POLARIS
AND THE ROYAL NAVY

An introduction to the British Polaris Force issued by authority of The Chief Polaris Executive and Flag Officer Submarines

POLARIS

What me – POLARIS? You're joking . . . Three months at sea with no mail . . . and then to Faslane for life . . . Big ships nothing but flannel . . . sit at the bottom for months on end . . . no runs ashore . . . won't be enough schools at Faslane . . . Married Quarters situation hopeless . . . Don't make me laugh. . . .

These remarks are frequently heard. They are wrong. The facts of our Polaris Programme are given in this pamphlet

Acknowledgements

Larry's cartoons are reproduced by permission of 'PUNCH'

Index

Appendices

POLARIS

It is still incredible to me that a missile can be successfully and accurately fired from beneath the sea.' 'Once one has seen a Polaris firing the efficacy of this weapon system is not debatable.'

President John F Kennedy. 19th November 1963

'Ban the Bomb'

It would certainly be much cheaper if we did; in fact every taxpayer would pocket over £25. Unfortunately the Communists have frequently and specifically declared that their aim is world domination and therefore, unless the Western Powers can continuously pose a threat of unacceptable damage to Russia and China, the Communists would be in position to achieve their aims by military means as and when they chose. The Western deterrent is therefore being used all the time it is in being. It has prevented war between the major powers for the past 15 years; as the Second World War is estimated to have cost £10,000,000 a day, the deterrent is a pretty cheap insurance policy. In fact if the deterrent ever has to be used it has failed.

Why Polaris?

Why not missiles buried in the ground; surely they would be far cheaper? They would, but they would also be far less effective. Every ten days a Cosmos reconnaissance satellite is blasted off from the Urals into an elliptical orbit whose nearest point is just under 100 miles above this country. Cosmos carry high definition cameras which photograph objects a few yards across and would hence quickly discover any missile sites being built. Once discovered the sites could easily be targetted, and although a surprise attack might not damage the missiles protected inside their silos, the launcher doors themselves might be jammed by the blast. Similarly aircraft on the ground are vulnerable to surprise attack. Once at sea a Polaris submarine is lost to the enemy's view. It could be anywhere in the oceans of the world which cover three quarters of the earth's surface. No attacker could neutralise a Polaris force at sea, so even if he chose to attack, retribution would strike from the ballistic missile submarines. This is what is sometimes called a second-strike capability. It is a true deterrent.

The Polaris Force

Britain is building four Polaris Submarines at a cost, with support, of about £370,000,000. This is the largest single industrial undertaking that the country has attempted within a given

timescale. Over 800'major firms are directly involved. We are *not* buying American submarines. We are however buying the missiles and associated weapon systems from the US. This is a well-proved system. Britain is making her own warheads for the missiles. When *Resolution* and *Renown* are at sea in 1968 their combined fire power will be greater than the total of all explosives detonated in the history of war; even one submarine's fire power will be greater than all the bombs dropped by both sides during the second world war, including both Hiroshima and Nagasaki. This is no mean force.

When all submarines are in service we shall always be able to keep one at sea and generally two.

The Submarine

Operational dates and building yards are as follows:

Submarine	Building Yard	Operational
Resolution	*Vickers, Barrow-in-Furness*	*Mid 1968*
Renown	*Cammell Lairds, Birkenhead*	*End 1968*
Repulse	*Vickers*	*Mid 1969*
Revenge	*Cammell Lairds*	*End 1969*

Because of the long period of trials and work-up, the submarines will start sea trials about 14 months before operational date. Each submarine displaces more than a County class destroyer (over 8000 tons when dived), has three decks and draws almost the same as the *'Queen Mary'*.

Apart from the missile compartment, the submarine will be entirely British designed and built, driven by steam turbines powered by a pressurised water nuclear reactor and incorporating many technical advances. Each will carry 16 type A3 Polaris missiles with a range of 2500 nautical miles. The furthest point in the world from the sea is near Lake Baikal in central Asia, 1720 miles inland. Any point on earth is within their reach.

The Missile

Polaris is a two-stage ballistic missile powered by solid fuel rocket motors. It is 31 feet long and 4 foot 6 inches in diameter, weighing about 28,000 pounds and built largely of glass fibre. Each missile is housed in its own launch tube which, prior to launch, is pressurised to slightly above sea pressure. The missile is launched by firing a gas/steam generator. At the surface the first stage motor ignites. After about one minute it burns out and first stage separation and second stage ignition occurs. During its powered flight an inertial guidance system using extremely precise gyroscopes and accelerometers and its own digital computers puts the missile

on the correct course for the target and guides it independently of any external commands or control. At the precise moment when the required velocity has been reached the guidance system triggers separation of the reentry body from the missile. The re-entry body then follows a ballistic trajectory to the target.

