

A Summary of the Key Developments

Background

In its long history, and since being reformed as Dstl in 2001, the origins of innovation for military support can be traced back to the 17th Century and the founding of the Royal Laboratory at Woolwich, later to become the Woolwich Arsenal.

This capability and expertise has led to many developments that find every day uses, and have in some cases considerably transformed the way we live today

1664: The Royal Carriage works, Woolwich, is established.

1695: The Royal Laboratory, Woolwich, is established.

1716: The Royal Gun Factory, Woolwich, – formerly Royal Brass Foundry – is established. It is the forerunner of the modern Royal Arsenal, Woolwich, which will lead to work at Fort Halstead.

1783: The Royal Gunpowder Factory (RGF) is formally established at Waltham Abbey, having been in existence since 1545.

1872: The Admiralty Experiment Works (AEW) is established at Torquay to work on Hydrodynamics.

1887: AEW moves to its permanent home at Haslar.

1896: The Wireless Section, Torpedo School, HMS Defiance, Plymouth, is established to develop radio and signals equipment for the Royal Navy.

1902: The Admiralty Liquid Fuel Experimentation Station (ALFES) is set up at Haslar. It is soon to become Admiralty Fuel Experimentation Station (AFES).

1907: The Chemical Research Department is formed at Royal Arsenal, Woolwich. It is renamed the Research Department in 1908, before moving to Fort Halstead in 1942.

Farnborough launches the first UK airship flight. The airship is a non-rigid design powered by a 50bhp V8 engine – known as Nulli Secundus. As a result of high winds, the flight is forced to land prematurely.

1908: The Royal Engineers Balloon Factory is renamed the HM Balloon Factory, at Farnborough.

Samuel F Cody takes his first manned flight on Laffins Plain, Farnborough.

1910/13: Several balloons are built and tested at Farnborough.

1911: HM Balloon Factory at Farnborough is renamed HM Aircraft Factory.

1912: Farnborough receives the Royal Warrant and is renamed the Royal Aircraft Factory (RAF). The High Explosive Research department formed from the Research Department at Royal Arsenal, Woolwich, which was the progenitor of Atomic Weapons Establishment, Aldermaston.

1914: World War One starts.

1915: RGF becomes the Royal Ordnance Factory, Waltham Abbey.

A laboratory is built in the Old Fort at Fort Halstead. The site belongs to The War Office.

Winston Churchill's famous Admiralty Landship Committee is formed, which begins the development of the tank.

The Design Department, Royal Arsenal, Woolwich, is created – one of Fort Halstead's ancestors.

1916: Signals Experimental Establishment (SEE) is founded on Woolwich Common. The remit was Army communications research, including gun sound ranging and aircraft sound location.

March 1916: Porton Down site is established.

April 1916: The first hydrogen sulphide field trial at Porton Down takes place.

1917: The Searchlight Experimental Establishment (SLEE) is founded on Woolwich Common to conduct anti-aircraft weapons and searchlight research.

The Admiralty Research Laboratory (ARL) is founded at Teddington.

HM Signal School, Experimental Department and Portsmouth Dockyard take over wireless and signals work of TEE's Wireless Section.

The Admiralty Engineering Laboratory (AEL) is established at West Drayton, which later becomes part of National Gas Turbine Establishment (NGTE), Pyestock, in 1972.

1917/18: Two 7ft wind tunnels are built at Farnborough.

1918: George V visits Porton Down.

Following the creation of Royal Air Force, RAF Farnborough is renamed the Royal Aircraft Establishment (RAE) to avoid name confusions.

The Royal Airship Works (RAW) established at RAF Cardington for the development of airships and balloons for the RAF.

1919: SLEE takes over sound ranging and location research, and develops the acoustic mirror air defence system.

Admiralty sets up the Mining Design Department (MDD) at Portsmouth to improve naval mines, and later depth charges.

1920: Research is started at Porton Down into whole-body protection against mustard gas. Detectors and equipment are developed for decontamination.

1924: SLEE is renamed the Air Defence Experimental Establishment (ADEE) and moves from Woolwich to Biggin Hill. Catapult and cable arrestors are developed at Farnborough for carrier use.

The Aeroplane and Armament Experimental Establishment (A&AEE) is formed at Martlesham Heath, Suffolk, before moving to Boscombe Down in 1939.

1925: The Experimental Bridging Establishment (EBE) is formed at Christchurch out of the Experimental Bridging Company, which had been established on the same site in 1919.

The Tank and Tracked Transport Experiment Establishment (TTTEE) is formed at Farnborough.

The Marine Aircraft Experimental Establishment (MAEE) is formed at Felixstowe for work on seaplanes and flying boats. It merges with A&AEE in 1956.

