



MINISTRY OF DEFENCE



GUIDE TO ENGINEERING SYSTEM ANCHORS

Introduction

The DESG Graduate Scheme is streamered by 'Engineering System Anchors'. These represent areas of work that your initial professional development can be rooted in within the MoD. This means that your mentor, work placements, specialist training courses and your first professional appointment will be allocated according to your Engineering System Anchor.

The Scheme will provide management and technical training that is common to all graduates regardless of their chosen ESA: including induction, team building, leadership courses and regular Graduate Discussion Groups. Each work placement will cover similar pre-set modules (including research, design, production, equipment support and project management) but within the context of your Engineering System Anchor. Moreover, your System Anchor is intended to develop you with depth as well as breadth which will assist your longer term career aspirations. This approach fits well with the requirements of the Professional Institutions who accredit the Scheme, particularly for graduates who need to undertake further learning as a pre-requisite to professional registration.

Accredited Engineering or Science Degrees	CAAS	Aero	Land	Maritime		Nuclear		Weapons		Combat Systems
				NA	ME	Weapons	Propulsion	Weapons	OME	TIS
Mechanical Engineering										
Electronic Engineering										
Electrical Engineering										
General Engineering										
Engineering Science										
Naval Architecture										
Ship Science										
Marine Engineering										
Aeronautical Engineering										
Aerospace Engineering										
Avionics										
Computer Systems Engineering										
Information Technology										
Computer Science										
Civil Engineering										
Structural Engineering										
Building Services Engineering										
Physics										
Estates Management										
Systems Engineering										
Chemistry										
Mathematics										
Control Systems										
Statistics										
Telecommunications Engineering										
Automotive Engineering										
Rural & Commercial Practice										
Surveying										
Quantity Surveying										
Building Surveying										
Environmental										

Degree subject areas accepted for Direct Entry on to the DESG

Graduate

Scheme

Key:

ME Marine Engineering
CS Combat Systems
NA Naval Architecture
OME Ordnance, Munitions & Explosives
Surveyors Rural & Commercial
TIS Telecommunications Information Systems

This is a generic guide only; please check the website to see if your degree is being accepted *this year* by DESG – or telephone 01225-4-49368 for further advice.

Maritime

What degree disciplines are covered by this ESA?

See table above.



What kinds of roles are involved in this ESA?

This anchor provides the UK's force projection ability across the world including the ability to evacuate citizens from major crisis to major war fighting operations. We also provide the platforms for our nuclear deterrent which provides the ultimate assurance for our national security.

Within this ESA you could be working on anything from the most advanced and most powerful destroyer the UK has ever seen to the landing craft which sit in our assault ships. Some of the projects within this ESA are the largest projects in the UK bigger than the Olympics and T5. You could also work on new concept designs for our new submarines which are considered to be more complicated than the space shuttle. This area allows you to work at the forefront of concept design for new ships and submarines

as a naval architect.

Or you can work within the Marine Engineering area sponsoring new and innovative cutting edge technologies. This work can revolve around supporting the current fleet or looking at new designs for new classes of ship and submarines. This could be anything from electric propulsion to electric actuation to intelligent systems for fire fighting. Marine Engineering offers the ability to work on any ship systems in either the mechanical or electrical field. This equipment can range from the command and control systems right up to the gas turbines used on Type 45 and the rest of the Royal Navy Fleet.



What specialist courses and further learning will I be expected to undertake?

Depending on your degree qualification you could complete a 3 month warship design course or an MSc in Marine Engineering or Naval Architecture at University College London. You will also have the opportunity of studying at the Royal Navy's home of Marine Engineering at HMS Sultan.

Where will I be expected to go on work placements?

This anchor offers you the opportunity of working across the country, as with all anchors Bristol & Bath is the main MoD acquisition site. This anchor can also offer you the opportunity of working at other sites in the UK and beyond including Portsmouth, Plymouth, Faslane, Rosyth and even at sea with the Royal Navy. There is also the opportunity for industry placements with BAe Systems, QinetiQ, BMT, Babcock's, and VT shipbuilding.