Fire Control

The fire control system can prepare missiles f6r launching within minutes of receipt of the order to fire. It uses two high speed computers to calculate the guidance parameters for each missile independently. To ensure that these are correct and up to date, the computer calculates the parameters, feeds them into the missile computer, reads them out again and makes an inverse calculation to see where the missile would fall if fired with those parameters, compares this position with the actual target and if correct fires the missile - all this within the last 30 milliseconds before firing.

Navigation

To enable the fire control system to launch the missiles accurately to their targets, the position of the submarine itself must be known at all times with an accuracy far greater than previously achieved by navigators and preferably without using the periscope. For this purpose two SINS each controlled by its own digital computer are fitted. Entirely novel fix-taking devices are used and a separate Navigation data assimilation computer is fitted to correlate all navigational information and perform all the necessary calculations.

Reliability

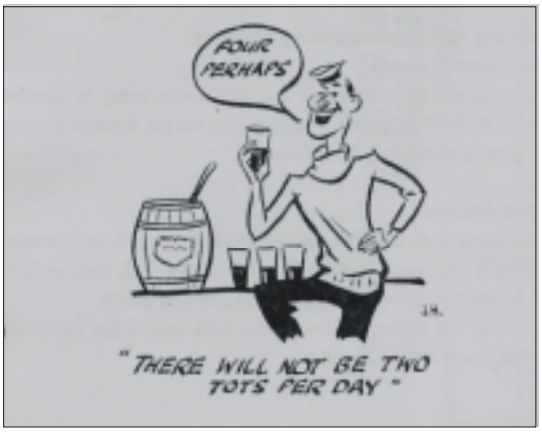
In spite of its exceptional complexity the missile system is reliable. In over 100 American patrols 15 of the 16 missiles have been operational 99% of the time and all 16, 95% of the time.

Sea Time

‘When men come to like a sea life, they are not fit to be on land’ Dr Johnson.

Each submarine will have two crews of 13 officers and 124 ratings. There will be a spare crew at Faslane as well (ie nine crews altogether). Patrols will last eight weeks (a few may have done this long in a Conventional), the submarine then returning to Faslane for a month to change over crews and maintain, after which the opposite crew will go to sea for eight weeks. *No one will ever go to sea for two patrols running*. In two years the average person will do four patrols. The ‘off patrol’ crew will take leave due (standard leave rules apply), take refresher and advancement courses, break in the new boys, and work in the Base at Faslane. It should be possible to tell a year in advance the exact dates of leave.

During the first nine months after Sea Trials, submarines will do work-up and carry out equipment tests, the time at sea being split between crews. Each crew will demonstrate its ability to fire missiles at Cape Kennedy at the end of work-up and before going on the first patrol.



When at sea there will not be two tots per day (only one), fitted carpets or log fires. But apart from that life will be just about as different from a Conventional as could be imagined - three decks, no ditching gash up the tower, and no leaking vents on bunks. Two 5,000 gallon a day distillers will provide water for the showers and laundry whilst the air will be kept clean by air conditioners, scrubbers and precipitators.

Messing will be on a cafeteria system, with several choices of hot and cold dishes provided by four chefs. There is also a canteen, a washing up machine and an ice cream dispenser. Senior rates have a lounge and coffee bar over twice the size of a Porpoise class Petty Officers' mess, also bunk spaces on decks 2 and 3 and a dining hall. Junior rates have a recreation space abaft the fore ends, a dining hall on deck 2and bunk space on deck 3.

A daily newspaper (with *Daily Mirror* cartoons) will be produced and a special news summary incorporating local news from the Faslane area. Special arrangements will be made for several family messages to be sent to each man every patrol.

The submarine will keep radio silence.

There are three film projectors and some 50 films, a large library of hard-backs, paper-backs and reference books, facilities for language and correspondence courses and a daily beer issue.

Important

The preceding pages have given you a brief idea of the submarine and the Polaris weapon system. In the accompanying pamphlet, which forms an appendix to this one, you can read about the equipment in more detail and see what specific duties you could expect to do on board and how long your pre-commissioning training is likely to be.