1926: Jet engine axial flow experimental compressor experiments begin at Farnborough. The General Service Respirator is produced at Porton Down, which is a vast improvement on previous designs. They were in service until 1942.

bASDIC Research and Development Unit (ARDU) is formed at Portland to further the nascent work on ASDIC, the forerunner of sonar.

1928: The Mechanical Warfare Experimental Establishment (MWEE) is formed at Farnborough out of TTTEE.

1930: The Chemical Defence Experimental Station (CDES) takes over at Porton Down from the Royal Engineers.

1931: A crash of the R101 airships halts British development of airships.

1932: Power Jets Ltd is set up to take forward Whittle's work on the jet engine.

1934: The Radio Direction Finding (RDF) Tizard Committee (Committee for the Scientific Study of Air Defence) is proposed.

MWEE is renamed the Mechanisation Experimental Establishment (MEE).

1935: After research was conducted at Porton Down, millions of new civilian respirators are manufactured but are never issued.

February 1935: The Daventry experiment confirms the Watson-Watt's theory that aircraft could be detected using radio waves.

April 1935: Farnborough satisfies the need for larger, more modern wind tunnels by producing a 24ft wind tunnel.

May 1935: Orfordness Research Station (ORS) is set up to develop radiodirection finding (RDF) as a means of long-range aircraft detection. (RDF was the term used for 'radar' by the UK until c.1943, when common nomenclature was agreed with USA).

1936: The Aircraft acoustic location system is made operational for RAF (ADEE).

Gyro Gunsight is developed that improves lethality of air-to-air combat.

Farnborough provides the research and evaluation of Hurricane, Spitfire, Wellington, Lancaster and many other aircrafts.

May 1936: ORS moves to Bawdsey Manor and is renamed Bawdsey Research Station (BRS). The RDF range is extended to 75 miles.

1937/8: Brigadier McNair (Chief Superintendent, Research department – dealing with explosives) chooses the Fort site to be the location for experimenting with large cordite charges. As a result of this, elements of the Rocket section of the Ballistics Branch are moved to the Fort.

1938: The first ship-borne radiolocation is fitted in HMS Rodney and HMS Sheffield (HM Signal School).

RAW Cardington is renamed Balloon Development Establishment (BDE).

1939: World War Two starts.

BRS moves to Dundee and becomes Air Ministry Research Establishment (AMRE) in September.

ADEE moves from Biggin Hill to Christchurch and becomes Air Defence Research and Development Establishment. (ADRDE).

AI (Airborne Interception, ie aircraft-to-aircraft radiolocation used in night-fighting aircraft) is implemented in a Blenheim night fighter at Bawdsey Research Station. (BRS).

November 1939: One-and-half metre ASV (Air-to-Surface Vessel, ie Ship/submarine detection by aircraft) radiolocation is fitted in a Coastal Command Hudson aircraft. (BRS).

First practical IFF (Identification Friend-or-Foe) system is developed at BRS.

One-and-half metre ship-locating radiolocation for coastal artillery is developed, which is then adapted for detection of low-flying aircraft. (ADEE).

Army gun-laying radiolocator, GL Mk1, enters service allowing radiolocation control of Anti-Aircraft fire. (ADEE).

After the evacuation of Dunkirk, the Fort site is deemed vulnerable to air attack and Hitler's invading armies. The Rocket team is moved to Aberporth, Wales.

1940: Decontamination method operations in tropical areas leads to research into the insecticide DDT at Porton Down and in Africa.

Research into Biological Warfare also starts at Porton Down.

AMRE moves to Swanage, renamed firstly Ministry of Aircraft Production Research Establishment (MAPRE) in May and then Telecommunications Research Establishment (TRE) in November.

Biology Department, Porton (BDP) is set up.

The Royal Ordnance Factory is renamed Chemical Research & Development Department (CRDD), War Office.

The Department of Tank Design and Ministry of supply formed at Woolwich from the Design Department, Royal Arsenal, Woolwich.

MEE becomes part of Department of Tank Design, MoS.

February 1940: The first working Magnetron (E1189) is developed by Boot and Randall at Birmingham University (under Admiralty's Coordination of Valve Department (CVD) contract) and allows radiolocation to operate at 10cm. This kicks off the 'centimetric revolution' in radiolocation.

July 1940: The first 10cm RDF echoes received from an aircraft. (MAPRE).

October 1940: The first IA Night fighter operation is conducted by Ground Controlled Interception (GCI). (MAPRE).

ASE Valve Division develops the first microwave reflex Klystron, later used in Type 271 naval radar (ASE) and the airborne H2S equipment. (TRE).

PPI (Plan Position Indicator) is now a 'working-weapon' (Watson- Watt's term). (ADRDE/TRE).