NOTE: If selecting the Maritime ESA and completing the MSc you must be available to start work from September in order to undertake MSc or day-release lectures at University College London. To be considered for UCL MSc courses you must have a minimum BEng 2:1 or an MEng 2:2 degree.

Aerospace

What degree disciplines are covered by this ESA?

See table above.

What kinds of roles are involved in this ESA?

Success in modern military operations depends upon effective deployment of Air Power. The ability to project military force in air or space by or from a platform or missile operating above the surface of the earth is an immense challenge, particularly when the operating environment is:

- Inherently joint, combined and multinational in nature.
- Dependent upon forces drawn from all three Services.
- Concerned with the effective exploitation of air power assets.
- Supported by national civilian and commercial resources.
- Influenced by, and in turn influences, the land, sea and space environments.

Against this backdrop, engineers in the aerospace ESA provide the lead for delivery and support of effective aerospace platforms and weapon systems, both new and in-service. They perform in roles that include:

- Requirements definition, project and engineering management of fixed, rotary wing and unmanned air vehicles, air launched weapons and other engineered airborne mission systems.
- Specialist work in current and evolving aerospace technologies, including propulsion, aircraft systems & avionics; structural integrity; reliability & maintainability, quality assurance, safety, test & evaluation,
- Provision of expert services at the forefront of aviation assurance, aviation safety management and airworthiness Regulation

What specialist courses or further learning will I be expected to undertake?

All graduate engineers in this ESA should strive to become Chartered Engineers. New entrants to the Scheme are expected to demonstrate or to achieve academic qualifications that will satisfy the academic requirements for Chartered status. In this respect, graduates with a Bachelor's degree will have the opportunity to work towards a Master's degree in an aerospace engineering subject. Those who enter with a relevant Master's degree will have opportunity to access short-course modules that expand their aerospace knowledge. All graduates shall undertake MOD specific air-worthiness training.

Where will I be expected to go on work placements?

Placements give invaluable first experience of aerospace projects throughout the project life-cycle. Internal placement opportunities exist within Defence Equipment Capability areas and the Defence Equipment & Support Agency. External placement opportunities may include Dstl, QinetiQ, BAe Systems and Airbus. Primary locations are presently at Bristol, London, Yeovilton and Wyton (Cambridgeshire).

Nuclear

What degree disciplines are covered by this ESA?

See table above.

What kinds of roles are involved in this ESA?

The UK's Strategic Deterrent comes in three parts: submarines, missiles and warheads. The submarines are Vanguard Class SSBN (Ship Submersible Ballistic Nuclear), which were all built by BAE in Barrow-in-Furness, the only submarine yard in the UK. The missiles are Trident II D-5, leased from the United States, which are fitted with UK warheads designed and built by AWE Aldermaston. The UK also has a number of SSN (Ship Submersible Nuclear), the newest being the super-stealthy Astute Class which, contribute to peace and security by providing a conventional deterrence to anyone, or any nation that may pose a threat to world stability. Nuclear Submarines are immensely powerful vessels that provide the Royal Navy with the versatility and technical excellence required to operate successfully across the globe.

The Nuclear ESA sub-divides between the nuclear weapons programme maintaining the UK's Strategic Deterrent and the nuclear propulsion programme providing the driving force behind the RN's submarines. Both these programmes employ some of the most highly skilled engineers and scientists in the UK. Roles include project and engineering management, safety, regulation, design, construction & maintenance, tests, trials & commissioning, shore facilities, radio metrology, decommissioning, emergency response, performance & effectiveness assessment and training.

What specialist courses and further learning will I be expected to undertake?

