe, Dwight Eisenhower, directed Crossbow attacks should have absolute priority over all other air operations, including the now sustained day and night attacks on German industry and civilians: "with respect to Crossbow targets, these targets are to take first priority over everything except the urgent requirements of the Overlord battle; this priority to obtain until we can be certain that we have definitely gotten the upper hand of this particular business" Overlord was codename for the imminent landings in Normandy, later known as the D-day assault. Southern England was by now packed full with men and arms massing for the assault. The intelligence about the potential scale of the impending missile attacks, with wild estimates hard to discount fully, had military and government leaders somewhat rattled. Poison gas stocks were moved forward to some USAAF and RAF bases as discussions were held by Churchill and allied military chiefs about possible retaliations on German cities if the rocket and missile attacks tuned out to be as bad as some feared. Luckily for both sides, cooler thinking prevailed on that issue.

As a result of the air attacks on the concrete heavy Wasserwerk and ski sites, the Germans began a new construction series of "modified sites". Local French construction labour was no longer used and the SS applied much stricter security to the sites. Russian prisoners, under the by now usual appalling SS controlled conditions, would supply the manual labour. The Allies would not get good local intelligence on these new sites. The launch ramps were built in transportable short sections and very well camouflaged. Outbuildings were kept to bare minimum and existing farm buildings were re-used and also kept as decoys. The new sites could be built and made operational quickly and would fire almost all of the 7,400 missiles that would head toward England from mid June till early September. These sites were fed missiles and fuels from underground storage depots that had been built in natural caves north of Paris and near Reims.

An aerial reconnaissance photo of a bombed out V1 site. Allied bombing and shelling killed more French civilians in 1944 alone than Londoners were killed by the Luftwaffe during the whole of World War 2

As a deliberate decoy, the Germans did continue patching the bombed older ski-sites and several large concrete bastions that had been built to launch A4s. This very successfully attracted very significant amounts of fruitless bombing effort. The families of rural Northern France would pay a heavy price for their impending liberation. Allied bombing is estimated to have killed as many as 50,000 French civilians in 1944 alone. By comparison, German bombing (including the V1 & V2 attacks) killed near 60,000 UK civilians during all of WW2.

It was estimated in the post-war "United States Strategic Bombing Survey" report that, from August 1943 to August 1944, the joint Crossbow effort between the RAF and USAAF in the UK absorbed 14.9 per cent of all aircraft sorties and 15 per cent of bomb tonnage. Over 122,000 tons of bombs were dropped in total on Crossbow sites by almost 65,000 aircraft. Again in comparison, the London Blitz during the Winter of 1940-1941 consisted of about 18,000 tons of bombs. Crossbow also consumed immense reconnaissance effort: 4,000 sorties or 40 per cent of those flown from the United Kingdom in the 23 month period from May 1943 to April 1945. 1,950 Allied aircrew were killed on Crossbow missions, with almost 500 aircraft lost.

The Germans did however only achieve about a third of their planned production and deployment of the FZW-76. Much of the reduction was due to the sustained allied air force offensive against the factories building components in Germany and transport links in France before and after the Allied landings and breakout.

http://www.allworldwars.com/V-Weapons%20Crossbow%20Campaign.html#10

The radar controlled anti-aircraft gun

43,000 civilians were killed in air raids in the UK.
17,500 in London
6,200 by V1
2,500 by V2
8,800 by "traditional" bombing

The Germans first dropped flying bombs (V-1s) on Britain at dawn on 13 June 1944. In the following fortnight, around 2,452 bombs were dropped on England. Not all reached their intended target. A third were brought down by anti-aircraft fire over the Channel, or shot down by fighter pilots. About 800 missiles hit London and the surrounding area. The greatest single tragedy took the lives of 121 people when a V-1 landed on the Guards Chapel at Wellington Barracks during a service

The radar controlled anti-aircraft gun

In September of 1940 the Germans shifted from the daylight bombing of England to night bombing. The RAF had been quite successful in destroying attacking Luftwaffe bombers in daylight in the long summer of 1940. Under the modern distributed command-and-control system, developed in the late 1930s by Fighter Command's senior officer Air-Marshal Hugh Dowding, the short range RAF single-seat fighters had been able to be often in the right place at the right time, with enough fuel left for intensive combat, to make a decisive difference.
Anti-aircraft guns had also played a role in defending England, but their efficiency was a serious problem. Anti-aircraft (AA) gunnery accuracy in the early years of World War 2 was just not very good. The guns averaged several thousand rounds fired for every aircraft downed by daylight and tens of thousands by night.
AA gunnery in 1940 still used optical rangefinders and mechanical computers (called Predictors) to calculate the target's future location. Firing a shell to explode near an aircraft travelling at 250mph and up to 20,000 feet high meant that the gun had to fire at a location that the aircraft would not reach until several tens of seconds later. The Predictors' complex mechanical gearing calculated the solution to this 3D trigonometric problem and their output was via indicator dials on the guns. The gunners would then wind the gun-mount handles to match gun-position indicators to the dials. Each shells had a manually set mechanical timer to trigger the explosive after a timed flight. This very labour intensive process meant that each AA gun batteries had quite a large staff count and could fire a round only every 6 seconds. After 1941, most young British women were conscripted, many into the Auxiliary Territorial Service to man the optical rangefinders and Predictors.
The primary British AA gun was the QF 3.7", a high velocity weapon (as are all heavy AA guns), with a single charge. Firing substantial quantities of ammunition meant that barrel life could be short. An over-worn barrel might split in use and possibly kill members of its crew. By the end of 1940 the replacement barrel supply situation was becoming critical, and production in Canada was quickly scaled up to meet the UK demand. The spring of 1941 brought respite to Britain as the bulk of the German military turned eastward toward Russia on the brutal campaign

ATS crews "man" the optical rangefinder (above) and the mechanical range computer (below). The firing solution was fed to the gunners on dials and manually matched.

that would eventually destroy them. Britain would not see large numbers of German aircraft again for the next three years. Airborne intercept radar built into multi-seat Allied night fighters would change the odds dramatically against the Luftwaffe for the sporadic nights bombing attempts made during this period, but we are getting ahead of the story!
The British 'Chain Home' radar that had helped feed Dowding's

Fighter control network was relatively low frequency – it had a one and a half metre wavelength The aerials were huge and the resolution and accuracy were quite low. Good enough to easily spot full German squadrons massing up over the French coast and help calculate a vector once they turned toward England, but much poorer on single aircraft, particularly at lower altitudes and over a rough sea. One of the reasons the Chain Home radars were not attacked more heavily by the Germans in 1940 is that

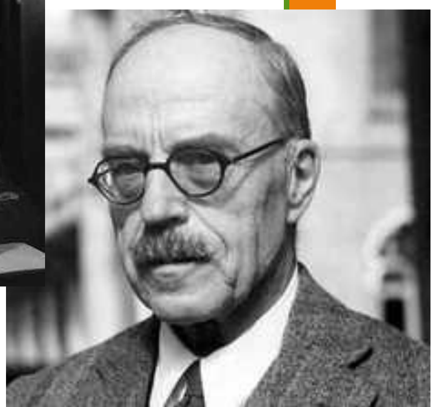
The radar controlled anti-aircraft gun

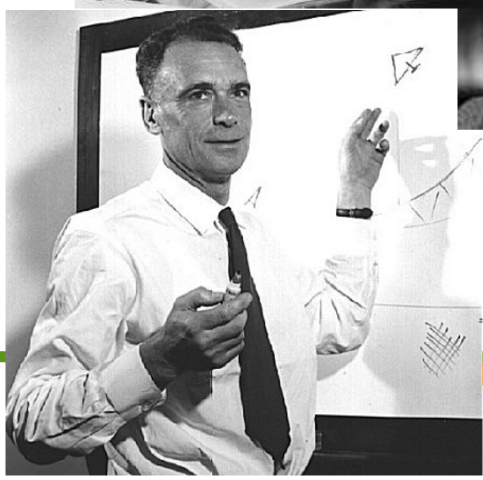
An anti-aircraft gun crew training with a searchlight and a QF 3.7-inch anti-aircraft gun. This gun was the mainstay of British heavy AA for the duration of WW2

their own radar was already in service, but at a wavelength of about 50 centimetres. German reconnaissance discounted the large aerials as too long a wavelength to be related to radar.
For the British, the best way to really improve radar performance was also to dramatically reduce the wavelength. They had made some progress at wavelength much shorter than the Germans, but generating high powered magnetic pulses at those very high frequencies was in 1940 only achievable in a laboratory and even that was still a secret.

