



Little room to be had inside Israel's Leviathan and, left, a US naval officer kisses his girlfriend in Groton after an eight-month deployment with the USS San Juan.

LIFE BENEATH WAVES WEIGHS ON EVEN THE MOST SPIRITED

My last column described how submarines operate and pointed out the advantages of them being able to operate under sea for long periods of a few months without needing to surface or berthing.

But it is not hard to imagine the agony of staying in confined spaces for extended periods without sunlight and the ability to communicate with families and friends.

As an example, a US sub can carry some 100 naval officers of different ranks, and with nuclear power that does not require refueling, there is no need to rise to the surface for many months.

The limit is actually food provisions, but with a large stock, some subs can stay submerged for more than 300 days.

Some may believe that oxygen supply and the ability to expunge or store carbon dioxide is the most difficult part, but modern technology can deal with that effectively.

Oxygen supply can be from compressed air storage, or manufactured by the electrolysis of sea water.

To minimize fire risks, oxygen levels inside the sub will be slightly lower than that in the atmosphere, but this is not a supply issue, as it is ample.

CO₂ is stored by absorbing it in soda-lime scrubbers and then exhaled periodically. The characteristics of the scrubbers are that it will store CO₂ at room temperature and release it at higher temperatures.

The snag in using this system is that the amines produce a foul smell that lingers in the cabin.

Similarly, for the disposal of human waste, specially designed toilet facilities are required, as the cabins are always under pressure. After using the toilets, the contents must be appropriately pressurized for delivery to a compressed storage ready for disposal on suitable occasions. Incorrect operation will have seriously unpleasant consequences.



Nuts and bolts

Edmund Leung

Submarine officers are selected not only on physical health but also on superior psychological qualities to ensure they can stay calm and healthy in tight spaces that come with foul smells, no natural light and no external communications for prolonged periods.

They usually work on 18-hour cycles, with six hours of work, six hours of rest and six hours of sleep, which is different from the daily routine of officers on land.

They often need to bunk with others, line up for toilets and showers, and are only given tiny spaces for exercise, not to mention laundry and shaving facilities.

The tight spaces and low air circulation also see unpleasant odors accumulate from human metabolic activities.

And there is little privacy as there is very little space between persons at all times.

All of these issues pose severe challenges, especially as they must maintain cordial relationships with others for extended periods with no ability to back away in case of conflicts or arguments.

Balanced against these shortfalls, they have ample food supply, plenty of reading material and card games to entertain themselves, or get to pursue their scholarly interests during rest periods.

Though there would obviously be no fresh food available after the first few days of setting out, chefs are usually good even with the limited ingredients to keep crews happy throughout journeys.

Life as a sub officer is invariably stressful, but they earn high respect from other officers.

This is a great sacrifice for naval service as a submariner.

Veteran engineer Edmund Leung Kwong-ho casts an expert eye over features of modern life.