Specialist Nuclear Weapons (NW) courses are provided by AWE Aldermaston. Other courses in common with the Weapons & Ordnance, Munitions & Explosives ESA are delivered at the Defence College of Management & Technology (DCMT), Shrivenham. Specialist Nuclear Propulsion (NP) courses are provided by DCMT, Gosport. On completion of the Graduate Scheme, further opportunities exist to pursue an MSc in Nuclear Engineering.

Where will I be expected to go on work placements?

Placements are intended to provide exposure to the full life-cycle of the programme from concept and design to in-service support and disposal. NW placements include AWE Aldermaston, Central London, HM Naval Base Clyde and Bristol. NP placements include Rolls-Royce (Derby), HM Naval Bases at Devonport and Clyde, BAe Systems (Barrow) and Bristol.

NOTE: Additional security vetting and eligibility criteria will apply to those selecting the nuclear weapons sub-division.

Combat & Info Systems

What degree disciplines are covered by this ESA?

See table above.

What kinds of roles are involved in this ESA?

Modern military operations depend fundamentally on the processing and exchange of information. Sensors provide an awareness of the world, which is fed to decision-makers who command forces at all levels; platforms – tanks, ships and aircraft - are drawn together by global communication networks for common missions; and individual units maintain coherence over modern digital radio systems. The requirement for delivering meaningful, precise and timely information and control is therefore ubiquitous and underpins the design of most of our platforms, communications, command & control systems and business operations. An understanding of the capabilities of such battlefield and ‘back office’ support systems and the principles surrounding their design integration and support is essential for successful deployment. There are excellent opportunities to work with ‘world class’ industry partners using innovative commercial arrangements for the supply and support of CIS (Communication, Information Systems) and associated services.

The key technical areas for the Combat & Information Systems (C& IS) Anchor include:

- Information Systems Architecture/Design;
- Information Management and Exploitation;
- Designing Real Time and High Integrity Software;
- Command and Control Systems – principles of design and use;
- Communication systems and networks;
- Sensor information processing (e.g. Radar, Sonar, Thermal);
- ISTAR (Intelligence, Surveillance, Target Acquisition & Reconnaissance) systems.

Work Placements

Your placements during the DESG Graduate scheme will be principally within two large business units within DE&S. They are the ISTAR Cluster for battlefield systems including Communications, Command & Control and ISTAR systems and ISS Cluster for IS networks, applications, infrastructure, operations, cryptographic services and info security supplemented by industrial placements. On completion, graduates should be prepared to contribute directly to a wide range of information-rich projects, in management or technical support role.

Training and further learning opportunities

Training, principally undertaken at RMCS Shrivenham, is available on all the Information Systems topics listed above. The courses are modular and can form part of a further formal qualification. You will be expected to complete sufficient training and gain experience to become a C Eng. For graduates joining the anchor with a degree that is not fully acceptable for a C Eng application you will be expected and supported to gain a future qualification that meets C Eng requirements and is relevant to the Combat and IS anchor.

What are the longer term career opportunities?

Long term career opportunities as advertised by DESG. High performing candidates can expect to achieve advancement to more a more senior posts depending on development and performance. Reaching chartered status of an engineering institution enhances the possibility of early advancement and will be actively encouraged by your anchor.

Opportunities exist to reach senior management grades by mid-career and also to gain wider experience by transferring to other career anchors within MOD and on short to medium term secondment to other Civil Service Departments or to industry.

Land Systems

What degree disciplines are covered by this ESA?

See table above.

What kinds of roles are involved in this ESA?

Modern Military Operations around the world depend upon high quality vehicles from light to heavy armour systems for use on the battlefield, to specialist and general support vehicles that can be used across a broad range of duties. Land Systems also has responsibility for the individual soldier ensuring that they have the capability when engaged in direct battle, including training the soldier in use of new equipment using simulators. This will enable you to gain a greater understanding of how the different Technologies within Land are integrated to deliver capability to the battlefield.

