

Inventory Management Model

The Supply Officer on your ship is concerned about getting underway without enough spares of an important radar module. On the other hand, storage and budget restrictions prevent him from grossly overstocking the module. He has accepted your offer to use your math skills to build an inventory management model. The following information may be useful:

- Ample supplies are readily available in SERVMART in your home port, but are not available underway or in any other port.
- The module is a well constructed, MILSPEC standard conformal-coated printed circuit board. The probability of a failure is proportional to the time elapsed after installation.
- On the last cruise of 180 days, there were 30 failures. Perhaps there would have been more failures, but the radar was CASREPT the last 60 days because the Supply Officer had stocked only 29 spares. The Captain was not happy. Neither was the Supply Officer who was in hack during port calls to Palma, Monaco, and Gaeta.
- As a cushion, the Supply Officer wishes to return to homeport with 3 modules as spares.

(a) Design an appropriate model. If the ship is to deploy to Northern Europe for 2 months to participate in the annual NATO exercise, how many spare modules does your model suggest should be carried?

(b) The Supply Officer takes your advice. However, your model proves to be a poor predictor. You both miss port calls in Bergen, Rotterdam, and Edinburgh. You decide to collect some additional information and discover that a similar module is often substituted for the given item. The mistake occurs with a probability p and is not likely to be corrected. The only practical way to detect the mistake is upon installation of the module in the radar. Revise your model to account for the necessity of discarding these modules.