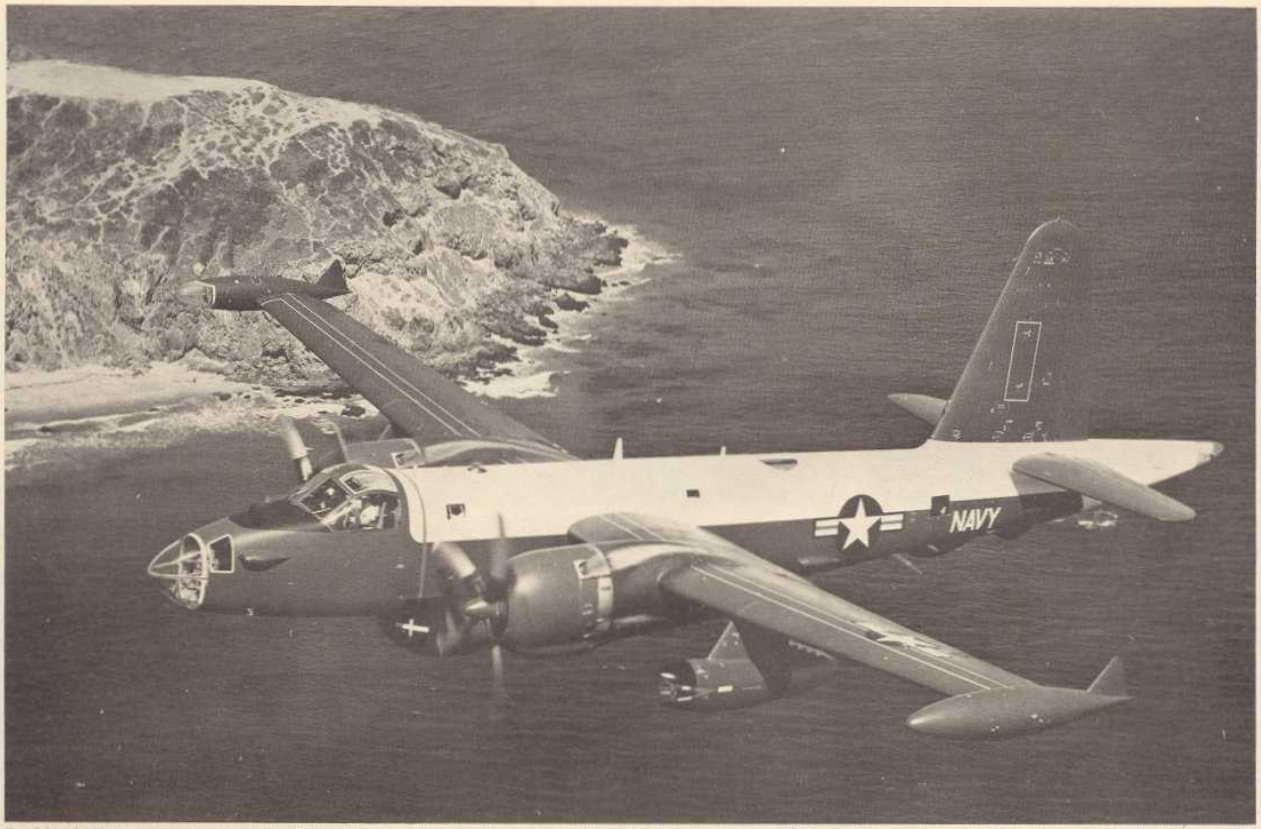


Lockheed Neptunes were amongst the first ASW aircraft to combine active and passive detection systems. Their good payload making them ideal to carry their 2½ tons of sub-hunting equipment and a variety of ASW armament as well (Lockheed).

The Modern Submarine Service

by Andrew Ambrose

Part 4

Possibly one of the most important items used in modern naval wargames, is the 'SDC' or 'Ships Data Card', which is the card used to store all the information on the individual ships abilities, values and damage records, (specimen cards were shown in Figure 3, in the last part of this series). Before proceeding it is therefore, prudent to understand the use and methods of recording which are used on these cards.

