

# CAPABILITY MANAGEMENT, FLEET MANAGEMENT AND SUSTAINABILITY

Where queues, schedules, optimisation and constraint satisfaction meet

## Industry contact

Dr Simon Goss  
DSTO Air Operations Division

## Moderators

Philip Kilby (NICTA)  
Patrick Tobin (ACU)

[www.dsto.defence.gov.au](http://www.dsto.defence.gov.au)



**Australian Government**  
**Department of Defence**  
Defence Science and  
Technology Organisation

*What we seek from the MISG is an actionable general formulation that captures both the high level and low level of the relationships and issues in capability management.*

## Background

Aircraft are managed by aircraft type. This is known as the fleet (for instance the C-17, C130 H and J, “classic” Hornet” fleets). Some capability may use several fleets—for instance Air Lift uses both the C130 and C-17. The goal of capability management is to maximise capability, or robustly provide a guaranteed level of capability. This includes fleet management activities, such as balancing the constraints of the fleet flying hours allocation, the sorties necessary for the mix of flying missions required of the fleet (including training, and proficiency maintenance of aircrew) such that the fleet can meet the objectives across the fleet lifetime (sustainability).

Sustainability is affected by the interdependent interactions of usage, maintenance and the training of personnel. At a high level of description usage, training and maintenance can be viewed as queues. Within each area they are managed as schedules of activities to accommodate the “regular course of events”, and which have a degree of agility in dealing with surges and the unexpected.

Looking at the maintenance cycle, each aircraft will require maintenance over its life, which can generally be undertaken when deployed or in Australia. This includes:

- » Phased or scheduled maintenance, where a range of regular services for known durations is undertaken in accordance with manufacturer’s guidance (some of this is block mode, some rolling).
- » Deep maintenance, a major service performed by contracted personnel, undertaken less frequently but with longer durations than for phased services.
- » Unscheduled maintenance, which occurs randomly for unknown durations. Unscheduled maintenance may occur on aircraft that are not in any type of maintenance, or on aircraft that are in phased maintenance, where defects may be discovered unexpectedly.

Upgrades and modifications, which occur over the life of the platform and are sometimes combined with deep maintenance events but are some discrete activities—these can be long events of the order of a deep maintenance event and need to happen quickly to keep the fleet as close to one configuration as possible.

Due to different skills required, the unscheduled, phased and deep maintenance lines are not interchangeable. Sometimes deep maintenance and upgrade lines can be/are combined. There are a set fixed number of lines for each of the maintenance types.

Important issues associated with aircraft usage include:

- » Aircraft and crew need to be mission appropriate.
- » Can’t fly aircraft without appropriately trained crews and approved tasking.
- » Training tasks, currency tasks and contingency tasks all are traded within a comparatively fixed program flying hours. Flying hours are planed on a yearly basis in “blocks” of hours covering basic training, collective training currency training and contingency activity. Within any year the flying hours are kept comparatively constant, but hours allocated to each block is varied dependent on a range of circumstances.
- » Different missions have different effects on the maintainability of the aircraft.
- » Usage requirements dominate maintenance schedule.

Important issues associated with training:

- » Initial skills development and conversion to type occur in the training sector, operational proficiencies and currencies occur in the operational sector, which is a consideration in usage.
- » Aircrew training and maintenance crew training are to some extent dependent on each other and aircraft configuration. A block upgrade of an aircraft requires block training of all crews.
- » Some elements of training can be considered perishable commodities.

In summary, while providing a minimum number of serviceable aircraft to meet the allocated sortie rate, the aircraft fleet must also provide enough serviceable aircraft, and crew at home and deployed such that the required hours can be met annually.

Therefore, a principal objective is to manage the daily flying program such that the specified annual requirement is achieved.

These complex issues are prevalent in capability management across a range of contexts, for instance a fleet of ADF aircraft, a fleet of trucks, or an airline, although the heuristics, constraints, data distributions, and cost functions are different. Solutions to particular problems are typically obtained through iteration and experience; however, these solutions are often brittle and context dependent.