If you want to volunteer for the force you must realise that there is no guarantee that you will be recommended or accepted. Standards demanded are high. The equipment in these submarines is the most advanced in the service: it takes good men to look after it and work it. From the beginning of the transit to her operating area until the moment she surfaces at the end of her patrol, the submarine will be on a ***war footing***. The crews will be men who can sustain a high standard of work and concentration. Every man on board from the Captain to the youngest rating will be carrying out a most demanding and responsible duty. They will all, throughout their patrol, be in the front line of the country's defence, standing-by constantly to bring their Weapon System to ***immediate notice to fire***.

Life in the SSBNs will, however, not be all deadly earnest. There are many perks, some not

enjoyed by the rest of the service, eg a higher standard of training, plenty of time at home, regular leave.

As has been said, the submarines will be based at Faslane and built at Barrow and Birkenhead. The following pages give information on these places, their married quarters, schools and other facilities.

Faslane

Why on earth choose Faslane of all places for a base?

Since the base was to be new, the merits of all parts of the British Isles were very carefully discussed. Among the factors that had to be considered were: accessibility by sea and by land, not too close to civilisation (we are better off than Dounreay and other nuclear power stations in this respect), but close enough to give reasonable amenities for families, nearness to potential operating areas, nearness to an armament depot and to local deep areas for diving, and on a railhead.

Faslane was therefore chosen. The name is about all that is the same as the old Third Squadron Base. Out of the rubble and mud is rising £47,000,000 worth of new equipment, offices, amenities and houses.

Repairs and Maintenance

The base is designed to cope with four SSBNs and a full squadron of fleet and patrol submarines. On arrival boats will berth at a new jetty equipped with four travelling cranes able to plumb the outboard berths. All supplies, whether lub-oil, any shape or size of amp, fresh or distilled water will be provided at any berth. Within a stone's throw of the jetty will be the workshops in which every single piece of submarine equipment can be repaired under rigid quality control. These workshops will cover 70,000 square feet of which 18,000 square feet will be air conditioned and controlled for dust, temperature and humidity. This workshop will be a maintainer's dream - there are to be facilities for almost everything, for example, it will be possible to sound test machines before they are installed in the boats, and to test periscope optics in the shop to prevent the misalignment which has plagued periscope ERAs for years.

Naval Stores

Jack Dusty's got the key and he's ashore.'

Not any more. Naval Stores will have a new look at Faslane. With a retail shop on the jetty and outsize pneumatic tube system for demand notes and the supply of small items. Not only will local stores holdings be on the generous side, but a computer will mete out Fairy Godmother both in treatment, supplying stores listing to orders, and whistling up special items by high

speed data transmission links, going as far afield as Charleston, South Carolina.

One for One Exchange

Stores exchanges of defective items will be made easy at the jetty shop, while similar exchanges for 'hot' working units will be a regular feature of the workshop service. No more treks down to South Yard.

Accommodation and Messing within the Base Single berth cabins for Chiefs, 3-berth cabins for POs, 6-berths for the remainder. 'On duty' Polaris crews will sleep on board but eat ashore. When on patrol, we are planning for you to be able to leave your gear in your cabins.

Facilities

Mess and Recreational Building

This will be three storeys high with separate facilities for CPOs, POs and Junior Rates. There will be a NAAFI shop, loan and cash clothing store, cobbler, tailor and barber, snack bars, bowling alley, library, TV lounge, games room for table tennis, darts and billiards and most important - a Tavern. Families will be welcome, separate rooms can be put aside for them and for the WRNS. Midday meal space for the RAs has been provided.

Church

Initially there will be an inter-denominational Church seating 215.

There are numerous sporting facilities:

Indoor Sports Arena

This consists of a covered sports/games area, a cinema room, a heated swimming pool, a rifle range, squash courts, and ample changing facilities.