The SDC has two sides, known as side A and side B. Side B is used to store the information being collated from various reference works available on the market such as *Janes Fighting Ships* etc. From this information, a ships 'survivability factor' is obtained by the use of the following formulae: Firstly, the ships standard tonnage is divided by four. Using HMS *Blake* as an example, this would give us 9,500 tons ÷ 4 = 2375. To this figure an allowance for the ships type of construction is added as shown in Scale 1, which in the case of *Blake* is 300. We then have 2675. In addition, a flotation factor is added, which broadly speaking, is based on the vessel's number of flotation chambers/watertight integrity. For Naval vessels this figure is arrived at by dividing the ships standard tonnage by 38, hence giving a figure of 250, and a total survivability factor of 2925. This is then entered on the ship's SDC in the respective position on side B, and again on side A in the blank box on the right hand side. This box is used to keep a running total of the state of the ship in general, and as the game progresses, the points total is gradually reduced by receiving hits from shells, missiles etc as detailed later.

One will notice from the SDC's that the remainder of side A is used for logistics and damage control records. These boxes are used to mark off damage to specific of the ship's abilities, and her use of basics such as fuel and general supplies. The scope of this article really prevents an in-depth explanation of these sections, and therefore players new to the game, are advised to ignore these sections altogether for the moment, and only introduce these elements to the game later as more experience is gained, and additional interest is to be created. Further details of the use of these items may appear in later editions of *Airfix Magazine*.

Each vessel in the game is given a specific ability to withstand a certain amount of destructive effort. This is known as the ship's survivability factor as just discussed, and for the vessel to be totally destroyed, it must be hit by an equivalent CSV or Critical Strike Value of missiles or shells etc. The missiles' or shells' CSV is dictated by the warhead size and type, and not by the delivery vehicle. For example, an Exocet missile has a warhead of 220lbs (100Kg); to arrive at its CSV, the warhead weight is simply multiplied by four, thus giving the Exocet a CSV of 880. Therefore, if HMS *Blake* was hit by one Exocet missile, 880 would be deducted from her survivability factor thus leaving her an SF of 2045. If *Blake* was hit by three Exocets, she would be on her last legs, and if hit by four, she would sink immediately. However, that is only if all four actually hit her!

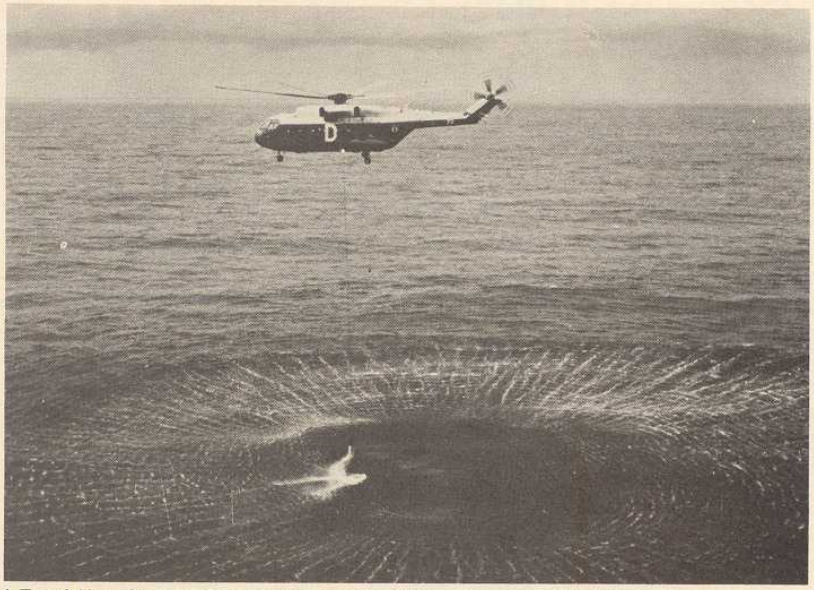
To determine whether a missile launched has actually hit the target another factor is bought into play. That is the missiles EF or 'efficiency factor'. The EF is determined by the ability of the warhead's delivery vehicle and is not affected by the warhead size. An EF is determined by reference to the efficiency factor of the prototype and divided by ten. Therefore, the Exocet with an efficiency factor of 92%, is allocated an EF for the game of 9. To determine whether a hit has occurred or not, two dice are rolled, and if