The Tizard mission

Late in the morning of 29 August 1940, a small team of Britain's top scientists and engineers, under the direction of Sir Henry Tizard and in conditions of absolute secrecy, boarded a converted ocean liner in Liverpool – bound for Halifax on Canada's Atlantic coast. With them was a black metal deed box containing all of Britain's technological secrets that might have military application. The group were on their way to the still neutral United States - to gift them the intellectual property in exchange for promises of development and large scale manufacture. Winston Churchill had already pre-arranged with President Franklin D. Roosevelt (FDR) a gathering of the leading lights of US military technology development to meet Tizard's delegation in Washington for long program of exchange meetings.
FDR had the extremely good fortune to have as a scientific adviser a man called Vannevar Bush. He had encouraged FDR to commission a group called the National Defence Research Committee (NDRC) to co-ordinate Army, Naval & civil military research – a not insignificant task given the professional and petty rivalries and jealousies that stood between those groups. Interestingly, despite his very significant role in many technological developments before and during WW2, Vannevar Bush would achieve modern day fame with a popular magazine article that he would write in 1945. The article imagines an electronic information research tool that pretty succinctly describes (in rather hokey 1940s technology!) the world-wide-web that would be built 50 years later.
A large Canadian technical delegation also attended the Tizard mission meetings with the US Army, Navy & NDRC. The tightly bound military technology and transatlantic electronic intelligence partnerships, and the dominant US role in those, (still making headlines in 2013), could perhaps be said to have started here.
Handed over and discussed at great length at Washington military offices, the Shoreham Hotel and the Wardman Park Hotel from September 9 onward were blueprints and schematic diagrams for rockets, new explosives, superchargers, gyroscopic gunsights, submarine detection devices, self-sealing fuel tanks, and early ideas that would lead to the jet engine and Britain's contributions to the atomic bomb. But the most immediately valuable was an early model of a hardware device called a cavity magnetron, which had been invented six months





Sir Henry Tizard (above), Vannevar Bush (above left) and Edward 'Taffy' Bowen (left)

The radar controlled anti-aircraft gun

earlier by two scientists at Birmingham University.
John Randall and Harry Boot had invented the cavity magnetron almost by accident. It was a heavy radio valve that could generate very high powered pulses of radio energy at a "microwave" wavelength of 10 centimetres. Nothing like it had been achieved before. The 10,000 watt GEC version in Tizard's briefcase amazed the US technical staff who were currently still working with 10 watt versions of a similar device called a Klystron.
By late September, the Massachusetts Institute of Technology (MIT) in Boston had been asked by the NDRC to set up a new secret laboratory called the Radiation Laboratory (aka Rad Lab) and was busy recruiting the cream of America's academic electronic talent to staff it. A Welsh member of the Tizard mission called Edward 'Taffy' Bowen also remained for several months in Boston, helping the setup of the Rad Lab. By November, the cavity magnetron was in mass production; and by early 1941, portable airborne radar had been developed and fitted to both American and British aircraft. In late 1941, Britain's Telecommunications Research Establishment, then at Swanage in Dorset, used the magnetron to develop a revolutionary airborne, ground-mapping radar codenamed H2S. This would be used to radically improve RAF Bomber Command's ability to find their targets at night and also provide the USAAF with the ability to bomb through cloud cover over Europe and Japan.
But a related Rad Lab project is more central to the V1 story. First called "Project 2", it was an advanced gun-laying system with automatic search, tracking and the ability to directly aim the guns. The Rad Lab team working on gun-laying radar was led by Louis Ridenour, a University of Pennsylvania physicist, and included two brilliant engineers, Ivan Getting and Lee Davenport. The team was very ambitious. The existing British and Canadian gun-laying radar programs were simply intended to develop a radar to track enemy aircraft, with the operator telling the anti-aircraft guns where to shoot. The Rad Lab group, in contrast, wanted the radar to actually steer the gun so that it stayed locked on the target.
The idea sounded like science fiction. Neither the Tizard mission nor US military representatives had suggested it, but MIT had very considerable existing expertise in feedback systems and servomechanisms. Another pre-war MIT facility, called the Instrumentation Lab, was then the world's best gyroscopic system developer and 20 years later would head development of another automation breakthrough: the onboard digital guidance computer that helped steer NASA's Apollo program to the moon landings.
The RadLab team had a prototype tracking radar system running by April 1941. To test the automatic aiming system, they attached the outputs from the radar to an electrically controlled gun turret base taken from a still-in-development Boeing B-29 bomber. They mounted a 16mm cine-camera with a long lens on the turret mount. A friend of theirs then flew his light plane around over Boston, illegally low in altitude, and by the end of May the system was able to accurately track the aircraft. The US Signal Corps was immediately interested and work started on making the system suitable for field use, mounting the entire system in a single trailer with the 6-foot aluminium parabolic antenna on top. Known as XT-1, for eXperimental Truck-1, the portable system was first shown to the US Signal Corps at an artillery range at Fort Monroe, Virginia in February 1942.
The NDRC had also commissioned the Bell Telephone Labs in New Jersey to developing a suitable gun-laying computer that could use electrical, as opposed to mechanical, inputs for pointing data. One night in May 1940, a young Bell Labs physicist called David B. Parkinson had a prescient dream: "I had been working on a level recorder for several weeks when one night I had the most vivid and peculiar dream. I found myself in a gun pit or revetment with an anti-aircraft gun crew. ... There was a gun there ... it was firing occasionally, and the impressive thing was that every shot brought down an airplane! After three or four shots one of the men in the crew smiled at me and beckoned me to come closer to the gun. When I drew near he pointed to the exposed end of the left trunnion. Mounted there was the control potentiometer of my level recorder! There was no mistaking it-it was the identical item. ... It didn't take long to make the necessary translation+ the potentiometer could control the high-speed motion of a recording pen with great accuracy, why couldn't a suitably engineered device do the same thing for an anti-aircraft gun?" He proposed the idea at work. Bell Lab engineering managers quickly saw that Parkinson's potentiometer could indeed be applied to antiaircraft gun control. The M9 gun director was the practical result of that dream. Potentiometers (variable resistors that can output a voltage precisely analogous to a varying physical rotation) were to be installed on the base of the scanning radar dish. Whatever the radar dish was pointing at, the guns would automatically follow -with range and direction offsets for shell fire automatically calculated by the M9. Bell Labs' analogue electronic computer was able to control a battery of four of the US Army's standard 90 mm M3 AA guns. The entire system, now designated the SCR-584* was demonstrated in complete form on 1 April 1942. An order for the provision over 1,200 systems arrived at the Rad Lab the next day. (*SCR is an abbreviation of Signal Corps Radio – the Signal Corps of the US Army was the sponsor for the project). Coincidentally, the Bell Labs M9 was the first use of vacuum tube "operational amplifiers", an electronic building block that would revolutionise analogue circuit design from then onwards.

An early demonstration in Washington of a Bell Labs M9 electronic predictor controlling a US 3 inch AA gun.

The radar controlled anti-aircraft gun

The SCR-584 was extremely advanced. To achieve accuracy it used a conical scanning system, in which the a slightly offset beam is rapidly rotated around the antenna's true axis to find the maximum signal point, thus indicating which direction the antenna should move in order to point directly at the target. This system was not new, having first been introduced on the German's Telefunken Würzburg D radar in 1941. A slightly earlier model Würzburg had been captured in a daring parachute commando raid at Bruneval on the French coast in February of 1942. Analysis of those captured electronics by TRE at Swanage led to several improvements in Allied radar and also allowed the RAF to develop some countermeasures to the increasing effective German air defences. However the SCR-584 developed the control system much further, and added an automatic tracking mode. Once the target had been detected and was within range, the system would keep the radar pointed at the target automatically, driven by motors mounted in the antenna's base. For detection, as opposed to tracking, the system also included a helical scanning mode that allowed it to search for aircraft. This mode had its own dedicated Plan Position Indicator display for easy interpretation. When used in this mode the antenna was mechanically spun at 4 rpm while it was nudged up and down to scan vertically.

The automobile manufacturer Chrysler was given the contract, via prime system contractor General Electric, to build the SCR-584 mechanical components: Their part of the story began in 1942, when two researchers from NDRC showed K.T. Keller, then president of Chrysler, some preliminary sketches of the radar antenna. Keller said that the paraboloid antenna could not only be made of steel, but could be stamped using auto presses; he also criticized the gearing used to turn the dish. As a result, the scientists recommended to the Army that Chrysler provide the entire microwave radar antenna system, rather than just the dish. That was approved, and a new high-security Chrysler division was set up in their Dodge plant in Detroit.