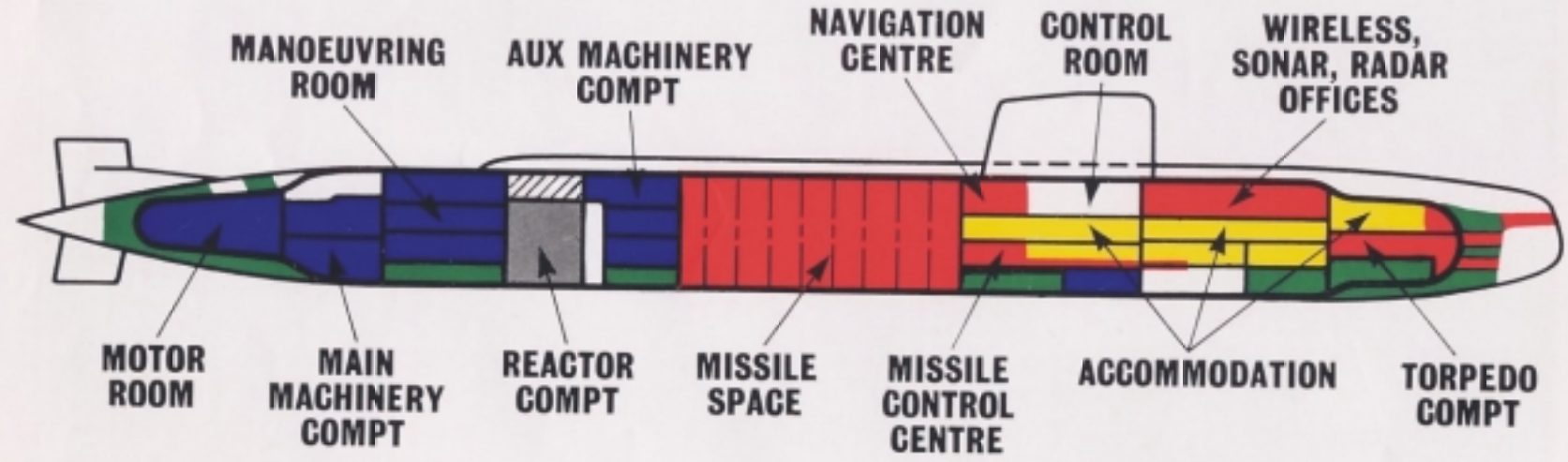
Games Pitches

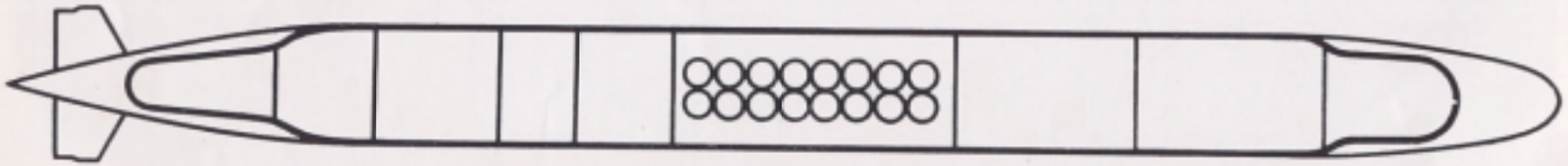
In the base - three all weather pitches for soccer/hockey, six tennis courts, two cricket nets, volley ball, basket ball, and a combined mini soccer/mini hockey pitch.
Outside the base - three soccer and one rugby pitch, an athletic track and a pavilion.

Sailing

A sailing centre has been designed, and should be finished in mid 1967. Twenty GPR 'Bosun' dinghies, and a cruising yacht will be available. There will be a clubhouse and all these facilities can be used by families.

SSBN. 01. (Resolution)