the total of both dice is the equal of the missile's EF, a hit has taken place and the CSV of the missile is effected against the target, but if the dice roll gives a figure of above the EF, then a miss has occurred. Anything rolled less than the missile's EF, will result in a hit, but the lower the dice roll, the further away from the ship's centre is the strike point of the missile! With Torpedos, exactly the same process is followed, but with the additional complication that the firing party must also predict the track and time span of each shot, due to the much slower speeds involved with these weapons.

Missiles fired during a tactical move only allow time for one anti-missile missile to be fired against them. However, if for example, an SSM is fired during an Operational move the defending player will have time to launch two AMMs. Firstly an area defence missile such as Seadart, followed by a Point defence missile such as Seawolf. (NB. Players and umpires should keep a careful record of how many missiles they have used, in order not to expend all their available supplies).

Having covered the destructive abilities of the weapons and their resultant effects on the ships they hit, our next area of interest is 'detection', which is another of the important items in the overall context of Anti-Submarine warfare. The most important Anti-Submarine device in this field is Sonar, which for the purposes of the game, we shall say is comparable to above water radar although technically this is untrue. A Sonar contact, will give the operator a bearing of the target, its approximate distance off, and a rough idea of its depth, in a similar manner to Radar. However, there are two distinctly separate forms of Sonar, these being passive and active devices.

As already stated, the active sonar is of a similar nature to Radar only working below the surface, but passive systems are of a very different nature indeed. Passive sonars consist of several widely differing systems including; (a) Hydrophones, which are in effect underwater microphones which listen for the noises given off by a contact. (b) Electronics, which listen for the opponents 'active' sonar systems. (c) MAD, or Magnetic Anomoly Detectors, which detect even the slightest change in the Ocean's magnetic field thereby giving away the presence of a submarine. (d) Infra-Red Linescan, which can detect the minute particles of 'hot' water given off by the submarine's exhausted reactor cooling water particles, as they float to the surface.



A French Navy SA-321G Super Frelon operates a dunking sonar search off the Atlantic coast.

The effectiveness of these differing systems, and their corresponding allocation of a value in the wargame, is a rather difficult programme, as for example, passive sensors in use in the early seventies, were able to detect deep sound patterns in the water, which had been trapped in time almost, between water layers of differing temperatures. These sound patterns were later found to be sources of vibration which had initially been caused by depth charges and explosions from as long ago as World War Two! If nothing else, this proves most conclusively, that modern submarine detection systems are indeed highly sophisticated. Unfortunately however, the powers in authority seemed most alarmed when asked for accurate details of ranges and abilities of present day devices, and frankly refused to give any further information than that which is on public record, so for the purposes of our games, we have had to make a lot of estimates in regards of the exact abilities of ASW equipment.

The United States Navy S-3A Viking, is one of the most advanced Carrier Borne ASW Hunter Killers available today. It has on board the most sophisticated array of avionics ever developed for a tactical aircraft, including a large on-board digital computer. The probe which can be seen extended from the tail in this view, carries a set of various types of sensor including the MAD, and Linescan pickups (Lockheed Aircraft).