Chrysler Dodge was able to deliver the systems at a mean price of a fifth of the Rad Lab's initial estimate of around $50,000. The actual cost ended up as $9,386. By April 29, 1942, Chrysler engineers were at MIT, examining what had been done thus far. That work was determined to be improvable on several counts, including shortening the long gear trains, reducing the weight, and improving parts interchangeability. A fresh mechanical re-design was undertaken.

The plastic-enclosed spinning antenna element, located at the center of the dish, beams short wave radio pulses one-millionth of a second in duration at intervals of half of a thousandth of a second. The system interprets the return signal and can determine the direction, speed, altitude, and course of the target. Once locked on, the antenna would track the target and synchronise the motorised pointing of the guns. The equipment was designed to cope with aircraft speeds up to 700 miles per hour, up to 60,000 feet, at a target distance of not less than eight miles. Gear train accuracy with miniscule backlash was fundamental to success.*

**The same aerial feed was used to send a high power pulse from*

Up on the roof: The radar tracking gun mount was developed and tested on the roof at MIT Building 20

the magnetron and then cutover and connect to sensitive receiver circuits to listen for the very faint echoes. This changeover time set the minimum for the distance that a target could be ranged.

The paraboloid reflector dish was engineered to be made out of steel, rather than the aluminium used in the experimental model at the Rad Lab. In order to withstand winds of up to 60mph when in operation and not be tipped over in hurricane winds of 100mph, 6,640 half-inch diameter holes were included in the six-foot dish.

Chrysler engineers worked out the mechanical problems, and then developed manufacturing processes to achieve quantity production. The SCR-584 required gearing that would hold to a maximum backlash of less than 4 minutes for a full revolution of the dish. A minute is one sixtieth of a degree.

The motor specified turned at 3,600 rpm. The dish would turn a maximum of eight times per minute horizontally and up to four times per minute in elevation. Very large gearing reductions in quite small spaces were necessary. A unique planetary-type multi-gear arrangement was built, one of the major contributions to the success of the mechanical system. This radar system was truly cutting-edge, state of several arts work. General Electric and Westinghouse engineers handled the principal electronic features of the apparatus while Chrysler solved mechanical and transportation aspects of the system. Chrysler and a freight trailer specialist company called Fruehauf designed a special 19 foot, ten-ton semi-trailer that would clear the hatches of Liberty ships. These were much stronger than commercial freight trailers, and were equipped with a series of built-in jacks to achieve accurate levelling. Each trailer had to pass a stringent high-pressure water test to prove its tightness against rain. Some trailers later has snorkelling added so that

The proximity fuse.

against rain. Some trailers later has snorkelling added so that they could be safely towed off landing craft at the Normandy beaches on D-Day

By August 31, 1943, 610 systems had been shipped. On October 11 1943, the Signal Corps announced that production would be halted at 1,470 systems plus spares. The Allies had achieved air superiority in Europe and Japan and the scope for AA gunnery was expected to diminish gradually. The V1 program in Europe and Japanese kamikaze attacks that would appear a year later would challenge that expectation.

Chrysler's Dodge Division delivered system number 1,470 on January 28, 1944, with 628 additional sets going to the U. S. Marine Corps, coast defence, and spares after that. An average of ten complete systems had been built per day.

The fast moving SCR-584 program shipped 132 complete systems to the UK before Christmas, 1943. They would be ashore at Anzio in April, Normandy in early June and their finest anti-aircraft roles in England and Antwerp lay ahead. In addition, inventive engineers and soldiers would use the SCR-584 in Europe in 1944 to pioneer several new innovations: close air-ground fire support and ground controlled airstrip approach in bad weather, radar ranging for anti-mortar counter-fire and, in the Ardennes at Christmas 1944, perform devastatingly effective anti-tank gunnery in thick fog to help stop the final large German counterattack in Western Europe.

But first, one more piece of the technological summit has it story waiting to be told:

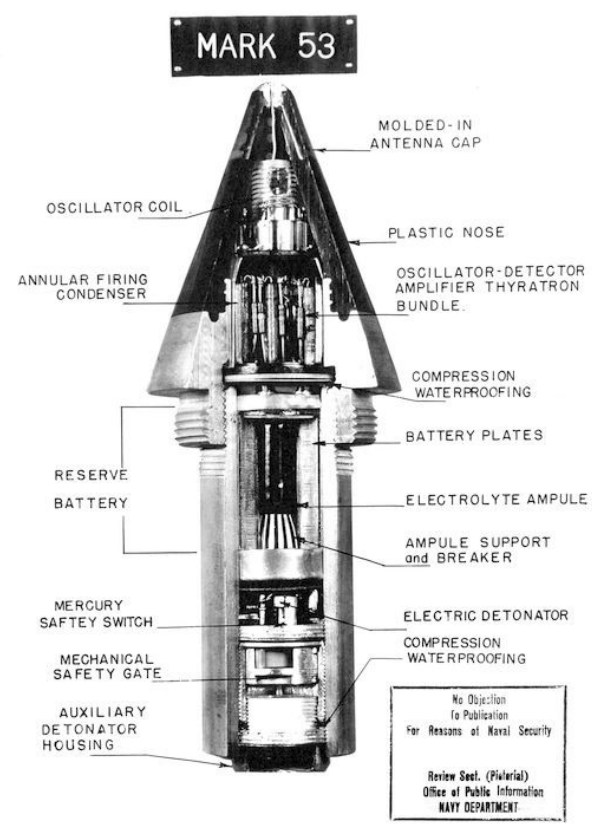
The proximity fuse.

Originally, the M-9 predictor gave the gun crews the manual timer settings for the shell fuses, but in a few months a new electronic marvel arrived: the proximity-fused shell, which included an electronic device that allowed it to explode when it came within a certain distance of a target. Unlike the SCR-584, the proximity fuse had little or nothing to do with the Rad Lab.

British military researchers had begun work on proximity fuses for anti-aircraft shells in 1937. Their initial work envisioned photoelectric or acoustic fuses, but these ideas didn't work out. In Autumn of 1939, William Alan Stewart Butement, a New Zealander and one of the lead engineers in the British Army coastal radar effort, suggested that a shell with a remote-control fuse, activated from the ground over a radio link, or a shell containing its own electronic radio-wave sensor, might do the job. The second option quickly proved more practical and a circuit was designed. The production of a vacuum-tube sensor rugged enough to survive the shock and acceleration of artillery fire was considered a significant challenge. There were many competing priorities for military researchers as the war intensified in early 1940 and UK development halted. However, the fuse idea & circuit were included in the Tizard briefcase.

http://en.wikipedia.org/wiki/W._A._S._Butement

Even before the formation of the Rad Lab, Americans military development scientists and their government sponsors had considered the advantages and possibility of a proximity fuse. In August 1940, Carnegie Institution physicist Merle Tuve, already well-known to the Naval Research Laboratory through various collaborations, spoke with Vannevar Bush of the National Defence Research Committee (NDRC) about proximity fuses for shells, bombs, and rockets. The NDRC had been commissioned by the US government to co-ordinate Army, Naval & civil military



The proximity or "VT" fuse: cutaway

research – a not insignificant task given the professional and petty rivalries and jealousies that stood between those groups. Interestingly, despite his significant role in many technological developments before and during WW2, Vannevar Bush would achieve modern day fame for a popular magazine article that he would write in 1945. The article imagines an electronic information research tool that pretty well describes the world wide web.

Vannevar Bush helped organize NDRC Section T (for "Tuve") at the Carnegie Institution's Department of Terrestrial Magnetism in Washington to work on a proximity fuse. A section T engineer named Richard Roberts began by performing a series of increasingly rigorous experiments to show that a vacuum tube could survive thousands of Gs of acceleration, as would be required if an electronic circuit were to be shot out of a artillery barrel.

Section T had been considering some of the same options for a

The proximity fuse.

proximity fuzing mechanism as the British researchers had, and was coming to the same conclusions when the Tizard mission arrived in September. William Butement's research notes were included in the "Black Box" and were immediately made available to Section T. Butement's electronic circuit design was both elegant and practical, and the Carnegie proximity effort moved forward quickly. Section T had a lab prototype of the circuit operating within days.