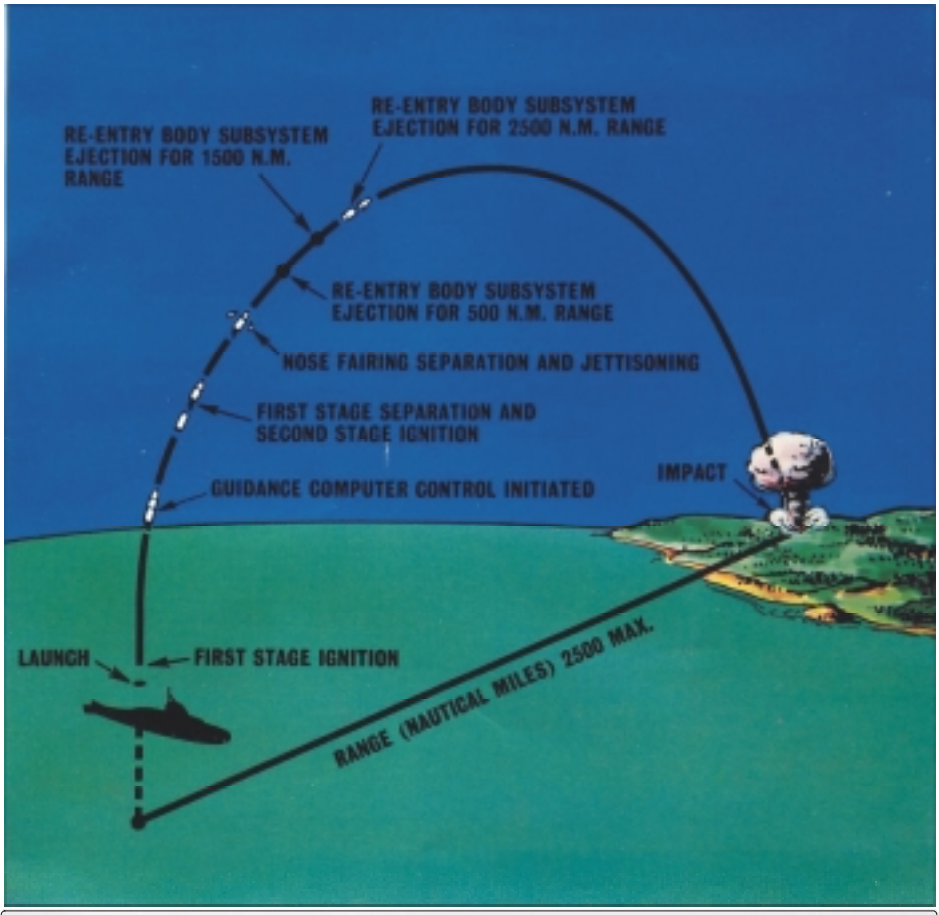


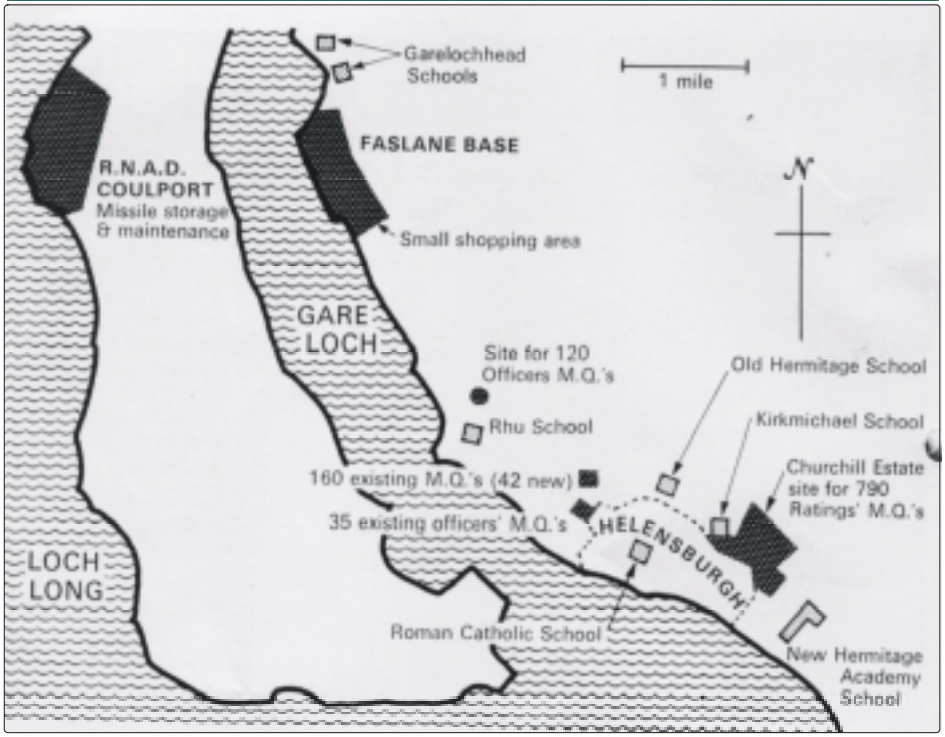


2

3

2. Churchill Housing Estate. **3. Artist’s impression of Faslane**





Top: Polaris Missile trajectory **Bottom: Location of schools and MQs**

For those that do not know Faslane, it is worth mentioning that the Highlands start some ten miles away with the McGregor and MacNab country. Camping gear is available for Exped. In the lochs around Faslane the fishing is good and permission has already been granted to fish certain of these lochs and several sets of fishing tackle are held. Glencoe (1+ hours by 'tilly') is being developed as a skiing resort and ski parties will be arranged to go to the ski lifts - in any event 30 pairs of skis will be acquired.

Families can use all these facilities if they want to. When completed Faslane should be the finest base that we or any other British Service has ever had.

Married Quarters

The percentage used to calculate the requirement for married quarters in the Faslane area is higher than that used throughout the rest of the Navy; even so it may not be high enough for Faslane in view of the special nature of the work. The final number of houses to be built is being kept constantly under review.

A married quarters estate of 162 houses is already in existence at Ardencaple near Helensburgh. A further 42 houses are being built in this estate.