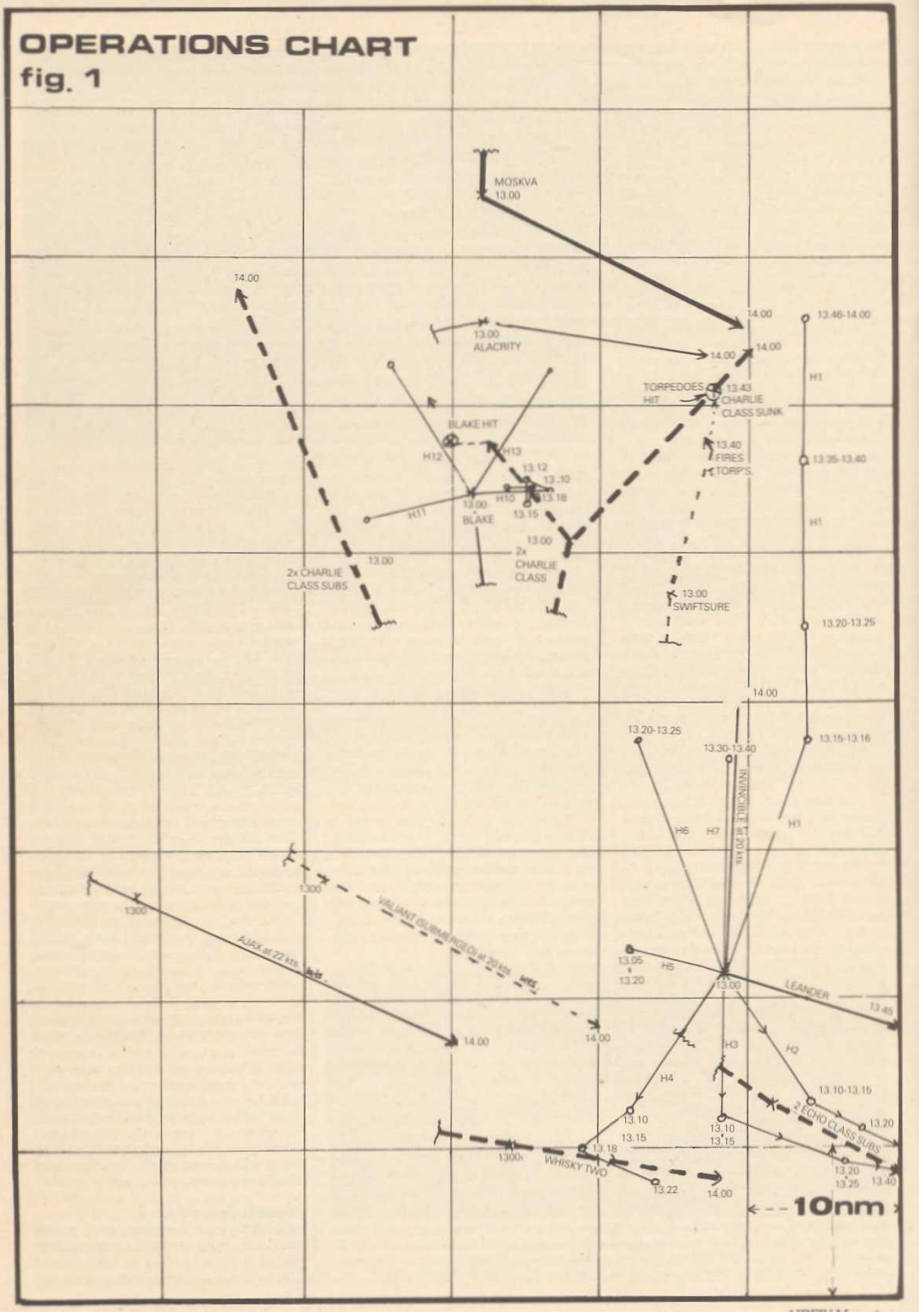
With the use of very low frequency sonars nowadays, the ranges of active sonar detection equipment has been vastly increased, but due to the very nature of the elements themselves, there are a lot of inherent drawbacks to virtually all the systems in present operation. As such, for the game we have allocated each specific item of equipment with an efficiency factor which is used in much the same manner as the EF of a missile. Let me explain the reason for this method adoption: A ship mounted sonar will, (because of the greater amount and sophistication of equipment which can be carried) possess a far greater range capability than the equivalent aircraft or helicopter carried unit. However, because the ship must propel itself through the water and be able to operate a search, it creates its own sound pattern, which will diffuse and divert sonar signals and consequently lower the units effective range. This type of argument seems to progress throughout the entire spectrum of underwater detection equipment, and consequently adds yet another problem to this already rather 'grey' area.