The circuit only required four vacuum tubes, including one for an oscillator, two for an amplifier, plus a gas-filled tube called a "thyratron" that operated as the trigger. The oscillator was connected to an antenna, which in an operational fuse would be the shell casing itself. If a metallic object came within a few wavelengths of the antenna, its proximity would affect the impedance loading and therefore the output volume of the oscillator circuit. The oscillator output was fed through the two valve amplifier, whose output in turn was the input of the thyratron. At the input passed a certain level, the gas in the thyratron ionized and allowed past a large current surge from a capacitor to trigger the detonation of the shell.

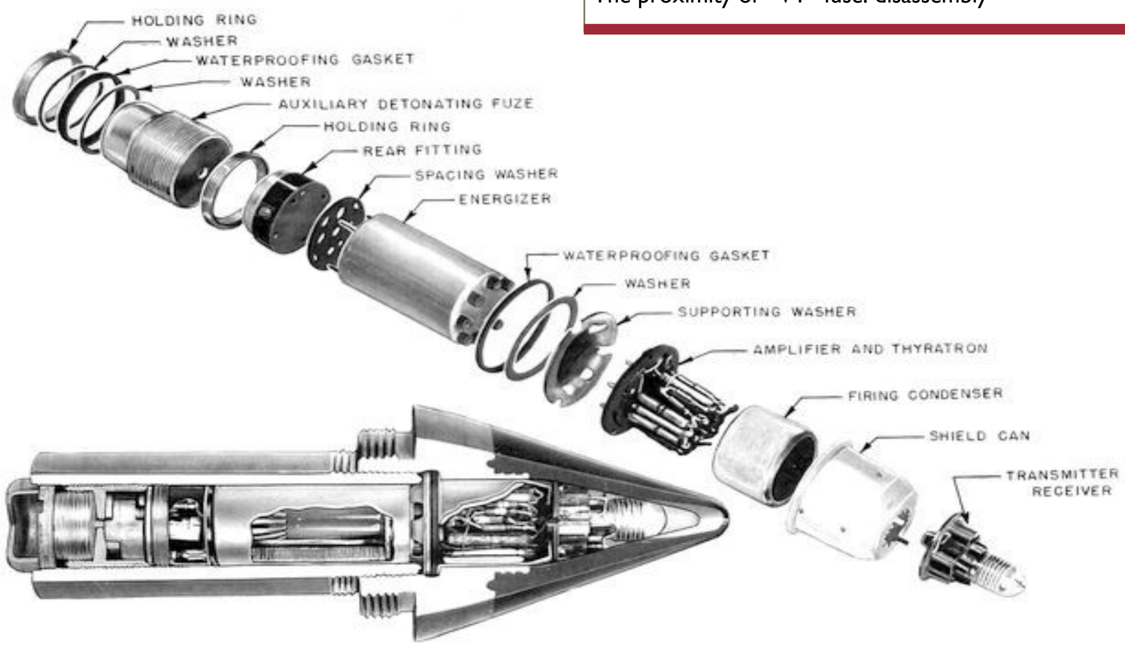
The theory may have been simple, but the problems encountered in all steps of development and after the fuse was released for use by the military were formidable. The components in the fuse, including the miniaturised glass vacuum tubes, had to withstand the shock of being fired from a 3" AA or 5" Navy gun. The firing of the gun creates a force of near 20,000 Gs almost instantly as the projectile is accelerated to an almost 3,000 foot per second muzzle velocity. In addition, the shell's brief trip through the gun's rifling grooves start it spinning at near 25,000 revolutions per minute. In addition, safety features had to be built in to protect the personnel handling the ammunition in transit and storage in the field. More safety features were necessary to prevent the shell from exploding too soon after firing which would endanger the gun crews and nearby forces. A self-destruct feature was also necessary to prevent unexploded fuses falling into the hands of the enemy.

Proximity fuse development for bombs and rockets was passed on to a group at the US National Bureau of Standards (NBS). Section T focused on the radio proximity fuse for shells, which was judged the highest priority.

Proximity fuse development was regarded as urgent, even in the still neutral USA, and Section T grew rapidly. By early 1941, components and circuit elements were being shot out of guns to determine how well they would operate, with test shots of complete fuses beginning in the spring. By summer, tests were being conducted to calibrate the sensitivity, and so the triggering radius of the fuse.

A parallel research effort to develop improved dry cells and a wet battery, where the electrolyte would be kept separated from the electrode until after the projectile was fired, was concentrated at the Cleveland, Ohio plant of the National Carbon Company (the parent of Everyready). The outcome of this research was the development of a cylindrical battery the size and shape of a fountain pen. The electrolyte was contained in a glass ampule at the centre of a cylindrical cell of thin plates. The shock from the firing of the projectile would break the ampule, releasing the electrolyte. The centrifugal force generated by the rotation of the projectile then forced the

The proximity or "VT" fuse: disassembly



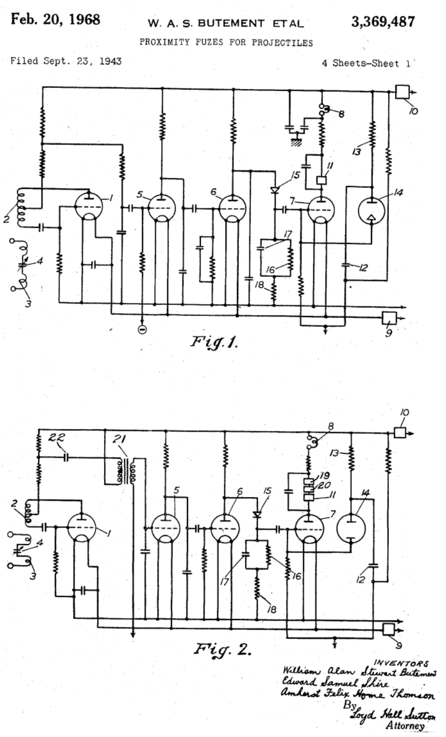
The proximity fuse.

liquid between the plates and immediately activated the battery. This battery was ready for experimental testing in February 1942 The attacks on Pearl Harbour validated the concerns by some about the existential danger to surface naval forces from aircraft attack and developments and deployment in naval anti-aircraft gunnery entered a blank-cheque era. The immense surge in US industrial development and production capacity had begun. US Government and allied orders would double the size of the US GDP over the next 4 years and together with the destruction of most European industrial capacity (much of it by US forces) would produce the post-war dominance by US industry.

Initial service tests of the proximity fuse were conducted on the brand-new cruiser USS Cleveland in Chesapeake Bay in mid-August 1942. The results were remarkable: three target drones were promptly shot down by the ship's 5 inch AA guns. The Cleveland then left to support the amphibious landings in North Africa, making no stateside stops to ensure that the crew didn't have a chance to spread talk about what they had seen.

By September 1942, subcontractors like RCA, Sylvania, Eastman Kodak and Crosley were ramping up production. A batch of 5,000 early-production fuses was sent to the Pacific theatre in November 1942. The fuse was introduced to combat on 6 January 1943, when the cruiser USS Helena used one to shoot down a Japanese aircraft.

Section T was transferred from the Carnegie Institution to control of Johns Hopkins University, where the group was given the vague name of "Applied Physics Laboratory (APL)". APL is still in existence, with a history of a wide range of development projects, most defence related but with some significantly satellites and space probes for NASA.



The circuit of the proximity fuse in WAS Butement's patent

The production proximity fuse was originally designated the "T3G Device", then the "Mark 32", and finally the "VT", which was suggested by the British, as it truthfully by deceptively implied "variable time" or "velocity triggered". The fuse sent out a continuous radio signal in the range of 1.67 to 1.36 metres (180 to 220 MHz), and detonated when the shell got within a few wavelengths of a target. A backup self-destruct timer fuse destroyed the shell before it fell back to earth if it missed the target.

Building practical circuitry that could fit into an anti-aircraft shell and survive being shot out of a gun, with accelerations of thousands of gees and spinning at hundreds of revolutions per second, was a major engineering accomplishment, particularly in the days before solid-state electronics.

A miniature ruggedized vacuum tube, the "T3", was developed by the Sylvania company and put into massive production. A particularly tricky issue was powering the proximity fuse, since conventional dry cells would drain away in storage. The answer was to develop a battery that was inert until the shell was fired. The battery only worked for two minutes, but that was well longer than the lifetime of the shell after firing. The fact that the battery wasn't active before firing also provided an arming mechanism, since the shell wouldn't be fully powered up until a tenth of a second after it was in flight, by which time it would be hundreds of meters away.