Another 790 houses are being built near Kirkmichael six miles from the base and named 'The Churchill Estate'. Completion dates are planned to coincide with the Naval build-up and the waiting list should remain short. The three-year rule is still officially in force but it is confidently expected that there will be no need to enforce it from 1968 onwards. Ratings in SSBNs refitting at Rosyth may as a special concession remain in their Faslane quarters if they do not wish to move their families. Married quarters will however be available at Rosyth if preferred.

At the Churchill Estate the first 50 houses were completed on time, in June 1965; a further 100 were ready in June 1966 and are thereafter due to complete at an average of over 100 every six months. The Estate is above and behind Helensburgh overlooking the Clyde. The houses are heated by electric storage and painted throughout in pastel shades. Wives at a meeting in March 1966 unanimously agreed that they were very pleasant to live in. There will be several small, simple enclosed playgrounds for young children and rough kick-around playing areas for older ones. Two small burns flow through the estate and these and their adjoining coppices have been deliberately left for the children's benefit. The whole estate consists of cul-de-sacs and there is no through traffic.

A community centre on the estate will house a NAAFI 'families shop and provide a social centre in which dances can be held, club rooms, a babies' crèche and a children's play ground, and two tennis courts. Car parking space will be provided as well as offices for the Chaplains, Married Quarters Officer and WRNS welfare worker.

The New Hermitage Academy School is about half a mile away from the bottom of the estate.

Unfurnished Married Quarters

Although this has not been formally approved, it is hoped that there will be a proportion of

unfurnished quarters available for those who wish to use their own furniture.

Buying Privately in the Faslane Area

A number of private housing estates are being developed in the Faslane area, mainly at Rhu and Helensburgh. Prices range from £3,575 for a 2 bedroom semi-detached villa to £8,275 for a 4 bedroom detached house with garage. New houses are available at 3-6 months' notice with a minimum deposit of 5%. Further details are available from FOSM and officers at Faslane.

Church of Scotland Hostel - Helensburgh

Negotiations are at present being carried out with the Church of Scotland to see whether it may be possible to rebuild the existing club in Helensburgh to accommodate Service families. This would provide inexpensive accommodation for naval families coming from elsewhere for a holiday.

Garages

In the Churchill Estate there are garages for 25% of the houses and hardstanding parking facilities for all; in the base there will be parking facilities for about 2,000 cars. It is also hoped to provide covered parking for cars left on the base by men at sea.

Life when Husband is at Sea

As you have read, everything within reason is being done to make the wife's life as secure as possible when her husband is away. The community centre, the NAAFI shop, the children's playgrounds and the school were all designed to this end. Further it is hoped to have an allotment paying centre within the estate.

A Welfare Officer supported by a Chief Wren will be available for help if it is required; furthermore it is envisaged that the off duty crew will be ready to give any assistance needed to the families of their opposite numbers at sea.

Transport to and from Churchill Estate and Helensburgh

Negotiations with British Rail are being carried out to see whether a rail car service can be provided between Churchill Estate, Ardenconnel and Kirkmichael to Faslane.

Garelochhead Bus Company have said they will be willing to provide a service to the base.

Work for Wives

There will be opportunities for working as:

a. Clerical workers - including any who have had computer experience. They would be employed as non-established civil servants, at either Coulport or at the Base. Transport will be provided at a small fee.

b. Canteen Staff at the base.

c. Staff at the NAAFI families shop.

d. Female Industrial Staff in various capacities.

Scottish Education

a. *Starting Age for Children at Primary Schools* Enrolment takes place during the summer vacation for children who are five by 1st September and after the Christmas vacation for those who reach the age of five between 1st September and 1st January.

b. '*11* Plus' Comprehensive schooling is universal throughout Scotland, Secondary schools being called academies. In primary schools, children are given two intelligence tests, six months apart, and the results of these two tests are combined with the teacher's estimate of capability in English and Maths to decide into which stream in the academy the children will go.

c. *Technical Education*

The New Hermitage Academy will give technical education until school leaving age after which further technical education is available in Glasgow.

d. *GCE*

Fourth year pupils take Ordinary level examinations in May and early June, these being equivalent to '0' level in standard but slightly more difficult. Fifth year pupils sit the Higher Certificate examinations which are somewhat lower than GCE 'A' level. The county education authorities have no objection to GCE being taken provided schools can cope with the extra administrative burden.

English authorities will recognise Scottish 'O' level and most English Universities will recognise the Higher Certificate examination as equivalent to 'A' level. However, all English Universities have their own particular entrance requirements and would probably prefer English 'A' levels. Entrance to English Universities is so cut-throat that families with children over 15 who want a place in an English university should realise that their child stands a better chance if left in England. If you do decide to leave your child in England, you should approach your Instructor Officer for the pamphlet entitled 'The Education of Service Children in the United Kingdom', which has a lot of extremely useful information on the facilities offered by local education authorities in England and how to get financial assistance. You should then personally visit the local education authority where you are living, or where you own a house, or for the area in which your children normally spend their holidays.

