



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 & Info Systems	
				NA	ME	Weapons	Propulsion	Weapons	OME	TIS	CS
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											
Physics											
Systems Engineering											
Chemistry											
Mathematics											
Control Systems											
Statistics											
Telecommunications Engineering											
Automotive Engineering											

Degree subject areas accepted for Direct Entry on to the DESG Graduate

Key:

- ME Marine Engineering
- CS Combat Systems
- NA Naval Architecture
- OME Ordnance, Munitions & Explosives
- 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 030-679-84320 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,