vessel equipped with a passive sonar may attempt a passive fire control solution.

The base chance for a passive fire control solution is 60%, and requires six turns of contact in ten consecutive turns. Modifiers are shown in the Passive Fire Control Solutions Table.

This number is secretly rolled during the Plotting Phase and if successfully rolled the unit may fire during the Planned Fire Phase of that turn. After a successful fire control solution is gained, at least two turns of contact in five consecutive turns are needed to maintain the solution.

5.3.5.3 Passive Sonar Information (Optional). The machinery in a ship emits sounds which can be heard by a passive sonar. This set of sounds is distinctive for a given ship class, and sometimes unique to a specific ship. By analysis, a detecting vessel can often identify a contact's type. A contact's speed can also be determined, based on its screw noises. A passive sonar can detect and identify an active sonar.

Two successful consecutive passive detections tell the detecting vessel the contact's speed. If the contact changes speed by 5 kts or more on the second turn, no speed data is obtained; the detecting ship must start again, using the second turn as its new starting point.

The detecting vessel has a chance of deducing the contact's class based on the number of successful detections (consecutive or not). The chance is equal to the number of turns detected times 5%. If the contact can be correlated with an ESM signal, add 20% to the chance. If the contact is using an active sonar, add 20% to the chance. This *information roll* is made with D100 in the Detection Phase immediately after sonar detections rolls are made. A passive sonar automatically indicates whether a contact is a surface ship or submarine.

For example, a *Kara* class CG is passively detected by an *Oberon* class sub for the third time. The sub (after making its successful detection roll) has a 15% chance (3 times 5%) of learning something about the contact. If the sub rolls 01-15, it knows it is a *Kara.* If the sub rolls a 16-35, it knows it is a CG-type warship. If the sub rolls a 36-55, it knows that it is a gas turbine-powered ship. If it rolls over 55, all it knows is that it is a surface ship. On the next turn (if the sub makes a successful detection), it will have a 20% chance of determining the ship's class; if it fails the detection roll, an information roll cannot be made.

5.4 Visible Light Sensors. Visual light sensors use light to detect and track objects.

5.4.1 Visual Sighting. The naked eye is still an important source of information. It cannot be jammed (yet), it is passive, and it is cheap. Visual sighting range depends on meteorological conditions and is limited to the visual line of sight. If the visibility arrived at is different from that stated in Annex N, *Environment,* use the shorter of the two. Visibility at night is one-third of this figure.

5.4.2 Sighting From Aircraft. Aircraft can sight other aircraft or missiles at High or Very High altitudes at 50 nm (due to contrails). Aircraft at Medium altitude or below are sighted at 3 nm (small aircraft) and 6 nm (large aircraft). Sighting ranges to ships and subs are equal to the ship's speed in knots rounded to the nearest 5 nm. Sighting range is at least 10 nm and maximum 35 nm. For example, a ship moving at 32 knots would be detected visually at 30 nm, other factors permitting. A ship moving at 18 knots is detected visually at 20 nm. Just round the value to the nearest 5 nm.

Aircraft can be detected at ranges farther than possible for the naked eye by using a magnified TV camera, called a TCS (Television Camera Sensor), which displays a TV image in the cockpit. Small aircraft can be seen at 16 nm, and large aircraft at 38 nm. This sensor can be used (with the radar off) to search for aircraft without producing radar emissions. It can also be used to classify contacts detected by radar. It is affected by weather, so if the visibility is only 50% its range is halved. It can only view objects within a 60° arc centered on the aircraft line of flight and cannot see anything at night. TCS is listed as a sensor in the aircraft listings in Annex B.

5.4.3 Sighting From Ships. Ships detect aircraft and missiles as above, and detect other ships at the visual horizon.

5.4.4 Sighting From Submarines. Surfaced subs function as surface ships. Submerged submarines must use periscopes to get visual information. The periscope is a purely visual sensor. Using one requires that it be extended, and thus visible to others. It can be extended, used, and retracted in one turn, during the Detection Phase. Periscope visual ranges and detection chances are not reduced by darkness (they carry infrared and low-light level vision aids). A periscope is also equipped with a rangefinding device, independent of the radar (usually a stadimeter or a laser rangefinder). The submarine player may measure the range to one contact per turn using these devices.

The chance of sighting a periscope or submarine radio aerial is 30% – the square of the range in nm – the sea state × 5% computed each turn it is extended (divide by three at night). The sub's player makes the roll and the opposing side is told if the roll is successful. Rolls should be made when subs put anything above the water: periscope, radar, or radio aerial. There is always a 1% chance of the scope or aerial being seen within 6 nm (and within 2 nm at night).

For example, an SSN is cruising at Periscope depth with its radio aerial extended. In sea state 4, a DD located 2 nm away has a 6% chance of spotting it (30% – 4% – 20% = 6%).

5.5 Infrared Sensors. IR sensors are passive, designed to detect the heat generated by a ship, aircraft, or a missile. They can be used without risk of detection, and unlike radars or IR missile seekers, cannot be jammed. They are limited to visual line of sight, and are degraded by fog, snow, or rain.

5.5.1 Infrared Search and Track (IRST). This IR sensor is mounted on fighter aircraft and supplements their air-intercept radars. It detects airborne targets (but not ships, they are too *cool)* at 20 nm, subject to visual line of sight. Air units can be detected one altitude level away and within a 60 degrees arc centered on the aircraft's line of flight. Very Low altitude is considered part of the Low altitude level for IRST purposes.

5.5.2 Forward-Looking Infrared (FLIR). FLIR is an airborne search sensor which displays a magnified thermal image on a TV screen. It operates in any weather, day or night. An aircraft equipped with FLIR (visual line of sight allowing) can detect surface ships at 20 nm; if the contact's bearing is already known, it can detect at 35 nm. The TV image allows identification of