However, Tuve didn't rely on this feature as the primary arming mechanism since it wasn't entirely predictable. The fuse also featured an ingenious arming mechanism activated by the shell's spin. Instead of a complicated and bulky centrifugal clutch system, the fuse was fitted with a porous cylinder offset from the center, with the core of the cylinder filled with mercury.

Under normal conditions, the mercury provided a conductive path that shorted out the fuse circuitry, but when the shell was set to spinning rapidly, the mercury leaked out through the porous material, opening the circuit. The charge time of the capacitors in the circuitry also provided a safety delay.

The proximity fuse was longer than the older timed fuses and protruded into the interior of the shell, but the greater accuracy more than compensated for the reduction in explosive charge. Although proximity-fused shells tended to have a high rate of misfires, for example sometimes being set off by entering heavy cloud, they were still much more effective than timed shells.

** The proximity fuse project was top secret, with shipments protected by armed guards and the fuses stored under lock and key. Even when the fuses were deployed, they were at first restricted to naval forces in the Pacific, where it was unlikely that an unexploded shell would be recovered by the enemy. There were worries not only that the Axis might be able to duplicate the fuse, but could even generate countermeasures against it, running a sweep of radio waves through the fuse frequency range to set the shells off prematurely. This actually happened by accident in a few cases, when the fuses were triggered by longwave radars that happened to be on their frequency.*

The proximity fuse.

In the summer of 1944, the Germans began firing their "V-1 flying bombs" at London. The V-1 was a small winged missile powered by a pulsejet engine that gave it a distinctive buzzing sound in flight. It flew at high speed on a straight and level trajectory, held on course by a gyroscopic guidance system. The flying bombs did terrible damage to London at first, but fighter and ground defenses were refined and slowly managed to pick off more and more of the bombs. The Americans released SCR-584 radars and M-9 fire control systems intended for the Continent to British 94 millimeter (3.7 inch) anti-aircraft gun batteries, and also set up similar batteries with their own 90 millimeter anti-aircraft guns. The batteries were set up in a screen along the English coast.
Churchill pleaded for the proximity fuse, pointing out that the shells would only fall in the English Channel or on English soil. He got his wish, and the combination of SCR-584, M-9 director, and proximity fuse proved to be the most effective countermeasure against the flying bombs. The straight and level path of the intruders made them relatively easy targets, and after a learning curve, fewer and fewer of the V-1s got through to London. In the end, statistics showed that it took 156 proximity-fused shells to kill a flying bomb, which may not sound good except in comparison with the 2,800 conventional anti-aircraft shells required to accomplish the same trick. Incidentally, the proximity fuse had been designed to engage larger flying machines than the V-1, and so the fuses supplies to the defenders were "recalibrated" following tests against a static V-1 model back in the US.
Incidentally, the TRE also developed a rangefinder to help fighters shoot down the flying bombs at night. It was a simple but clever device, developed on short notice. All it did was optically split the image of the bomb's orange jet exhaust and focus the images so they came together at a range of 180 meters (600 feet), providing the pilot with a glowing indicator that indicated he was in firing range.
The V-1 attacks ended as the Allies overran the launch sites in northern France. Although the Germans tried to continue attacks by air-launching the buzz bombs from Heinkel He-111 bombers, the effort proved expensive in men and airplanes and was abandoned.
** Although the proximity fuse had been developed for anti-aircraft shells, of course Tuve and his people had always known it could be used for conventional artillery as well. A proximity fuse attached to ground bombardment artillery would allow the shells to burst in the air, showering the target area with fragments and leaving few places for victims to hide.*
Demonstrations of howitzer shells with proximity fuses were performed to Army brass in September 1943. Although the demonstrations were characterized by a good deal of bungling, the Army was still impressed and wanted to get the proximity fuse into the hands of the field artillery as soon as possible.
Most of the field artillery used howitzers, which often used high-angle fire trajectories. This led to a problem in that sometimes small powder charges were used, resulting in low accelerations and spins that defeated the fuse arming mechanisms. Gun crews were told to use heavier powder charges with proximity-fused shells.
There was also the worry about the fuses falling into enemy hands. In fact, the Germans were working on proximity fuses themselves, mostly for rockets. One issue was that the V-2 long-range missile tended to bury itself before detonating, reducing its effectiveness, and the Germans were also working on anti-aircraft missiles. They experimented with acoustic, optical, and radar proximity fuses, but the effort was unfocused and went nowhere. An intact VT fuse might have helped them a great deal, but by late 1944 the Reich was obviously on its last legs. There was little chance that the Germans would have the resources or the time to duplicate proximity fuses if they fell into their hands, and after strong lobbying by fuse advocates, their use was greatly expanded.
During the Battle of the Bulge in December 1944, proximity fuses were installed on artillery shells for ground bombardment. A backup impact fuse detonated the shell if the proximity fuse failed. Proximity fused shells proved devastatingly effective, and shell-shocked German soldiers surrendered in large numbers.
Allied brass worried enough about the possibility of the Germans copying the VT fuse to order the development of jamming systems that would cause proximity-fused shells to detonate prematurely. The jammers were built, but they were not needed. The Germans simply didn't have the time left to copy the fuse.

Summer 1944

Detail of Construction

Adelaide River, Northern Territory, 1943-09-06: A display of ammunition posed by members of the 5th Australian Advanced Ammunition Depot.
left to right:
Warrant Officer 2 A. Haines with a 40mm Bofors Anti-Aircraft Shell;
Private K. Wheeler with a 6 pounder light artillery and anti-tank shell;
Lieutenant J. Thompson with the 3.7 inch Anti-Aircraft Shell.

Gunnery on the coast – a memoir

HEADQUARTERS 601ST GUN BN (SM) APO 638, US ARMY "Narrative History" byT/5 Gordon R. Kerr

This is an excerpt from the story of the US "Six Hundred and First" an ack-ack outfit (90mm) that made a distinguished name for itself during the Blitz of Robot Bombs in World War Two. Originated at Fort Bliss, Texas in February 1942, the battalion soon moved to Philadelphia and then crossed the Atlantic in February 1944. They sailed from New York aboard the French liner "Ile de France" and seven days later arrived at Greenoch in Scotland. They spent two months in rural Monmouthshitre and then their Kent chapter begins…

Our day comes at last – combat assignments – orders to move – and on 21 April 1944 – 601st pulls out along the vast network of military highways spiderwebbing the British Isles – roads leading in one direction – towards the channel – towards D-Day – towards victory.

It's a good assignment – the White Cliffs of Dover no longer a song – they became reality as we set our guns along the fogbound rocks of Folkestone – and Hythe – near Dover. The men are excited – anxious – impatient for their first crack at the enemy – take care preparing the gunsights – digging in – revetting – and – they hadn't long to wait – as day after day – vast armadas of planes stream overhead – our bombers heading towards the enemy less than twenty miles away – and the enemy's striking at London – always London.

On clear days – the coast of France – Calais – very clear – we wondered if – Hitler might be over there – staring back at us – divining – where – when – would we strike? Great air battles raged overhead – the limping giants creeping home – afire – some plunge like flaming meteors into cold channel waters – air-sea rescue boats speed to their aid. Nazi ack ack thunders the air and shakes the ground at night – red puffs of fire – soaking our planes – distant fireworks – death for many victory for some – war.

Hitler is already talking about his "secret weapons" and D-Day is drawing near – you could feel it in the air – as the tempo of our bomber fleets increased hour by hour – day by day. All day and night the roar overhead – darken the sky – you felt the fever of war mounting everywhere. We were not aware but we were to be an important part of all this – the allies answer to Hitler"s "Goebbel-gobbling" about "secret weapons" – we were a Task Force – Top Secret Task Force-Six-O-One – and for many days and nights to come – we'd battle Hitler's V-bombs to a standstill to their defeat.

6 June 1944 – historic day – D-Day – and the day before – "alert" – "Stand by the guns" – we knew it had come at last. Long lines of ships and landing craft – strange looking barges end to end – heading South past Folkestone Point – southward through the shifting haze of natural and man made fog – the air umbrella blots out the sky – gliders by the thousands – airborne troops – we crossed our fingers for them. The scream of mighty shells from Germany batteries on Calais rip the air – burning ships dot the channel – a rising wind whips white caps – bad news for men who must fight their way ashore through any winds or waves. D-Day has come at last and we stand by for Nazi planes – those few that can be spared from Normandy Beach and dare to cross our field of fire.