The method of using sonars and radars during a game, will be dictated largely by conditions of play, but as a general guide, players will operate their radars at all times, along with ship mounted sonars which require no external support. However, for aircraft to operate sonar search, for ships to operate VDS (Variable Depth Sonar, which is towed on a long cable behind a ship in order to remove the detecting heads away from the ships sound and turbulence generation etc), and any non standard equipment such as either dunking or air-dropped sonabouys etc, a player will need to inform the umpire of his intentions before proceeding to operate the search. This is demonstrated in our explanatory game.

Aircraft Operations

Although aircraft can take part in tactical moves, their speed makes it impossible to record their movements in this phase of play so the plotting of aircraft moves is only

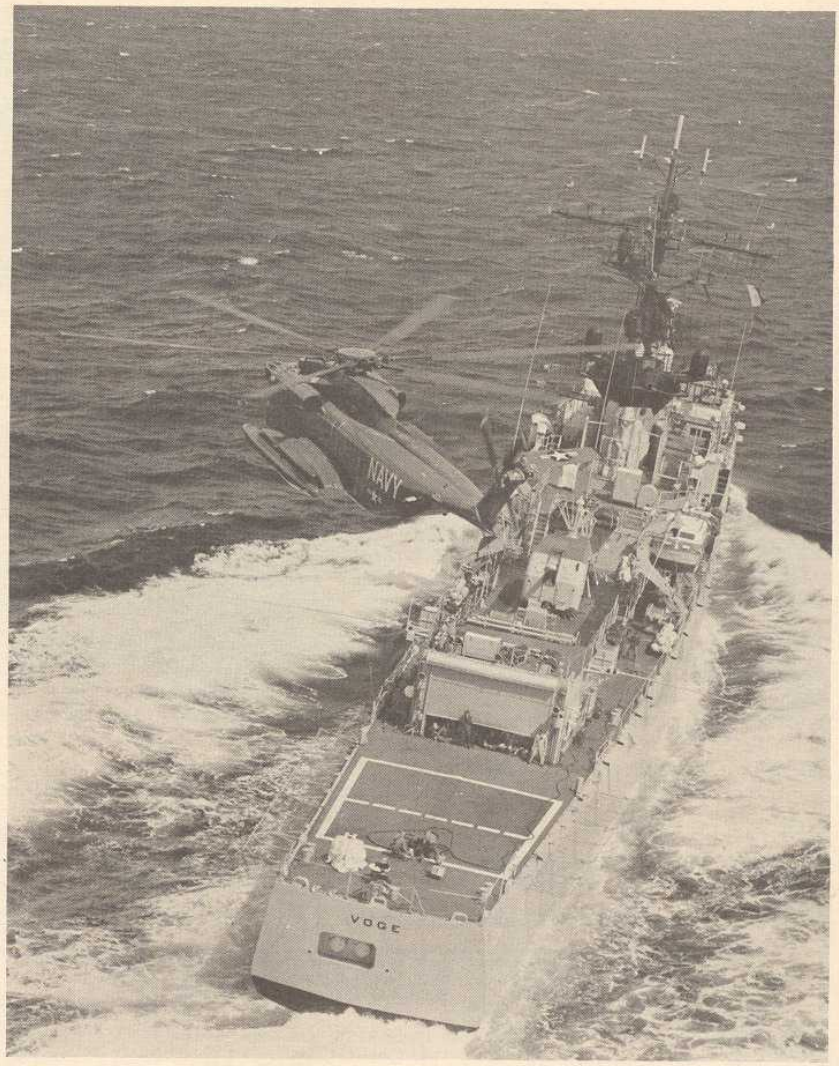
OPERATIONS CHART
fig. 1



carried out on the Operations Map. It is said therefore, that an aircraft in a tactical move can cover the whole area of tactical play in each six minute tactical turn. Operational movements of aircraft proceed in the normal way, their speed in miles per hour being recorded directly on to the Ops map. The only alternative form of operation called for in which aircraft plotting and operations would need to diverge from the above system, would be for example, when a helicopter was operating a sonabouy dunking search of a particular area, and as such would not move at all but would in fact hover over a certain given point, and would lower a sonabouy into the water, and operate a search for submarines. In the tactical phases of play this manoeuvre is carried out using a helicopter model piece, and positioning the model in the tactical play area at the precise point at which the player wishes to operate his sub-surface search. A dunking sonabouy search of this nature can take anything up to six minutes, or as little as one minute dependant on the operating players wishes, but a minimum period of one minute must elapse between successive searches — longer obviously if a helicopter has to travel any distance between successive searches. Therefore, in any six minute game turn, a player may make a maximum of three sonar searches.

In the operations stage of play this manoeuvre is carried out by the player marking on the operations chart at the beginning of each turn, a plotted course for the searching helicopter, together with a small circle at each position he wishes the helicopter to operate a scan with its sonar. Alongside the circle he must mark the time and duration of each particular search, so that the umpire can check at a glance, the likelihood of any possible contacts he may make.