1941: The Farnborough site becomes an 800-acre modern airfield that holds new hangars, a runway and workshops.

SEE moves to Warnham Court, Horsham, and is renamed the Signals Research and Development Establishment (SRDE).

Admiralty Signals Establishment (ASE) is formed at Haslemere mainly from the Experimental Department of HM Signal School, Whale Island.

HM Anti-Submarine Experimental Establishment (HMA/SEE) is formed at Fairlee, Scotland, from the ARDU, Portland, before moving back to Portland in 1946.

1941: The Admiralty Signals Establishment (ASE) develops the Type 271 radar, the Navy's first microwave radar.

50-cm Naval fire-control radar based on GL Mk1 is used by HMS Suffolk in tracking the Bismarck. (HM Signal School (ASE)).

1941/42: The Fort once again becomes habitable after the bomb threat reduced. Roads were relaid and buildings were built around the site.

Pre 1942: The Chertsey site in Surrey (originally called RAF Chobham) tests tanks on Chobham Heath. A section of the experimental wing in the Department of Tank Design moves from Farnborough to a new purpose-built camp at Chobham. This section is named FVPE (Fighting Vehicles Proving Establishment).

1942: Farnborough's new high-speed wind tunnel opens. It is used to test prototypes of early jets (Meteor) and the later marks of Spitfire at wind speeds up to 600mph.

Following the Bruneval raid and fears of reprisal, TRE moves to Malvern College, ADRDE moves to Malvern Pale Manor (North Site), and SDRE moves to Christchurch.

The Experimental Demolition Establishment (EDE) moves to Christchurch from Bovington and the Experimental Tunnelling Establishment (ETE) to Christchurch from Yorkshire.

From the founding work of PMS Blackett and JS Hey on operational research, the Army Operational Research Group (AORG) is created.

The Royal Naval Physiological Laboratory (RNPL) is set up at Alverstoke.

The Fighting Vehicle Proving Establishment (FVPE) is established at Chertsey. The Wheeled Vehicles Experimental Establishment (WVEE) is formed initially at Farnborough, before moving to Cherstey in 1943. It is formed out of the Department of Tank Design, MoS.

March 1942: The first operational use of Gee aircraft navigation system with Bomber Command. (TRE).

December 1942: The first operational use of Oboe, a precision ground-controlled blind bombing system. (TRE).

1942/43: The threat of Bacteriological Warfare from Germany, leads to anthrax trials on Gruinard Island (isolated island off coast of northwest Scotland.)

1943: The Admiralty Underworks (AUW) established at Rosyth starts work on the effects of underwater explosions on ships.

The Torpedo Experimental Establishment (TEE) is established at Greenock, Scotland, before moving to Portland in 1959.

A new 11ft by 8ft wind tunnel, which reaches speeds of up to 270 mph, is opened at Farnborough.

Mine detector, no.3 is developed. It is the first hand-held mine detector using miniature radio techniques. (SRDE).

January 1943: The first operational use of H2S, an airborne radar navigation and bombing aid and the first ground mapping radar. (TRE)

March 1943: The first use of centimetric ASV by Coastal Command, leading to the demise of the U-boat threat. (TRE).

1944: ADRDE is renamed Radar Research and Development Establishment (RRDE).

The Research Department, Royal Arsenal, based at Fort Halstead since 1942 is renamed the Armament Research Department (ARD).

Due to work analysing the debris from V1 and V2 weapons, the RAE is able to establish accident-investigation methods that limit the threat of weapons (Farnborough). ADRDE is renamed Radar Research and Development Establishment (RRDE).

No.10 Downing Street introduces the Army's first multi-channel microwave radio-relay system into service by SRDE just before D-Day.

Oboe and Gee make invaluable contributions to the successful navigation of the invasion forces to Normandy's beaches. (TRE).

1945: World War Two ends.

The Services Electronics Research Laboratory (SERL) is established at Harlow and Baldock, as the research department for CVD.

The Underwater Weapons Launching Establishment (UWLE) is set-up in Bournemouth.

The Admiralty's MDD reforms as Admiralty Mining Department (AME) at Havant.

The National Aeronautical Establishment (NAE) is formed at Bedford; the following year it becomes Royal Aircraft Establishment (RAE) Bedford.

BDE is renamed Ministry of Supply Research & Development Establishment (MoS RDE), before being absorbed into RAE in 1949 and closure in 1986.

The Guided Projectile Establishment (GPE) is formed at Westcott.

Transonic & Supersonic aerodynamic research leads to English Electric Lightning (Farnborough).

BABS (Beam Approach Beacon System) is the first radar-controlled aircraft instrument landing. It is the forerunner of the system installed at Heathrow post-war. (TRE).