Room in Schools for Naval Children in Helensburgh Area. In planning the extra school places for the Naval build up, the Naval average of 1.3 children of school age per family has been adopted. If this proves wrong, plans have already been made for extensions to the extra schools

which are now being built.

In a nutshell the situation is that with the Naval build-up and before the new schools are ready, classes will rise to between 45-50 per form. By 1967 when the schools mentioned below are completed, numbers will drop to about 35 per form (the national average) and this figure takes into account all the Naval children who will need local schooling.

a. The New Hermitage Academy

This brand new school below the Churchill Estate will take 1,000 comprehensive pupils but could be expanded to about 1,400.

b. Kirkmichael Primary

This is also brand new - a two stream secondary school taking a maximum of 600 5-12 year olds. For the position of this and all other schools - see map on page 4 of centre art section.

c. Old Hermitage Academy

The secondary pupils will go to the New Hermitage Academy and the Old Hermitage will be remodeled as a primary school. It will yield about 320 extra places.

d. Rhu

A new primary school will be built in lieu of the existing school and will yield an extra 90 places.

e. Garelochhead

If demand warrants this new school could be expanded. This is some way from the Churchill Estate and is intended for children in the Garelochhead area.

f. Dumbarton

There is a Roman Catholic school for boys and girls at Dumbarton now and a new girls' school is planned.

In all the planning, the Scottish Educational Department have been most helpful in catering for the Naval expansion and have spent a very large amount of money in building all these new schools.

Hospitals and Doctors

There are two small hospitals in Helensburgh, the Victoria Infirmary, a cottage hospital, and the Braeholm Maternity Hospital. The major hospital in the district is the 'Vale of Leven' at Alexandria. A large maternity hospital with 80 beds is planned to be added to it; building starts

in 1966. The Scottish Home and Health Department has assured the Ministry of Defence that local National Health facilities should be adequate to cope with the build-up of families at Faslane. The Chief Polaris Executive is keeping the situation under review as the build-up progresses.

HELENSBURGH

For a town of its size Helensburgh now offers an astonishing variety of entertainments.
In addition to the usual Scottish hostelries there are~ An Art Club, Wine Club (not for topers), Toastmasters Club, Horticultural Society, Flower Club, WVS, Library, Saltire Society (Scottish way of life), 35 mm Camera Club, Helensburgh Orchestral Society, Amateur Operatic Society, Dorian Society (Ballads, Folksongs, etc.), Oratorio Choir, Chamber Music Group, Beat and Rhythm Group, Scottish Country Dancing with separate instruction for beginners, Junior, Teenage. Couples and Ladies. There are churches for seven different denominations. For children, in addition to the amenities at the base there are Guides, Rangers and Scouts.

BARROW IN FURNESS

Married Quarters

There are 60 Admiralty hirings at present in use and 86 married quarters are being built by the Barrow Council at Walney Island about three miles from the Vickers works. These are well built and decorated and centrally heated by ducted air; they will be furnished by the Navy up to normal married quarters standards. The first 25 became available in June 1966 and the remainder will be completed at the rate of five per week. The total number of ratings requiring accommodation is expected to rise to a peak of about 137 in March 1967, before *Warspite* commissions, then tailing off again. Thus, barring unforeseen emergencies there should be little difficulty in providing ratings appointed to Barrow for over six months with either married quarters or a hiring, and there should be no waiting list. In any case if you are appointed/drafted to *Resolution* or *Repulse* building at Barrow, the First Lieutenant will write to you asking whether you prefer hirings or married quarters.

Buying Houses

Several ratings have purchased their own properties in the district housing estates being developed at Barrow, and Dalton and Ulverston, five and seven miles away. The price depends largely on the district and examples of prices are:

Barrow	3 bedroomed detached, garage	£4,800
Dalton	3 bedroomed semi-detached, no garage	£2,600
Ulverston	4 bedroomed detached	£5,100

Schools

Barrow education authorities have stated that there will be no problem in taking Naval children into Barrow schools. There are two grammar schools, a technical school for boys (Junior College of Technology), a technical college of further education, and 12 secondary modern schools; for Roman Catholics - a grammar school for girls, and secondary modern and primary

schools for girls and boys. All the secondary modern and grammar schools do GCE syllabus, classes average 25-35.