An aircraft operating a searching MAD, infra-red linescan or dropping free-floating sonabouys will plot a course on the Ops Map in the normal manner, but must note that his speed will be reduced significantly, when actually in the search mode. This procedure must be marked alongside the aircrafts track plot on the chart, to enable the umpire to see what is going on, simply by reference to each player's charts. With regards the dropping of sonabouys by fixed wing aircraft, players should note the exact positions of each drop, on the Ops map using a red pen, and noting the exact time of drop. The sonabouy is said to commence searching immediately, and is said to be effective for a maximum period of 48 hours, after which time its power supply fails. Therefore, any submarine coming within range of the sonabouys detection devices, can be found out up to two days after the initial drop. However, the aircraft dropping the sonabouy must maintain contact with it, in order to receive the sonabouys onward transmitted signals. Therefore, if there is no unit within the nine mile range of the sonabouy, to collect and process the signals received, then the umpire will not credit the searching player with a contact, and consequently the submersed vessel will escape detection. The umpire should of course, keep a careful record of the number of sonabouys an aircraft has dropped, so as to know when the aircraft has exhausted its supplies.



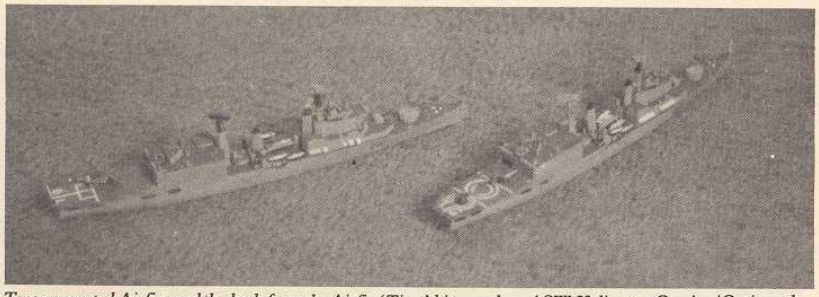
Although technically classed as escort rather than ASW ships, Frigates such as the VOGE are better armed and equipped than most destroyers. They are supposed to operate with the SH2D LAMPS choppers, but in this shot it appears that a CH53 ASW helicopter is in use! A rather interesting shot this one if you study it closely!

When an umpire decides, by reference to the various equipment in use, that a contact has been made, he should then roll two dice and should the efficiency factor of that particular sonar system be equivalent to or less than the amount of the dice roll, he should notify the searching player that a contact has been made. If it is an active sonar system which has made the contact, the umpire should also notify the detected player that his position is now known to the enemy, as the player who has been spotted is said to have detected the active search signals of his enemy's unit. If however, a passive system obtains the contact, then the detected player is not informed, as he would have no way of knowing that he has in fact, been found out.