Wartime discoveries at FHD

SR 365 incendiary filling for ammunition – used by spitfires and Hurricanes in the Battle of Britain

Hollow-charge projectiles and demolition stores

Sub-calibre armour-penetrating projectiles

Evolution of explosives such as ‘minols’ range and Torpex (a mixture of TNT and RDX with aluminium)- used in the destruction of Tirpitz and the Ruhr dams

Devised the fillings for the 22,000 pound ‘earthquake’ bombs.

17 pounder gun with special ammunition **1943/4**

The famous 25 pounder anti-tank gun

Wombat Battalion anti-tank recoilless gun

ADEN 30mm gun

Range of anti-aircraft guns

1946: BDP becomes Microbiological Research Department (MRD) at Porton Down. It amalgamated out of AORG (WWII original), the Military Operations Research Group (MORG) and Operations Research Group (Weapons & Equipment) (ORG (W&E)).

The Naval Construction Research Establishment (NCRE) is formed at Rosyth and Dunfermeline out of AUW.

The National Gas Turbine Establishment (NGTE) is established at Pyestock, replacing Power Jets Ltd.

RAE absorbs GPE Westcott, as the Rocket Propulsion Department (RPD/RAE).

The Military Experimental Engineering Establishment (MEXE) is formed from the merger of EBE, EDE and ETE at Christchurch.

The Fighting Vehicle Design Department (FVDD) is formed at Chertsey out of The Department of Tank Design, MoS, alongside FVPE and WVEE.

MOD scientists at Porton Down conduct further investigations into war gases and nerve agents after Tabun was discovered in Germany at the end of the war.

W B Lewis, TRE’s post-war Superintendent, establishes The Research Division, which begins the work on semiconductor research. It specialises in single crystals, computer development and work in infrared; the precursor to Malvern’s post-war development.

ASWE (Admiralty Surface Weapons Establishment) at Portsdown Hill opens. ASWE had five out-stations in the Portsmouth area; Portsdown West, Eastney, Funtington, Alverstoke, Haslar and Ditton Park near Slough.

Portsdown West was always classed as part of Portsdown Main rather than an outstation. It housed the Electronic Warfare Division and the Communications Division. The Comms Division was responsible for the provision of robust communications for submarines and improving the utilisation of SATCOM assets. It also worked on Polaris and SSBN.

October 1946: Harry S Truman, President of the United States, awards A P Rowe, TRE's wartime Superintendent, the Medal of Honour "for exceptionally meritorious conduct" in promoting the development of electronics in wartime.

1947: The Admiralty Materials Laboratory (AML) is established at Holton Heath, out of the Control Laboratory of the RNCF, Holton Heath.

The Underwater Detection Establishment (UDE) is formed at Portland from HMA/SEE.

ADD and ARD (Fort Halstead) are renamed Armament Design Establishment (ADE) and Armament Research Establishment (ARE).

1948: CDES is renamed Chemical Defence Experimental Establishment (CDEE).

The Army Operational Research Group (AORG) is formed at West Byfleet from MORU and ORG (W&E).

ASE becomes Admiralty Signals and Radar Establishment (ASRE) and begins its move to Portsdown site.

CRDD Waltham Abbey becomes the Explosives Research & Development Establishment (ERDE).

FVDD is renamed The Fighting Vehicle Design Department (FVDE).

The High Explosive Research Establishment (HERE) is formed at Fort Halstead.

The Clothing and Stores Trials Establishment (CSTE) is formed at West Byfleet.

The Clothing and Equipment Physiological Research Establishment (CEPRE) is formed at Farnborough.

Late 1940s: TRE takes over ARL's post-war and wartime developments in infrared devices and equipments that leads to the development of the modern thermal imager and spin-off technologies.

1945/50: SERI concentrates on:

- Q-band magnetron (8.6 mm wavelength)
- Q-band Local oscillator
- Z-band wide bandwidth TR and ATR cell
- Ruggedised miniature valves for VT fuses.

1950: HERE is renamed the Atomic Weapons Research Establishment (AWRE), initially based at Fort Halstead before a final move to Aldermaston in 1955.

1950s: The Cold War begins. The services demand a detector for nerve gas.

The Larkspur radio series is set up. It is the Army's first VHF/FM radio set series (SRDE).

1950s Malvern developments:

- Surveillance radar, leading to the modern development of the UKADR (UK Air Defence Region)
- Meteorological radar, as now used by the Met Office
- Infantry radars, leading to ZB298 and Super Shrimp
- Mortar location radars, highlighted by Cymbeline
- Air traffic control radar, leading to SSR (Secondary Surveillance Radar) and Collision Avoidance
- Electronic Warfare, as a consequence of the WWII's 'radio war'.