Omaha Beach secure – the allies landed on the Continent of Europe – battles raging inland – and still we stood by – men impatient – itching to join our comrades over there. Cherbourg had been assaulted – Bayeux – Caen – Isigny – and then our call came . . . . a very special call.

The night of 13 June 1944 – a strange craft appeared in the channel skies – two of them passed overhead – too foggy for identification – certainly not ours – they must be enemy. Rumors rampant everywhere – a new rocket plane – radio guided – without pilot – a flying projectile – what could it be. The 601st stood by.

16th June – another tiresome night – a siren moan rises and falls in angry cadence – "alert" – and our sacks barely warm – Hells Bells – this was getting monotonous – a guy might as well have been up all night.

Dark shadows stumble through the blacked out tent – shaded flashlights casting ghostly illusions through natures smoke screen – heavy channel fog - Silent steeplechase – madly dashing AA men – gunners - plotters – ammo carriers cursing – sleepy growls as untied shoes slip in countless sheep droppings everywhere "Baaaaa, yourself – you G---D----- son-of-a-blacksheep"

Halfway to the C.P. I spy the Old Man – pause – together we scan clear skies above the mist – far out across the channel – a tiny speck of light – yellow light moving our way – from Calais to Dover – no-more towards Folkestone – Hythe on our left--. Then faintly – a murmur – louder – throbbing – peculiar pulse like beat – the yellow light is larger – changing course again – now a shadow – a shadow with a blazing tail - a man made meteor – and it is coming our way – right over us now – fog swallows it and it roars by – a light – and sound – towards London.

The Captain looked at me – questioned – I shrug – "Ju 88 with one motor shot out" – impossible – well – mebbe? A voice sings out – the siren moans again – "Diver alarm" ---- "Dover Alarm", We head for the C.P.

Our Nissen hut crowded smoky – tense – momentary confusion crystallizes into calm – precise plotting and command, control take over – plotting Sections and Communications coordinate – the skipper is calm – steady – "Guns check" – ("One – two – three – four") "Machine Guns" (ditto the answer) "5 – 8 – 4" ("ready for action") – "Tracker" (they're set to) The mechanical eyes and care of the big 90s are synchronized.

The radio speaks again – the Oxford accent – "Dover alarm" – divah" – "Dover alarm – Divah" – GCR repeats – and we wonder "what the hell is a "divah"?????

The S-2Cpl is excited – yellow light crossing the channel at azimuth – plots start pouring across the boards – the hot loop is sizzling – the Captain speaks again – "Guns – stand by". Tracker Head and Radar sound off – "on target" – Range – azimuth – angular height – (we're on the ball that night) – "No identification" IFF is positive – range again – "fourteen thousand – thirteen – twelve – eleven – ten --- The B.C. sounds as if he's ordering dinner at his favorite restaurant back home – "Commence – fire – ring".

An infinitesimal – breathless space of time – then an ear shattering roar – four guns belch destruction – not alone – for countless others match our moves – the night air is splintered into a trillion parts – the C.P. shakes – dust fills the air as salvo after salvo blasts away. I am extra man that night and join the boys outside in the O.P. – to see – the

Gunnery on the coast – a memoir

greatest show on earth. Chills and thrills play tag along my spine – the enemy aircraft is overhead – all Hell as broken loose along the coast – the White Cliffs of Dover are white not more – they"re crimson – gold – green – rose – flame – every color of the rainbow as every gun of every caliber opens up – American – British – Canadian – throwing the book at the intruder – a wall of incandescent steel – shrapnel whines along the revetments – I clamp my helmet – tight – crouch lower.

It's a premature Fourth-of-July to end all Fourths-of-July – thousands of rounds of red – white – tracer and incendiary – arcs of fire streaming after the illusive target – and – the noise is terrific – sharp plan-plang of the Bofors 40s – staccatto rattle of the Oerlikon 20s – close knit bursts of 50s – the mighty roar of our 90s – and yes – some one is even firing an M-1 – pygmy throwing pebbles at a giant – but the enemy soars blissfully through the inferno – heading towards London – What kind of a man can that pilot be?

Suddenly – a beautiful, box-like burst of 90s brackets the foe – he wavers – falters – turns in a long curve – that mysterious yellow flame still blazing – streaming fire behind – down – down – but never reaching the ground – for the sky splits wide open – erupts a great, spreading, billowing orange-rod-rosebud of flame – one tremendous blast – then darkness – silence.

"Cease firing" – (The Old Man will have coffee with his desert)" "Guns Rest" we wipe the sweat from our dusty brows – look at each other – the Skippers on the phone to GCR at Dover – "enemy destroyed you say?" No doubt of it – but – by whom – Naturally we think – hope – we can't be sure – but – the Skipper grins in his quiet, assuring way.

"There'll be no more sleep tonight, boys", Nor for many, many nights to come – The voice again – with the Oxford accent – "Dover alarm – Divah Dover alarm – Divah".

A tiny speck of light – yellowish – leaving Calais – the distant – outboard motorish throb. Guns – stand – by The V-Is – the Robombs – were on their way.

That was 17 June 1944 – we were the first American Heavy Ack Ack Battalion to be credited officially with firing on the flying bombs – or "pilotless aircraft" first to be credited with "Cat A" kills – and they've been our special mission ever since – 18 – 19 – 20 – 21 – 22 – 23 – 24 – 25 – 26 – 27 --- the 27th – one of the "Great Days" in Ack Ack History ------

Let me quote here from an official commendation to qualify that statement – let me tell you especially about the last great night we fired on the Robombs in defense of England – a night that went down in history – monument and memorial to the Six Hundred and First – the following paper was presented to all men on the day of 8 August 1944 somewhere in Normandy – Every man has his copy – and we are justly proud of it. It is the story of June 27th.

"The commendation of Major General R.F.E. WHITAKER and Brigadier General LAMPEAU, British Army, and Col., Harry R. Pierce, American Army, for the magnificent firing on the nights of June 26 and 27, 1944 at Folkestone, England, is for the firing on flying bombs, which is in all probability one of the greatest demonstrations of 90 mm AA fire of this war ….."

"…….. commendation from Col. Harry E. Pierce, 2nd AAA Group . . . . I wish to express to you and to your batteries concerned, my appreciation o the results of action on the early morning of 27 June 1944 which resulted in the destruction of 13 Pilotless Aircraft and a very high percentage of those that came over . . . etc .. . ."

Yes – those were great days. But there were hundreds of other hectic days worth mentioning – if one could recall them all – the trips to London and Canterbury – ancient Saltwood Castle, Hythe – the great stone fort at Dover standing since the days of the Romans – the official exchanges of "guests" between the British and American ack ack units – supposed to favorably influence our relations (ahem) the romances with English girls – more "Mild and Bitter" – and the bitching about early closing hours for the pubs – narrow escapes from German shellfire in Dover and Folkestone – fights with friends and neighbors – mounting tension among all troops – especially the Canadians stationed there in Dover four long years – twiddling their thumbs – waiting to avenge Dunkirk and Dieppe. There were the letters from home – "wonder if you're in the fighting, dear – it's so awful not to know"

The morning after the "Great Night of the 27th", Able Battery received their orders for the crossing – the 29th found them at their staging area near Southampton where they were joined by other batteries of the 601st – the 30th at another still closer – and on 2 July 1944 Able was aboard an old converted channel steamer "The Channel Queen" – and bound for France.

The 601st was to move and resite itself 7 times before the war was finished. Two months in Normandy, two more in Paris and then many moves around Antwerp from November till Easter 1945 as part of the very successful AA defense against V1 attacks threatening the harbour city.

A US Anti Aircraft unit on the move through France in 1944

A Rad Lab engineer in Britain

A Rad Lab engineer in Britain

Lee L. Davenport got his BA in Physics in 1937, his MA in Physics in 1941, and his PhD in Physics after the war. He was recruited for the Rad Lab in 1941. He spent his entire time there working on anti-aircraft radar, eventually as a project manager for the SCR-584. In addition to the basic development of the SCR-584, he was also involved in getting equipment to the field quickly, training troops how to use it, and in adapting small numbers of SCR-584s for particular uses; e.g., waterproofing them for D-Day, adapting them to guide bombers for close support of infantry, using them against buzz bombs, and adapting them for mortar location.