The key technical areas for Land Systems include:

- Vehicles: including chassis / hull design, automotives & running gear, survivability.
- Sights, optics and sensors: specifically for land vehicles, line of sight systems and dismounted troops.
- Safety: including road safety & environmental legislation.
- Human Factors: specifically relating to the adverse combat environment.
- Integration of other systems into land platforms (for example, communications and weapons systems).

What specialist courses and further learning will I be expected to undertake?

A range of short courses at Defence Academy Shrivenham with mechanical or electrical options depending on your degree discipline.

Where will I be expected to go on work placements?

Internal opportunities exist within support groups and project teams at Bristol and Equipment Capability Directorates in London, Army Base Repair Organisation (throughout UK) and Dstl (south coast). External opportunities exist within QinetiQ, BAe Systems and a range of engineering consultancies and equipment manufacturers.

Weapons

What degree disciplines are covered by this ESA?

See table above

What kinds of roles are involved in this ESA?

There are many and varied roles including safety management, research, evaluation trials, procurement, production, risk, policy, range safety, design & integration and reliability & maintainability.

What courses, further learning will I be expected to undertake?

A number of specific short courses including:

- **Common**
- OME Safety Awareness Course
- OME Safety Intermediate Course
- Guided Weapons
- **OME**
- Ammunition Systems
- Explosives Level 2 C&G
- Introduction to Trials Management
- Risk Hazard and Safety of Explosives
- Ammunition Management
- **Weapons**
- Missile Guided techniques
- Rocket motors and propellants

Several other courses are available for CPD including MSc's in Guided Weapon Systems, Explosive Ordnance Engineering and Explosive Ordnance Technology.

Where will I be expected to go on work placements?

- Defence Ordnance Safety Group (DOSG).
- Any WOME IPT. Preferably a selection from different environments (air, land or Sea)
- Industry production units or MoD processing establishments
- Defence Science & Technology Laboratory (Dstl).

What are the longer term career opportunities?

WOME provides exciting and diverse career opportunities that can match the needs of most people that have an interest in the subject. It is flexible and can adjust to the changing aspirations. It covers all aspects of the CADMID cycle and can also provide experience in policy and regulation; excellent preparation for the MoD band B Assessment & Development Centre. A desirable aspect is that WOME specialists have the transferable skills needed by other Engineering System Anchors making crossover much simpler especially via platform IPT's e.g. integration of weapons on to aircraft,

Operational Analysis (Air)

What degree disciplines are covered by this ESA?

Analytical science degrees such as Mathematics, Physics or Aerospace Engineering.

What kinds of roles are involved in this ESA?

- Success in modern military operations depends upon the effective employment of Air Power. This is achieved by ensuring that the Royal Air Force obtains the best value for money when procuring new equipment, and that in-service equipment is supported by high quality logistics, training and tactics.
- Scientists and engineers within the Operational Analysis Air domain provide the lead for delivery and support of effective aerospace platforms and weapon systems, both new and in-service. They perform in roles that include:
 - Design and analysis of trials and experiments.
 - Tactical development for platforms and sensors.
 - Doctrine development through war gaming and experimentation.
 - Analysis support to fixed, rotary wing and unmanned air vehicles, air launched weapons and other engineered airborne mission systems.
 - Specialist work in current and evolving aerospace technologies, including aircraft systems & avionics; weapon systems, and test & evaluation,
 - Provision of analysis support to RAF assets deployed on Operations.

What specialist courses or further learning will I be expected to undertake?

All graduates in this ESA should strive to become Accredited or obtain Chartered status in their respective discipline. New entrants to the Scheme are expected to demonstrate or to achieve academic qualifications that will satisfy the academic requirements for Chartered status. In this respect, graduates with a Bachelor's degree will have the opportunity to work towards a Master's degree in a related subject. Those who enter with a relevant Master's degree will have opportunity to access short-course modules that expand their aerospace knowledge.