1950s SERL Baldock developments:

- Two-and-a-half megawatt S-band magnetron transmitter for ASRE's Type 981 radar and TRE's Type 80
- 'Squeak'/'Chirp' radar built and demonstrated, leads to wide application modern radar systems
- Organometallic semiconductor, such as Indium Antimonide and Gallium Arsenide, work begins
- High Power 1MW/1kW X-band magnetron for missile guidance and tracking radars, such as 'Yellow River'
- High Power Multi-Cavity Klystron for frequency variable radar systems research at ASWE and RRE
- The Q-band continuous wave Doppler auto-follow radar radar built for evaluation of mm-wave missile guidance systems
- The pulsed neutron source for UKAEA to start the fission chain reaction, which later expanded into many civil applications

1951: The facility at Nancekuke in Cornwall is opened. Sutton Oak closes.

AME becomes Admiralty's Underwater Countermeasures & Weapons Establishment (UCWE), Havant, before later moving to Portland.

1952: FVPE and FVDE amalgamate to form the Fighting Vehicles research and Development Establishment at Chertsey (FVRDE).

1953: TRE merges with RRDE to form Radar Research Establishment (RRE).

The Admiralty Oil Laboratory (AOL) is set-up at Cobham, Surrey, before being absorbed into NGTE Pyestock in 1977.

1954: Rain erosion testing creates leading edge material development at Farnborough.

The Admiralty Gunnery Establishment (AGE) is formed at Portland.

1955: The Armament Research & Development Establishment (ARDE) is formed from the merger of ADE and ARE, both based at Fort Halstead.

CSTE and CEPRE merge to form Clothing and Stores Experiment Establishment (CSEE) at West Byfleet.

1956: Concorde is put through aerodynamic wing tests of high and low speeds at Farnborough.

1957: RRE receives Royal Charter during Royal visit by Queen Elizabeth II, and is renamed the Royal Radar Establishment.

MRD becomes Microbiological Research Establishment (MRE).

The X-band CW travelling wave tube for GPO transmitter is developed at Goonhilly for the Telstar project, resulting in the world's first satellite communications project. (SERL).

1958: RPD/RAE spins-off to establish The Rocket Propulsion Establishment (RPE) Westcott. MOD scientists at Porton Down work on finding ways to treat nerve gas poisoning in humans. The New Service respirator 'S6' is produced at Porton Down.

Discovery of cadmium mercury telluride's potential as a thermal detection material revived interest in thermal imaging as a practical proposition with RRW taking the lead.

1959: Admiralty Surface Weapons Establishment (ASWE) is formed out of ASRE and Admiralty Gunnery Establishment (AGE).

The Underwater Weapons Establishment (UWE) is established at Portland from an amalgamation of UCWE, TEE and UWLE.

RRE proposes the First Integrated Circuit.

1960: The Admiralty Underwater Weapons Establishment (AUWE) is set up at Portland from an amalgamation of UDE and UWE. CSEE, West Byfleet, is renamed Clothing and Experimental Physiological Research Establishment, and rebased at Farnborough.

1960s: RAE's post-war contribution to the first ballistic missile Blue Streak at Farnborough leads to first stage rocket booster technology. RAE's Black Knight rocket fired from Woomera, Australia, tests ICBM design characteristics during re-entry.

SRDE/RAE develops satellite communications, which leads to project SKYNET, and the very successful SKYNET 2.

SRDE's work on passive viewing systems, especially image converters and then image intensifiers, comes to fruition with in-service equipment.

It is declared that the UK Services has the best chemical defence equipment in the world.

The 105cm Light Howitzer (LH70) is developed at Fort Halstead. 1960s – Malvern Developments:

- Liquid crystal materials and displays, in conjunction with Hull University and BDH.
- Lasers, particularly Carbon Dioxide, leading to LIDAR (Laser radar)
- Coral 66 software
- Algol 68 software
- Speech recognition

1961: ARDE receives Royal Charter and is renamed Royal Armament Research & development Establishment (RARDE).

1962: AORG is renamed Army Operational Research Establishment (AORE).

SERL begins work on 'Optical Masers', later Lasers, initially leading to the He-Ne ring laser proposed for inertial navigation systems.

1963: Carbon Fibre is developed at Farnborough.

1964: SERL starts work on the low-noise parametric amplifier, which became widely used in satellite communication and radar systems.

Also, work began on pulsed excitation of gas lasers, leading to the discovery of the high efficiency CO₂ laser.

1965: AORE becomes the Defence Operational Analysis Establishment (DOAE).

The Army Personnel Research Establishment (APRE) is formed at Queen's Gate site, Farnborough, from CEPRE and the Human Factors Division of AORE, West Byfleet.

Clansman radio system begins development work. (SRDE).