Primary schools are either wholly junior or combined infant and junior, classes average about 40. Instead of the 11 plus there is a selection system spread over four years; Barrow education authority have said that they will make special provision for selection tests for Naval children.

Unaccompanied Ratings

For a town of its industrial capacity Barrow has very little surplus accommodation for single people. There are about 130 approved lodgings available, but the number of unaccompanied ratings will rise to a peak of 265 in 1967. The present (1966) small overflow, is housed in a hutted camp. Conversion of a proper accommodation block is under way, and is due for completion in January 1967.

The Town of Barrow

In Barrow there is quite a good shopping area and Windermere and the Lake District are 15 miles away. The Submarine Building Group plays quite a lot of soccer, hockey, rugby and cricket and also has many Outward Bound expeditions to the Lake District.

BIRKENHEAD

Accommodation

At present (1966) the accommodation situation in this area is difficult but every possible effort is currently being made to solve the problem.

Schools

There are the following in Birkenhead two very good direct grant GPD schools, three boys' and two girls' grammar schools, ten secondary modern (single sex), five secondary modern Roman Catholic (two girls, two boys and one mixed), one Roman Catholic grammar school and many junior and infants schools. Classes average 30 in secondary schools and 40 in the junior schools. Because of the relatively small numbers of Naval children at Birkenhead, Birkenhead education authorities have stated that there should be no difficulty in getting all Naval children into schools

LIVERPOOL

Those who have had the fortune to pay a visit there will not need reminding what an interesting city Liverpool is. Apart from being the home of certain well-known musicians, there are all the usual amusements one expects in a thriving, rich, seaport. Wales and the Cheshire countryside are within easy motoring distances.

Appendix I

Submarine Water Moderated Nuclear Reactor

If atoms of a certain material such as Uranium are bombarded with neutrons, their atomic structure gets out of equilibrium. In the case of Uranium which is the fuel used in the type of reactor fitted in Submarines, this bombardment can force the atom to break in half, with a large release of energy, in order that it may try to retain equilibrium. This breaking in half is known as ‘fission’ or splitting the atom. One of the side effects of fission is that every time it happens some spare neutrons are released, and these in turn can cause further fissions, and this is known as a chain reaction. However it can easily be seen that if after the original split, this chain reaction were allowed to continue, it would rapidly become uncontrollable. We must therefore introduce something which will absorb the majority of neutrons produced by the fission process. The primary method of doing this is by the use of control rods which are made of a very good neutron absorber. The amount of neutrons available to cause further fission can be limited by the position of these rods in the reactor core and the chain reaction can thus be controlled.

Every time a fission occurs energy is released in the form of heat which is removed by pumping water (also a reasonable absorber or moderator) through the core. The water is maintained at high pressure to stop it boiling within the core. The circulating water, known as the primary coolant is passed through the heat exchanger where it heats the secondary system sufficiently to produce steam, which is used for the propulsion turbines and turbo generators for producing electricity.

Can it explode like an atom bomb? — No. The atom bomb is designed to give the quickest possible chain reaction and therefore produce a vast amount of energy very quickly, whereas the reactor is designed for only minute changes in ‘chain’ reaction.

Figures taken in USS *Nautilus* over several years show that the radiation levels in a nuclear submarine are *less* than those experienced by the man in the street from cosmic radiation from the sun. (This is because the sea acts as a shield against cosmic rays.) Nevertheless, a staff of a Doctor and four trained health physicists take regular readings of the radiation levels to ensure your family prospects.

Appendix II

(DUTIES ON BOARD)

This appendix is classified *RESTRICTED bec*ause of the details of equipment given in it.

It forms a separate pamphlet which is being given the same distribution as this one.

Appendix III

Conditions of Service

(Full details DCI (RN) 1139/65)

All officers and ratings in SSBNs will be full members of the Submarine Service and eligible for Submarine pay; non-submariners will receive training to qualify them as submariners. No new branches or specialisations will be formed to man the Polaris weapon systems.

For ratings *directly* employed on the Polaris weapons systems (eg see page 3 of appendix II), the period of service in the force, after completion of training is likely to be three to five years ashore and afloat. It is most unlikely that those in this situation who are drawn from General Service will be called upon to serve in other types of submarines prior to completion of the initial period of five years service in Polaris submarines. On completion of the first five years, those who are volunteers for the Submarine Service and accepted can look forward to service in other types of submarine or may volunteer for further service in Polaris Submarines, and will probably be allowed to do so provided that they have done well.

For all other submarine ratings who are not directly associated with the Polaris weapon system, conditions of service will be the same as in other submarines. Periods in commission will be comparable to other submarines.