Where will I be expected to go on work placements?

Placements give invaluable first experience of aerospace projects throughout the project life-cycle. Internal placement opportunities exist within Defence Equipment Capability areas, the Defence Equipment & Support Agency and the Front-Line Warfare Centres. External placement opportunities may include Dstl, QinetiQ, BAe Systems. Primary locations are presently at Waddington (Lincolnshire) and High Wycombe.

Estates – Construction

What degree disciplines are covered by this area of the ESA?

- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Building Services Engineering
- Structural Engineering
- Engineering subjects directly applicable to the Construction Industry

What kinds of roles are involved in this ESA?

The MOD is one of the largest landowners in the United Kingdom with some 240,000 hectares (ha) in the UK spread over 4,000 sites. The Estates Construction Systems Anchor centres on the work of the Defence Infrastructure Organisation to provide professional services for engineering, safety, specialist projects, maintenance and operation of works and engineering services on the Defence Estate.

Depending upon your degree discipline, roles may include the construction of new buildings and engineering facilities or maintenance of existing facilities. The following are some examples of the systems and types of infrastructure:

- Airfield engineering systems
- Buildings
- Landscaping and external works
- Bulk Aviation Fuel storage and distribution systems
- Electrical Engineering systems (High and Low Voltage)
- Engineering control systems
- Mechanical services
- Naval dockyards and ship support infrastructure

You may work in some or all of the following functions during your career:

- Project Management of Buildings and Infrastructure projects
- Facility Management of the Estate buildings and Infrastructure
- Procurement and Commercial functions
- Health and Safety Management
- Technical advice and support in specialist fields
- Estate Policy development

Where will I be expected to go on work placements?

Your placements through the Graduate Scheme will include project teams within DE and with industry to obtain design experience and hands on Works management experience. There are opportunities for a placement's outside the UK during graduate training. Typical placements would include:

- Operations and Maintenance Management generally in the Estate Management Team on an operational base.
- Construction of a major building or engineering infrastructure project.
- Design Office experience on secondment to a major design consultancy practice.
- An overseas placement to work in a number of different roles, and experience the management of works in a foreign theatre.
- Specialist Technical Support functional unit in Defence Estates.

What specialist courses and further learning will I be expected to undertake?

Relevant short courses will be available including technical training as well as management and self development courses. We are committed to giving you all the support you need to achieve corporate membership of the relevant institution or professional body.

What are the longer term career opportunities?

Reaching chartered status of an engineering institution enhances the possibility of early advancement and will be actively encouraged by DIO.

Estates – Surveying

What degree disciplines are covered by this area of the ESA?

See table above

What kinds of roles are involved in this ESA?

The MOD is one of the largest landowners in the United Kingdom, with an estate of some 240,000 hectares (about 1% of the UK mainland). Some 80,000 hectares of this comprise a varied built estate including naval bases, airfields, living accommodation for nearly 200,000 military personnel, scientific facilities, storage and distribution centres, communications facilities and offices, making the Department the UK's largest property manager. Reflecting the long history of the Armed Forces, the estate contains a substantial number of listed buildings. The rural estate (some 160,000 hectares) comprises mainly training areas and ranges on undeveloped land often of particular environmental or archaeological significance. The Department has rights to use about a further 124,900 hectares in the UK, mainly for training. The Department also manages an overseas estate mainly comprising the garrisons and training facilities in Germany, Cyprus, the Falkland Islands and Gibraltar, as well as facilities in Ascension Island, Belize, Brunei, Nepal, Singapore and the United States. The Armed Forces regularly uses other major training facilities in Canada, Norway, Poland and Kenya.