SERL begins work on photo-emitters that leads to the 1970s' GaAs:CsO photocathodes for the later generation image intensifiers.

1966: AFES Haslar is renamed the Admiralty Marine Engineering Establishment (AMEE), before being taken over by NGTE in 1965, and then AMTE in 1979.

May 1966: Duke of Edinburgh visits the CDEE and MRE at Porton Down.

1969: CDEE is renamed Chemical Defence Establishment (CDE). Porton Down opens its doors to the public to try to drive out the misconception that secret work was being carried out on offensive matters. The open days also demonstrated the research involved in evaluating the hazards and effective methods of defence.

01 April 1970: FVRDE amalgamates with the Military Engineering Experimental Establishment (MEXE) at Christchurch. The Military Vehicles and Engineering Establishment (MVVEE) is born.

1970: Engine intake design and proving tests are carried out at neighbouring Pyestock site. The Military Vehicles and Engineering Establishment (MVEE) is formed from merger of FVRDE, Chertsey and MEXE at Christchurch.

The Queen and Prince Philip visit Winfrith with the Minister of Technology and the Authority Chairman. They also visit Fort Halstead in November 1972.

1970s: SRDE starts work on Ptarmigan, the Forces' rear tactical communications system, where major elements are still in service.

Malvern Developments:

- Neural networks
- Image recognition and analysis
- Blindfire and LASERFIRE surveillance systems for Rapier ground to-air missile system
- MASCOT and ADA software systems
- With USA, the ARPANET network, laying foundation for the Internet
- Information Warfare techniques

SERL Baldock Developments prior to merger with Malvern:

- Atmospheric pressure CO2 laser rangefinder, with Malvern
- Microwave GaAs-based Field Effect Transistor (FETs) Electron beam high power CO2 lasers
- Waveguide lasers
- Growth of semiconductors by the alkyl system, especially GaAs photocathodes.

1971: Britain's first satellite 'Prospero' is launched thanks to work done at Farnborough.

The Himsworth report explores the toxicity of CS, a replacement for earlier tear gas (CN) that was to be used to defuse riots in Northern Ireland.

March 1973: The Defence White Paper announces proposed merger of RRE, SRDE and SERL, all to be based in the Malvern area.

March 1976: Queen Elizabeth visits Malvern to celebrate RRE's merger with SRDE and SERL, and renamed it Royal Signals and Radar Establishment (RSRE).

1977: The MacRobert Award is won jointly by RSRE Malvern and Malvern Instruments for the Photon Correlator. They also won the Queen's Award for Technological achievement.

The Admiralty Marine Technology Establishment (AMTE) is set up from the amalgamation of ARL Teddington, NCRE Rosyth, RNPL Alverstoke, AML Holton Heath and AEW Haslar.

The Propellants, Explosives & Rocket Motor Establishment (PERME) is formed from merger of RPE and ERDE.

September 1978: Georgi Markov is killed from Ricin being injected into his thigh from the tip of an umbrella. Defence scientists at Porton Down were involved in this case and identified the toxin.

1979: Malvern wins the Queen's Award for Technological achievement for Biphenyl Liquid Crystal and the Malvern crystal growth equipment.

MRE's biological work is transferred to CDE, becoming the Centre for Applied Microbiological Research (CAMR) of the Public Health Laboratory Service.

1980: Christchurch and Baldock establishments complete their move to Malvern.

CDE Nancekuke closes.

ELLA VLSI (Very Large Scale Integrated Circuits) design system is developed at Malvern.

1982: Malvern wins the Queen's Award for Technological achievement for discovering the Pyroelectric infrared detector.

1983: Malvern wins the Queen's Award for Technological achievement for the Invention of the SPRITE (Signal Processing in the Element), CMT (Cadmium Mercury Telluride), IR detector and High Resolution X-Ray detox crystals for applications in body and brain scanners.

1984: The Admiralty Research Establishment (ARE) formed from ASWE, AUWE and AMTE. The first drop tests on flasks and packages used to transport radioactive waste are carried out at Winfrith.

01 April 1984: Chertsey becomes the Vehicles Department of the Royal Armaments Research and Development Establishment (RARDE). RARDE is formed from an amalgamation of MVEE and the Propellants, Explosives and Rocket Motor Establishment (PERME) at Waltham Abbey and Westcott, with the existing establishment based at Fort Halstead.

1985: 'Super' RARDE formed from merger of RARDE (Fort Halstead), MVEE (Chertsey/ Christchurch) and PERME (Waltham Abbey/ Westcott).

1987: Malvern wins the Queen's Award for Technological achievement for Gallium Arsenide Photocathodes. It is used in image intensifiers and the Pyroelectric Vidicon tube, with special emphasis on its application for use in the Fire Service's thermal imaging cameras.