From http://www.ieeeghn.org/wiki/index.php/Oral-History:Lee_Davenport

SCR-584 in England

Davenport:
In 1943 when the first of the 584s were starting to come off the line, several were promptly shipped to England as deck cargo. I went over to receive the first one and demonstrate its operation to the British forces. I dashed off to England for the unveiling and learned about British red tape. Though the 584 was shipped to a British destination I could find nothing about its arrival from the British. Ship movements were very secret in those days. On that, the U.S. Embassy came to my rescue. I checked out the arrangements for its testing with the British. Upon my inquiries as to when it would arrive, I found out that it was expected to take about two weeks after it landed in Scotland to move it a few hundred miles south to the test area. Well, two weeks was certainly not our style. So I went to Scotland and found the ship. The 584 was on deck. I found the Habormastor and explained the secrecy of the program and its importance to the war effort. Can we get this thing unloaded rather promptly? The harbormaster said, "Oh, certainly if you need that in a hurry it's deck cargo and we can get that off of there." I said, "Could I come back tomorrow and can you have it on the ground?" "Yes, we'll have it ready for you tomorrow." So then I found the nearest US base, located the transportation section and talked the colonel in charge into loaning me a driver and a tractor unit (it was a standard semi-trailer, so any standard Army tractor unit would pull it). With a driver and a truck, the following morning we got the 584, signed the papers, and drove off with it. I rode with the driver, and we had it at the test site the following morning ready to go. Now this was typical of the way in which we tried to operate. We attempted to eliminate red tape. We knew we had credentials if we really needed to use them but we tried to avoid going through the command structure to get orders cut that would cause these things to happen since that took extra time. As a civilian, I wasn't in uniform.

Bryant:
Were you informed as to what procedure you could use to do that?

Davenport:
Oh, I certainly knew how to get official orders on paper. But the short cuts you learned yourself by being convincing. I told people, "I'm a civilian on an important classified assignment. How do you handle things like this?" The cooperation that we got all the way through was remarkable. The 584 performed very well for the British — as one would expect. That began the flow of such equipment to the British.

Bryant:
Was this British Army?

First Combat Uses of 584

Davenport:
It was their equivalent of our Anti-Aircraft Command, but under the Army's auspices. The first use, as you know, was at the Anzio beachhead.

Bryant:
Do you mean the first use in combat?

Davenport:
Yes, in combat, it was at Anzio beachhead, the invasion in Italy in 1944. From that point on, my involvements were largely for operations which were rapid response emergencies. One emergency that I can remember was an important one. It was the arrival of the buzz bombs. D-Day was also considered an emergency. So since I was in England several months before D-Day I took on the responsibility for arranging and supervising the waterproofing of 584s so that they could be floated ashore. Now this was something we never dreamed would become necessary. That required a trip to Wales with a British group, and we jointly worked with a team that was preparing trucks and other vehicles constructing snorkels for the air intakes and exhausts.

Bryant:
Oh, they added snorkels so it could almost drive in the water.

Davenport:
The snorkel could suck in air without sucking in water, and they would run almost submerged. The same group of people worked on our 584s, and I briefly supervised that. We had ventilation ducts under the floors and all sorts of unusual things to take care of. That was pre-D-Day extra work. The reason I was in England involved a different emergency invasion project: could the 584 provide close support for our Ninth Tactical Air Force Group? They flew dive bombers. We could readily track their airplanes. They often couldn't find their ground targets working from maps. Our quick solution was to make a simple synchro driven plotter to show the aircraft position on a map inside of the 584 itself, and have a controller talk to the airplane and vector him to his target. We had excellent detail maps of all of Europe. Close support meant attacking targets directly ahead of our advancing ground troops. We quickly designed and built plotting boards over there in some quantities prior to D-Day so that they would be able to do that close support work. That was a significant new application.

Bryant:
Did you work through the British branch of the Radiation Lab?

Davenport:
Yes, BBRL at that time.

Bryant:
Did BBRL support all of the American operations regardless whether it was Air Force or Army application?

Davenport:
That's right, all of the Radiation Lab operations. And it used services and facilities of the Technical Research Establishment and U.S. military bases. American military bases worked on making up parts for me for the plotting

A Rad Lab engineer in Britain

boards. There were machine shops at one U.S. Air Force base that helped us with parts and assembly. Some things were made in this country at RRL and at some in our own facilities at Radiation Laboratory and shipped across. In general it was these sorts of rapid response adaptations of 584 that kept my team occupied.

Normandy

Davenport:

I went over to France shortly after D-Day to be certain that the first close support 584 was working properly in its role for dive bombing. I helped train the 555th Signal Air Warning Battalion at BBRL and in Normandy which had been assigned to operate the unit. Leo Sullivan, George Huff and I were involved with that exercise and we were near St. Lo at the 584 site when the breakthrough occurred. Prior to that we managed to get shot at a few times by German 88 mm. guns while searching for closer sites for the 584. We watched the St.-Lo breakthrough while we tracked the waves of Eighth Air Force bombers that were coming. They dropped bombs for several hours on the German lines to prepare the way for the attack. We watched and tracked bombers as they came closer and closer to the American lines. The dust that was blown up by the explosions from the first waves of planes was blowing toward our lines. The following waves of planes were dropping blind on that dust cloud. One of the most tragic experiences I have ever had was to watch that happen, knowing from our plots that the explosions were dangerously close to American lines and being helpless to reach those bombers. Of course we reported to Ninth Tactical what was happening but without radio communications links to Eighth Air Force no one could inform the bombers. That was a tragedy. American troops were killed, and we lost one of our generals in that episode.

London: Defending Against Buzz Bombs

Davenport:

After that I came back to England since the close support equipment was working very well. When I returned I discovered we were in the midst of the London buzz bomb attacks. They had started about the 6th of June D Day before I had gone to France. When we went to France, those of us who were civilians had to wear military officers uniforms. If we were captured, we would be shot as spies if we were not in uniform. So we were supplied with assimilated ranks and credentials as military officers, but without rank insignia on our shoulders. It confused a lot of troops. They didn't know whether to salute us or not. Only when we were in battle zones did we wear uniforms

Bryant:

Did you have to wear a steel helmet and all?

Davenport:

No I didn't wear a steel helmet. Although we got shot at, we didn't wear steel helmets. I came back and was preparing to return to the USA after the successful operation of close support equipment in France knowing that it was working well. But I found that we were in a real problem with the V-1 buzz bombs. While I was in France, this buzz bomb situation had grown serious. I learned it had already reached a point where the British had asked the United States forces to bring 584 gun batteries to the south coast of England in order to try to knock down the buzz bombs out over the water before they crossed the coast into England. Colonel Arthur Warner, who earlier had been one of my staff people at Rad Lab, was by then attached to the Anti-Aircraft Command reporting to Eisenhower in the European Theater of Operations. Art Warner, many years my senior, had worked in my Group for some time as a civilian Radiation Lab Staff Member before he was recommissioned with the rank of Lt. Colonel in the Anti Aircraft Artillery. His knowledge of the 584 and the associated gun batteries was extensive and he became a principal advisor on AA in the European Theater. Thus, when I got a message from Art asking me to stop by his office at ETOUSA Headquarters outside of London I assumed it was just for a friendly visit before my return to the USA the following day. My assumption was wrong.

Art began our conversation by intimating that the request for US Anti aircraft gun batteries had gone from Churchill to Roosevelt implying that it had very high priority and that our reputation was at stake. In order to respond quickly, AA Command had directed that 584s together with the new M-9 directors and the necessary 90 mm. gun batteries be diverted to the south coast. This was the preferred location for AA since firing could be over water and wounded bombs would drop harmlessly into the sea. Since our AA troops and equipment were already in France, they had requested that Washington HQ. dispatch other AA crews from other locations to England. They had arrived a few days earlier and Art said they seemed to be having trouble since the twenty or so batteries in place had managed to destroy almost no buzz bombs. He had requested immediate help from the Laboratory and was told that I was just returning from France.

Art had a car and military driver waiting to take us to the south coast immediately. We arrived as darkness was falling and I watched seven buzz bombs all within range of one four-gun battery fly over us and on to London. Only a few shots were fired. Several interviews with the two or three crews we visited that night turned up the problem quickly. The men previously had been manning SCR-268 equipment with mechanical gun directors in places like Iceland where they had never seen an enemy plane. Thus they didn't know how to align the radar with the M-9 or make the guns point in the correct direction. Under those circumstances they deserved a lot of credit. It was a wonder that they had been able to connect all the cables between the equipments and find the on-off switches. They were trying to fire at targets while still reading the several instruction manuals. [The three War Department Manuals that accompany the 584 alone total almost 1300 pages.] I could make the 584s perform beautifully in a few moments for them but that was of no real help.

