CHAPTER 1

OPERATIONAL NEEDS ANALYSIS

1 INTRODUCTION

1.1 The processes described in the initial part of this chapter contribute to consideration of early engineering design options for a system or equipment to undertake a mission. The output of an Operational Needs Analysis leads directly to the deliberation of performance requirements and R&M Targets. The processes are iterative and underline the fact that AR&M are first and foremost the business of the system or equipment designer.

1.2 Operational Needs Analysis is the process of establishing what is required of a system or equipment to enable it to complete a mission or a number of different missions. The analysis breaks down the missions to establish what functions are required of the system and its sub-systems or equipment, when the functions are required, and the criticality of the function to the success of the mission.

1.3 A related Potential Scenario Analysis (Part 2 Chapter 1) is undertaken to consider possible engineering solutions to the Requirement and to derive practicable initial R&M targets. The levels of R&M achievable can only be obtained from the possible engineering solutions but have a direct bearing on the delivery of functionality throughout the mission(s).

1.4 Examination of operational needs leads to definitions of both the performance and R&M required to successfully complete a mission during combat operations and also the implications of owning and operating the system that meets those needs over a period of many years. The questions of cost, support, risk and safety also arise. None of these items can be addressed during the Operational Needs Analysis but all will be the subject of studies during Concept and Risk Assessment Phases when potential engineering solutions are being examined. The specific effects of the support environment over significant periods of the life of the system will form part of the [long-term] availability modelling undertaken as part of the Potential Scenario Analysis.

1.5 For the purposes of this chapter a mission may constitute anything from the deployment of a ship, fighting vehicle or aircraft to the launch of a missile, the operation of a communications system, a single equipment or of a sensor. It may cover a sortie undertaken by a single aircraft or fighting vehicle or a longer term assignment given to a Squadron.

2 THE MISSION(S)

2.1 The first action is to define what constitutes the mission or missions by writing or charting a detailed description from commencement to completion. The description should be annotated with potential external threats (including hostile action) to its achievement in order that later consideration be given to the functions required to overcome them.

Initiating activities include starting engine(s), loading fuel, supplies or weapons, switching on power to system or transmitter - whatever is applicable to the mission in question. Concluding activities might involve the ship, aircraft or vehicle returning to base at end of a successful mission.

2.2 The mission is then broken down into specific phases and/or time periods, which are as fine or coarse as necessary in order to be adequately defined. For example, it may be appropriate to consider fractions of a second for a system undertaking data handling but several hours for a ship en route. The mission phases may be of differing durations but the time periods within each phase should be constant and fine enough to resolve the functions needed.

2.3 It may be necessary to consider the requirements of differing missions or a series of missions with recovery periods. Examples include an aircraft flying a series of sorties or deployments of a warship over a five year period, where peacetime training and patrols are interspersed with operations in potentially hostile or actual combat conditions.

3 FUNCTIONS REQUIRED

3.1 The functions required of the system or equipment to perform each mission must then be defined. For vehicles, including ships and aircraft, propulsion and steering are clearly essential but communications, navigation and sensors may also be required. These systems may be of varying types and used in different phases of operations. It is also important to include the functions required for the accommodation, comfort and safety (escape and rescue, fire-fighting etc.) of the crew.

3.2 At this stage it is not essential to consider absolute details of performance, but it will be necessary to sub-divide a number of the functions. For example, when considering propulsion it will be necessary to decide the periods of time over which certain aspects, such as the requirement to loiter, operate at cruising speed and dash at top speed, are needed.

3.3 The phases or period(s) of operation appropriate to each mission and each function that will or may be deployed, should be recorded. For example, ESM will be used throughout a mission but ECM will be used only if required. If required, however, it is critical that the ECM is available.

3.4 During each phase and time period, the criticality of the function to success of phase or time period of operation should be determined.

4 CRITICALITY MATRIX

4.1 A criticality matrix with functions along one axis and phases/time-periods along the other should be drawn up. Each intersection on the matrix should be annotated with one of the following criteria:

C - critical

M - of major importance

N - not critical to this phase (or time period)

4.2 The criticality matrix is an essential input to the consideration of engineering solutions and the associated availability modelling which form part of the Potential Scenario Analysis.