1987/88: USSR Chemical Warfare specialists visit Porton Down and the UK visits Shikhany in USSR.

1988: RAE is renamed Royal Aerospace Establishment, following its previous absorption of NGTE Pyestock.

1989: Malvern wins the Queen's Award for Technological achievement for the ELLA VLSI (Very Large Scale Integrated Circuits) design system and the SAW (Surface Acoustic Wave) device as used in modern communication and radar systems, such as mobile telephones.

1990: Malvern wins the Queen's Award for Technological achievement for High-purity Metalorganic Precursors for Semiconductor and Optical Materials. Weapons Systems department develops an anti-landmine device called FireAnt which destroys a landmine without detonating it.

Malvern Developments:

- Ferroelectric LCDS
- Zenith bistable displays (ZBD), the basis for modern LCD screens.
- Nanotechnology
- Mobile radio
- Information warfare
- Information forensics
- C4I (Command, Control, Communications, Computers & Intelligence), leading to 21st Century ISTAR (Intelligence, Surveillance, Target Acquisition and Reconnaissance).
- UWB (Ultra-wideband) radar, as demonstrated in the Mineseeker project.

1991: The first NAMAS accreditation in the UK is given to the Health Physics Gamma Calibration Lab at Winfrith.

Malvern wins the Queen's Award for Technological achievement for High Precision Epitaxial Crystal Growth for advanced optoelectronic components, and a compact VLSI Distributed Array computer Processor for real-time applications.

April 1991: RSRE (Malvern), RAE (Farnborough and Bedford), RARDE (Fort Halstead and Chertsey) and ARE (Portsmouth, Portland, Rosyth and Haslar) become the founding members of Defence Research Agency (DRA).

CDE becomes the Chemical and Biological Defence Establishment (CBDE).

DOAE renamed Defence Operational Analysis Centre (DOAC).

1992: Malvern wins the Queen's Award for Technological achievement for the Multiplexing Mixture Liquid Crystal material enabling complex designs for LCD displays – its 13th in 14 years.

1995: DRA becomes a division of Defence Evaluation and Research Establishment (DERA) made up of DRA, CBDE, DTEO (Defence Testing & Evaluation Organisation, formed from Boscombe Down and all the Test & Evaluation Establishments, such as Pendine and Shoeburyness), APRE and CDA (formed from DOAC and the analysis divisions from the former DRA).

1997: Thrust SSC is developed at Farnborough. It broke the land-speed record (763mph, 1.02mach) driven by a DERA military adviser.

1998: F1 and V recombinant sub-units are patented as a vaccine against the plague thanks to scientists at Porton Down.

1998: The Non- Proliferation (Detection) team provides crucial technical support and advice to policy makers and implementers within MOD and OGDs working on Chemical and Biological arms control.

01 July 2001: DERA is split into two separate organisations; Dstl (the Defence Science and Technology Laboratory) and QinetiQ. Alverstoke, Bedford, Bingley, Chertsey, Christchurch, Farnborough, Fort Halstead, Glasgow, Haslar, Hurn, Malvern, Rosyth and Winfrith come under control of QinetiQ.

2001: The Biological Weapons Analysis Laboratory at Porton Down is formed in response to numerous anthrax postal attacks and threats after the US anthrax attacks and 9/11.

'Foot and Mouth' hits the UK. Dstl staff provide immediate expertise which helps reduce the effect of the catastrophe.

September 2001: Terrorist attacks in the US create extensive activity in Dstl laboratories.

October 2001: British troops are deployed to Afghanistan. Dstl analysts conduct tasks to help operations in casualty analysis, historical analysis, measures of effectiveness and combat assessments.

March 2002: QinetiQ staff from Chertsey move to Farnborough, leaving only Dstl and Defence Logistics Organisation (DLO) staff on the site.

June 2002: The Applied Research Technology Centre opens at Portsdown West. The unit tests and evaluates new, up-and-coming technology in a safe, enclosed environment.

July 2002: Dstl develops revolutionary 'Electric Armour' that can resist Rocket Propelled Grenades (RPGs) while remaining a practical size and weight for armoured vehicles to carry.

June 2003: Operation Telic was the biggest deployment of military scientists since WWII. Hundreds of Dstl's experts from 13 different departments in operational challenges were engaged during the conflict and more than 30 individuals were deployed to theatre in the Middle East.

Jun 2003: Porton Down opens a conservation centre, displaying wildlife that can be found on the Range and also historical artefacts from the pre-chemical defence period that have been found on the site.

November 2003: Dstl rationalises its operating sites to four core locations; Fort Halstead, Porton Down, Portsdown West and Alverstoke.

2003: A simulation facility, 'Cutlass', built at Abbey Wood, Bristol courtesy of scientists from Dstl.