DIO Land Management Services (LMS) provides an 'in house' professional property ownership and management service to all of DE's customers, covering property acquisitions and disposals, hirings, lettings, valuations, town and country planning, rental payments, damage and dilapidation claims, management of commercial rates, safeguarding and renewable energy. In addition LMS provide key input and support to estate rationalisation initiatives, regional engagement strategy and takes a long term holistic view of the estate and manages it from 'cradle (conception) to grave', with a primary objective to manage the estate in order to optimise military capability, whilst taking into account the interests of other users, and the interests of external stakeholders.

What specialist courses or further learning will I be expected to undertake?

You will be expected to undertake the Royal Institution of Chartered Surveyors (RICS), Assessment of Professional Competence (APC) to become a qualified Chartered Surveyor. DE LMS will jointly agree an APC training package with the Graduate Estate Surveyor (GES). The training package will be tailored to the individual requirements of the GES and the business need of LMS. The primary source of learning will be work place experience, supplemented by specialist training courses and potentially secondment to other government departments or the private sector.

Where will I be expected to go on work placements?

Your placements through the GES scheme will principally include working in a DIO office with direct management responsibility for Land and property interests in the geographic area. DIO Offices are located in or the vicinity of Lisburn (Northern Ireland), Edinburgh, York/Catterick, Shrewsbury, Cambridge, London, Aldershot, Portsmouth, Salisbury, Bath and Plymouth. There are opportunities for a placement outside the UK during graduate training in Mainland Europe. GES should be prepared to contribute directly to a wide range of property related challenges, early responsibility for a range of property and land related issues will be given.

What are the longer term career opportunities?

High performing candidates can expect to achieve advancement to more senior posts depending on development and performance. Reaching chartered status in the Royal Institution of Chartered Surveyors enhances the possibility of early advancement and will be actively encouraged by LMS. Opportunities exist to reach senior management grades by mid career and also to gain wider experience by transferring to other career anchors within MOD.

Estates – Environmental

What Degree Disciplines are covered by this area of the ESA?

The Environmental ESA includes the natural environment; environmental planning and historic environment. The relevant degree disciplines are as follows:

Ecology; conservation; Environmental Impact Assessment; Environmental Management; Archaeology; Archaeological Sciences; Building Conservation; Conservation Sciences; Historic Environment Management and Access.

What kind of roles are involved in this ESA?

The MOD estate extends over 240,000 hectares and it has been described as the finest estate for wildlife in single ownership. The size and diversity of the estate means that almost all habitats are represented and a number of military training areas are key sites for rare and protected species. The MOD has direct management responsibility for some 196 Sites of Scientific Interest (SSSI) and many of these are also covered by European designations such as Special Area of Conservation or Special Protection Area.

DIO is part of the Ministry of Defence (MOD). One of its key objectives is to ensure that the MOD estate is managed and developed in a sustainable manner. Graduates will be placed within Director Property or The Environmental Support Team (EST); both are part of DIO. EST is broken down into a number of smaller functional teams that include specialists in ecology, archaeology, access, sustainability and planning. These Environmental Advisers provide professional support to all branches of the MOD in the UK and overseas.

In support of the maintenance and improvement of the defence estate roles include advisers in all the specialist areas, for example in delivery of disposal of sites and planning of new builds.

Environmental roles also ensure that the MOD meets specific Government targets such as SOGE and SSSIs.

What specialist courses and further learning will I be expected to undertake?

You will be expected to undertake training which provides you with the knowledge and skills to perform the tasks you are asked to undertake. Depending upon your first degree Historic Environment courses sponsored by IFA and IHBC may be recommended. For other specialists courses such as Environmental Law and Policy; EMS Implementation; other specialist courses provided by IEEMA, Plas Tan Y Bwlch and FSC may also be recommended.

Where will I be expected to go on work placements?

DIO Environmental Support Team is based at Westdown Camp right in the middle of Salisbury Plain in Wiltshire. D Property is located in Bath and Sutton Coldfield. However, there will be opportunities to undertake work at other MOD sites in the UK such as moorland in Yorkshire, heathland sites in the Home Counties or dune systems of South Wales or Cornwall.

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