As regards radar, the situation is somewhat simpler, as radar is usually more effective than sonar, and consequently does not need to use the efficiency factor system in order to confirm a contact. The normally accepted system for this item, is that should a vessel or aircraft be within the range of an enemy units radar, then it is automatically detected, and positions of the contact are notified to both players, provided of course that the said radar is in fact in operation. The reason that both sides are informed of radar contacts is because as with active sonars, the use of radar gives ones position away. One may find therefore, that it is advisable not to use radar in certain circumstances. Radar ranges differ on the various systems in use, but as a generally accepted norm — air search radar is effective over an area of about 300 miles radius (depending on the altitude of the contacts), and sea search radar is usually effective at up to about 70 miles for large ship contacts, down to about 30 miles for Frigate size vessels. Additional details on the various ranges of the differing types, can be found in *Janes Weapons Systems* as indeed can all the available data on Sonars etc.

Having covered most of the basic items, we shall now take another look at the explanatory game as commenced in last month's *Airfix Magazine*, and see how the various equipment is operated in a small wargame segment. We pick up the game at 13.00 hrs, where we left off last month, with the pieces in the position as shown at that time.

At 13.00 hrs, *Invincible* and *Leander* split



Two converted Airfix models, both from the Airfix 'Tiger' kit, are these ASW Helicopter Carriers/Cruisers the Blake *(C99) and the* Tiger *(C20). Each are capable of operating up to four Sea-King ASW Helicopters.*

up, and *Invincible* launched seven Sea-King ASW Helicopters to perform AS sweeps in all directions. From the track of H2, we can see that a contact was in range of its first sonar 'dip' at 13.10 hrs, and as such the umpire rolled the dice and established that a contact had been made. Consequently, the player called up H3 to assist in the search and destruction, and a period of tactical play ensued, involving the two Sea-Kings and the two Echo II submarines. However, at 13.40 hrs, they left the area covered by our Ops chart, and so we leave them and move on to H4, which at 13.15, makes contact with yet another submarine, moves position, and picks up a confirmed contact at 13.18. He then moves to a position which he believes to be ahead of the submarine and prepares an attack, but unfortunately, due to an unfavourable dice throw, his scan at 13.22 fails to confirm a contact, and the Soviet submarine escapes from his clutches.

Meanwhile, further to the North, the fleet sub HMS *Swiftsure*, has gained a favourable contact with a hostile unit, and is moving in for the kill. At 13.40 *Swiftsure* fires homing torpedos at the Soviet 'Charlie' class sub following the tactical firing principles discussed last month, and records two hits which effectively put paid to the Soviet unit. The second 'Charlie' class sub which broke away at 13.00, has however, also been detected by Helicopter H10 from HMS *Blake*, which launches an unsuccessful attack. They immediately lose sonar contact, which allows the 'Charlie' class to close *Blake* and fire her own torpedos at the Helicopter carrier. Due to badly projected tracks, the sub only manages two hits out of the four torpedos fired, but, these are sufficient to cause *Blake* severe damage, which causes her to sink later.

One can notice from the Ops map, that none of the ships actually received a sonar contact of their own, this being because successive dice throws made by the umpire when vessels came within range, failed to achieve the throw required, and so under the EF factor, detection failed, although subs were frequently within the required sonar ranges.

Obviously, different players will put different interpretations on various manoeuvres, and to heighten the involvement in the game many more facets of play may be introduced according to personal choice, such as fuel calculations, logistics, static underwater detection devices and satellite observation of sea surfaces etc. The list of possibilities is indeed endless, and players must increase their own level of enjoyment depending upon the amount of research they are willing to undertake, using various well known reference books as guides.

Type of construction	Points allowed	Usual types of vessel
Ultra-Light	25	Small high speed eg, MTB's etc
Medium-Light	50	Fast smaller vessels, MCMV's etc
Light	100	Steel built fast frigates etc
Robust/Commercial	150	General commercial standard
Heavy commercial	200	Tugs, Trawlers, etc
Partially armoured	300	Cruisers, etc
Very Heavy/Armoured	400	Icebreakers & armoured less than 6in
Fully Armoured	600	Fully armoured ships with armour of over 6in thickness.