December 2003: Further rationalisation is put in place as Glasgow office closes.

June 2004: P2i (Porton Plasma Innovations) Limited is set up as a joint venture between Circus Capital investment fund and Dstl. This union helped commercialise a plasma coating, originally designed to protect soldiers against Chemical and Biological attack, so that it now benefits Industry.

July 2004: The MOD's need for Dstl to enhance large cross cutting, capability level programmes was answered when Dstl's Joint Systems Department (JSD) was formally set up.

March 2005: Dstl scientists conduct studies into the blood clotting drug, Recombinant Factor VIIa. They found that this drug, first used to treat haemophiliacs, has the potential to counter internal bleeding, which is one of the main causes of death in the UK Armed Forces on the battlefield.



April 2005: The official launch of Ploughshare Innovations. Ploughshare Innovations is responsible for sharing and exploiting Dstl's wealth of Intellectual Property outside of the MOD.

April 2005: 58 Dstl scientists and analysts are awarded with the Iraq Campaign medal. The award recognised the challenging and often dangerous work they completed.

May 2005: Dstl scientists publicise the entire genome sequence of *Francisella tularensis*. This biological warfare agent is one of nature's most infectious killer bugs. The discovery will hopefully lead to defensive countermeasures against the pathogen. Scientists at Dstl lead an international cooperation that sees its ground-breaking plague vaccine used worldwide.

July 2005: London Bombings. The expertise of the Forensic Explosive Laboratory is used immediately after the London attacks in support of the Metropolitan Police.

May 2006: The Chief Scientific Adviser opens the new Counter-Terrorism (CT) Science and Technology centre at Porton Down. It is the latest effort in the fight against terrorism.

June 2006: Dstl scientists supply Salisbury hospital with the BacLite[®] flex Rapid MRSA system for the screening of patients. It is the only available rapid screening test for MRSA.

August 2006: Dstl scientists produce a mouth spray that counters the deadly Plague. The spray works via inhalation supplying the body with antibodies which helps the infected treat themselves rapidly and effectively.

January 2007: Dstl Scientists produce a nautical version of 'catseyes' for underwater traffic. They work by reflecting sounds through 'sonar' back to the vessel, much like when a car's headlights are reflected back from the road 'catseyes'.

January 2007: Scientists from Dstl devise a method to improve the accuracy of global navigation satellite systems (GNSS) by taking into account weather systems in the lower atmosphere, and then applying the latest compression technology to transmit this information to the GNSS from the satellite.

January 2007: Dstl scientists study the creation of a fast-acting vaccine that could, in the future, protect against a range of biological agents such as plague and anthrax. The vaccine could be taken as a pill and would provide rapid immunity after a single dose.

March 2007: Thanks to Defence technology MRSA can now be diagnosed within five hours, instead of the conventional 48 hours. This is through a combination of the AK Rapid[®] and BacLite technologies.

July 2007: Key forensic evidence from Dstl staff leads to a terrorist's guilty verdict.

August 2007: Dr Frances Saunders is appointed the new Chief Executive for Dstl. She is accountable to the Minister for Defence Equipment and Support, who acts as the Owner of Dstl.

August 2007: The elite Advanced Course for sonar operators opens its doors for the first time to visitors. The 'A' Course has been described as the 'Top Gun' of the sonar world. It is the most demanding course for submarine hunters in the world and aims to take experienced sonar operators and perfect their skills to enable them to make quick decisions when detecting and classifying threats in a complex environment.



September 2007: Maggot secretions have properties that help to heal an open wound, however Dstl scientists realised that it is difficult for a soldiers or patients to gain access to live maggots. Collaborative research led to a way of identifying and purifying the active properties within the secretions. It will be possible in the future for the healing properties of maggot secretions to be delivered by a medical device directly onto the wound, rather than attaching the maggots themselves.

January 2008: The Portable Integrated Battlespace Biological Detector, or PIBBD, is being developed thanks the efforts of Dstl. It can dramatically reduce the logistical burden on troops and the system looks set to shrink even further.

January 2008: A new detection facility, designed to help troops detect lethal, hidden landmines, has been opened in the southern Afghan province of Kandahar. The detection school, at Kandahar Air Base, is managed by a team of specialist defence scientists from Dstl.

January 2008: Courtesy of Dstl scientists, it is now possible to pinpoint your position to within a few centimetres quickly. Scientists have devised a method to improve the accuracy of global navigation satellite systems (GNSS) such as the US Global Positioning System (GPS) using accurate weather reports.

April 2008: A team of researchers at Dstl, Porton Down, thinks it has found a way to diagnose those who are likely to develop sepsis before they show any symptoms, thereby greatly increasing their chances of survival.