OUTPUTS

5.1 Outputs are detailed descriptions or charts of all potential missions, a list of all the functions required to successfully perform each mission and a series of matrices linking the criticality of each function to the success of the mission or phase of a mission.

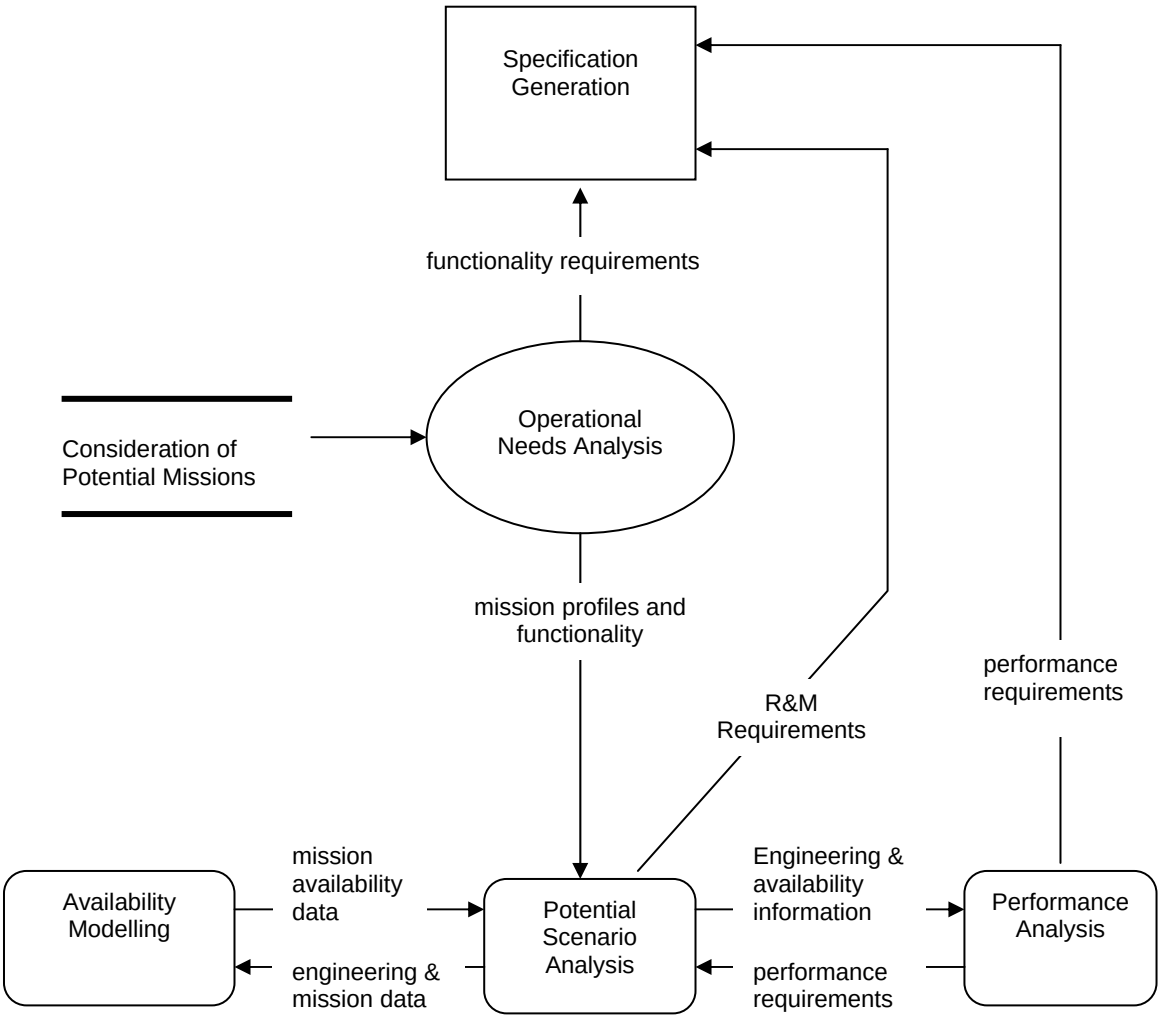

Figure 1: Data and Material Flow in and out of the Analysis