We returned to London in the early hours of the morning. No easy trip with blackout headlights. On the way down had Art confided to me that these batteries had been equipped with proximity fused 90 mm. shells, still a very secret development. This was their first use in the European Theater and it was permitted only because unexploded rounds would fall into the sea. This statement increased my growing suspicion that Art Warner's recommendations lay behind this entire deployment of US anti aircraft batteries against the V-1 buzz bombs. Every step had been expertly planned to use our best equipment under optimum circumstances. Then Art said, "Obviously we've got to do

The Marden Society

The Marden Society was formed in the 1970s in response to concerns about a particular development near the village. After that was successfully resolved the Society has gone on to both represent the views of the village, as far as it is able, and to promote interest in Marden, in Kent and in the countryside in general.

From The Parish Pump, newsletter of the Marden Society

Why do we garden – pleasure, exercise, de-stressing, freedom from food miles? Whatever! We probably wouldn't say that we were digging for victory. Yet during World War II this is what we were exhorted to do. Russell Bowles, our speaker, discovered that this subject was poorly covered by history books & thence advertised for people to tell him of their personal experiences.

At the start of the war we were an exporter of manufactured goods & an importer of cheap food – 70% of our needs. The Germans were far better prepared by growing 80% of the produce which they needed. To resolve this, the Ministry of Agriculture granted £2 for every acre of new land put under cultivation, thus making the shortfall of labour 50,000. So the Women's Land Army evolved. Lady Denman, a leading light in the Women's Institute, had already run a pilot scheme in the first war and she didn't allow her organisational skills to be thwarted by the lack of ministerial enthusiasm.

Many of these new recruits worked on dairy farms, having practised on plywood cows with rubber gloves attached! One former member of the W.L.A. remarked that you have never been cold until you've cut brussel sprouts in February. It is also true that famine can achieve what no bombs or invading forces can. So in spite of unworthy remarks about Eve & the apple-picking season by the National Union of Agricultural Workers, the toil of the "Land Girls" was vital to the war effort. Eleven girls from Canterbury worked together on a local farm. After a night of bombing they still arrived on time apart from one, who apologised for being late but she'd had to be dug from the rubble first. Another had cycled during the night to be with her cows in case they were frightened. Yet it was only after 1980 that these ladies were invited to take part in the Remembrance Day parades.

Thousands more acres came under cultivation in gardens, encouraged by the Government & the Royal Horticultural Society. (Evidently a recent poll of memorable advertising quoted the Dig for Victory as 2nd best recognised – coming after the Wonderbra adverts.) If you scrutinise the poster with the leg & spade, you will see there is only a left leg. Russell had to dig deep to uncover the fact that it was the leg of a tailor's dummy. If John Reed has a demand for hair clippings, it's reminiscent of the hairdressers who grew runner beans behind their salon & fertilised them with newspaper & hair (evidently high in nitrogen) Leaflets galore were available & advice bureaux were set up. The first BBC radio outside broadcast came from their own allotment & Vita Sackville West of Sissinghurst wrote in The Observer "How to dig for Beauty". She thought some flowers were still important. Even Anderson shelters could be beautified by growing things on or over them. Onions were like gold dust and when a packet was found, 74 people claimed them. One tip – a gas mask is good to wear when peeling onions! The W.I. were paid 1d per lb of rosehips. Growing cucumbers under glass was forbidden (because of the heat needed) and you needed a licence to grow asparagus. Tomatoes were in short supply & the USA sent us ½ million tons of seeds. Gardening entered the school curriculum & the cabbage white butterfly became more hated than Hitler. The Luftwaffe was part of a dastardly plot to destroy the potato harvest, then centred in the Isle of Wight. They dropped boxes of Colorado beetles, either of 50 or 100. Children were sent out to search for the enemy and if 51 were discovered lessons were abandoned until all the beetles were safely harvested. Allotments sprouted everywhere, even in Hyde Park & the dry moat of the Tower of London. And so to animals – pigs were popular as it was said that you could use every part except the squeal. However many others became family pets & who wanted to eat Fluffy or Clucky?

Eventually war ended and was celebrated with a French bred rose renamed as the popular variety – Peace.

Odd Spot

Throwing stones at passing trains would appear to be an old custom - in 1869 Stephen Pearson of Marden appeared in court for throwing stones at a passing train. He was bailed for £20 (payable by himself) and a further £20 which could be paid by others.

The Boer War reached Marden as a Miss Smart, of Howland Road, decided to make cushions for soldiers rercuperating in South African army hospitals. She asked people to donate feathers to her, which she could then fashion into cushions and ship out to the recipients.

However James Clark of Marden had other concerns in 1906 than Boer War wounded soldiers. He stole the sole from a cart and his defence was that his family was starving in London - he was a veteran of the Indian Mutiny. As he had not been in trouble before the case was dismissed.

At about this time a hop picker was accused of stealing a bed quilt and 2lbs of sugar. His doctor managed to persuade the court that he was of weak mind, so he received a sentence of 7 days without hard labour under the doctor's care.

Meet the History Group

Chris & Sue Turner
Written by Sue and dictated by Chris

I was brought up in Purley and Chris lived in Leicester; later moving to Old Coulsdon. As a result of his father being a Japanese POW Chris did not meet his father until he was 6 years old. We met at youth club when Chris was an articled clerk aged 19 and I was 16 and still at school. We married in September 1963, producing our first son, Daniel in June 1964, quickly followed by Ben in 1965 and Matt in 1967. Ben was diagnosed as having a severe learning disability at the age of 6 months and later Luke was born with a profound disability; both of them being diagnosed with sight and hearing disabilities. After the shock of what we might have to face, we both feel pride in all our sons and have met some amazing people from the world of sensory disability.

We moved to Spring Grove in February 1969 quickly became involved in village life; joining the motor club where Chris was treasurer from 1970 until 2013!!, taking part in the Parent Teacher Association, Chris running practice sessions for children at the tennis club and helping to run the popular youth club with Roger Jeffries, Janette Farrow and Bolly providing music. It was then that we first met Eunice, who even then was campaigning to secure the use of the small pools at Maidstone swimming pool for the use of families with disabled children on a Friday evening.

Chris worked in London; from 1964 until 1972 for Deloittes, and then for 25 years for Greek shipowners. Finally for the past 18 years with an Italian construction firm.

We lived in Marden for 44 years and were sad to leave such a lovely village, but most of all miss all our friends who have been so supportive over the last couple of years since Parkinsons has made life much more challenging for both of us.

Chris & Sue have both been valued volunteers in the Heritage Centre. Chris with cataloguing to the website database and Sue taking charge of the exhibition team. Both of them with ever ready smiles whatever life has thrown at them. They are much missed.

MARDEN HISTORY GROUP

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Current Exhibition

THE WEATHER – What subject could be more topical when Christmas Eve saw roads everywhere flooded and blocked by fallen trees? I know of one garden which is still under water in mid-March. But spring is in the air, the woodpeckers are drumming and calling and all around is resplendent with daffodils, including roadsides. Meanwhile an extra effort is being directed to remembrances of WW1. We're trying to persuade villagers to unearth mementoes and memories which they think are of no interest to anyone else – BUT they truly are

Marden Village Fetes : Summer 2013

Southons Field has had a busy year.

On June the Friends of Marden Heritage put on Picnic in the Park, a popular event with fun events during the afternoon, plenty of stalls and local societies running quizzes, selling strawberries, treasure hunt, etc. The singing is always popular, with the songs sheets provided so everyone can join us while they eat their picnic. The weather was a little unkind but it did not deter the enthusiasm.

The village fete fared better for weather. Local MP, Helen Grant, was seen in a wheelbarrow being pushed around in the opening wheelbarrow race.

This event is organised by a keen local committee, and again local societies had stalls with games, tombola, strawberries and cream. There was pulling the heavy vehicle, childrens' races, skittles alley, tombola, balloon race, bbq, and as it was a warm sunny day, it contributed to a very good event.

The activities on Southons Field were rounded off in September by a local produce day. Unfortunately the morning was ruined by heavy rain but the sun eventually shone through before the end of the Fare. Local produce included cheeses, fudges, vegetables, fruit, and it is hoped that this can be put on again in future years.

Marden History Group

The Marden History Group aims to seek, preserve, inspire and transmit knowledge of the history of the village of Marden. It is a working group of eight who meet each month to plan the work,

THE MARDEN HISTORY GROUP