

Sensors:

Ships require several different types of sensors in order to navigate the inhospitable void of space. Often ships will carry hot-swap backup sensors depending on their purpose.

RADAR/LIDAR: Based on the standard technology first developed during the 20th century, RADAR and LIDAR operate on the same principles. Sweep some volume of space with radio waves or laser light and pick up any energy that returns to the transmitter. The main caveat with these two technologies is that they require enough of a return to be able to determine if something is in the volume of space being scanned. The second and more important caveat is that a ship scanning with either technology is more likely to be found than to find another ship if that other ship is hiding. This is due the reflection physics models and the understanding that the energy sent out by the scanning ship is able to be detected further out by the target ship than the reflection waves can be detected.

Stealth coatings can be used by ships to further reduce the effective area of coverage for a scanning ship. Generally, only commercial vessels and large warships will rely on both technologies on a full-time basis, as their cross sections are too large to mitigate with a stealth coating in a cost efficient manner.

Ultraviolet and Infrared scanning: The use of specialized cameras for either non-visible wavelength is effective at detecting hazards in space and detecting objects that have a low albedo or absorb heat rather than radiate it. In order for a ship to truly be stealthy in space it must emit no radiation, reflect as little RF and laser light as possible, and must not radiate heat. While there are some rare exceptions of military and paramilitary forces developing and using IR as a communication method, it's unlikely to be spotted without a high end set of sensing equipment.

Communications: As described in a separate handout, communications in space typically rely on point to point lasers and broadcast RF. Directional RF was abandoned after it was discovered to be ineffective at maintaining stealth. Ship beacons are broadcast over RF. All civilized systems and governments mandate the broadcasting of a beacon or the perpetrators can face stiff fines and jail time.

Telescopes and windows: The Mark I eyeball is an ineffective sensor in space. As a result, large ships often only contain windows for pilots, or none at all. Windows can be a vulnerable spot for damage in almost any

situation. As a result, telescopes are standard on all ships. Optics quality has improved to the point that the speed of light is more often a barrier to observation than the equipment.

It is important to note that telescopes are part of a crucial system of navigation. By taking images of the star positions, it is possible to compute with relative accuracy the location of the ship. Indications of the nearest “landmarks” (for example, nebulae, known supergiant stars, some neutron stars, and particularly pulsars) can accelerate this calculation.