Functional Analysis

1 Definitions

Functional analysis is the systematic process of identifying, describing, and relating the functions a system must perform in order to be successful. **It does not address how these functions will be performed.** In the early phases, functional analysis deals with the top-level functions need to be performed by the system and the required operational concept and environmental conditions. Later, functional analysis proceeds to lower level to define the system functional design and interfaces.

2 Why Need Functional Analysis

1. To draw out all the functions the system must perform to meet its requirements.
2. Required for subsequent requirements allocation.
3. To identify profitable trade studies.
4. In describing what must be done and not how to do it, we decouple requirements from implementation. This leaves the implementation trade spaces unbiased.

3 System Decomposition

3.1 Physical breakdown

1. Each decomposition is specific to an architecture.
2. Analogous physical components do not always serve the same function or exist.

3.2 Functional Breakdown

1. Universally consistent across architectures
2. Intuitive for quantifying requirements
3. Freedom for revolutionary concepts

4 Functional Analysis Tools

4.1 Functional Architecture

1. Places functions in a top-down organization, structure or hierarchy.
2. Each function description contains an object and a verb.
3. Adverbs should not be used to specify where, when, how and how much, which should be developed during requirements definition.

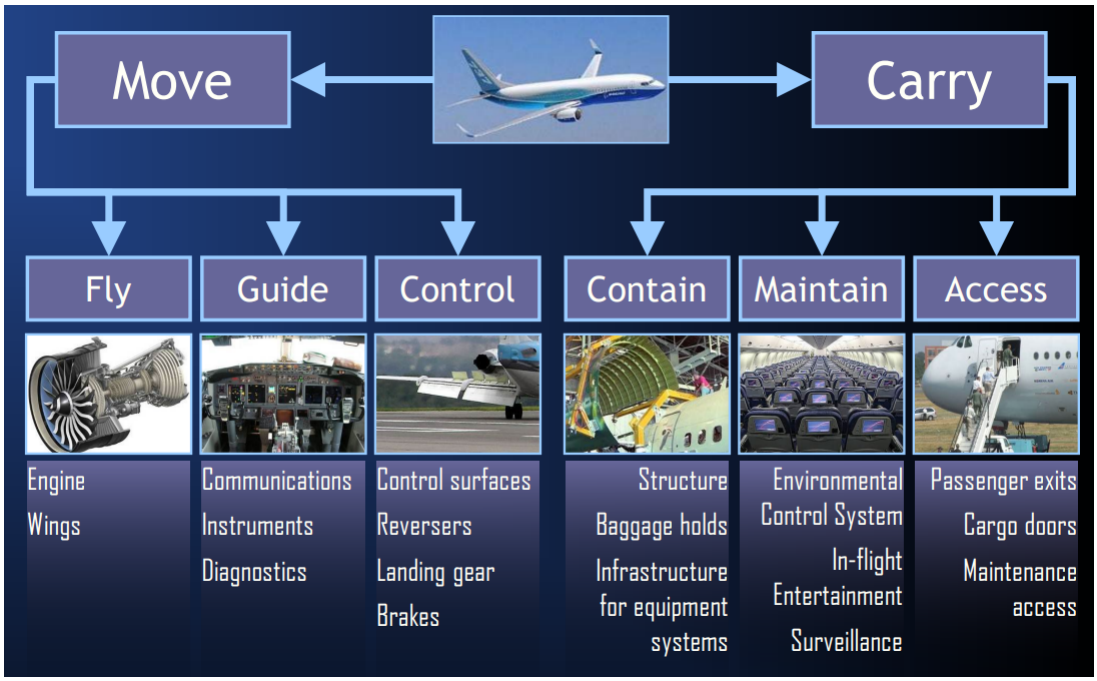

Figure 1: Functional Architecture.

4.2 Functional Flow Block Diagrams (FFBD)

1. Used to show the sequence of all functions to be accomplished by a system.
2. To indicate the sequential relationship of all functions that must be accomplished by a system.
3. Show the entire network of actions that lead to the fulfillment of a function.
4. Each function (represented by a block) is identified and described in terms of inputs, outputs, and interfaces from top down so that sub-functions are recognized as part of larger functional areas.
5. Some functions may be performed in parallel, or alternate paths may be be taken.
6. Functions are arranged in a logical sequence so that any specified operational use of the system can be traced in an end-to-end path.

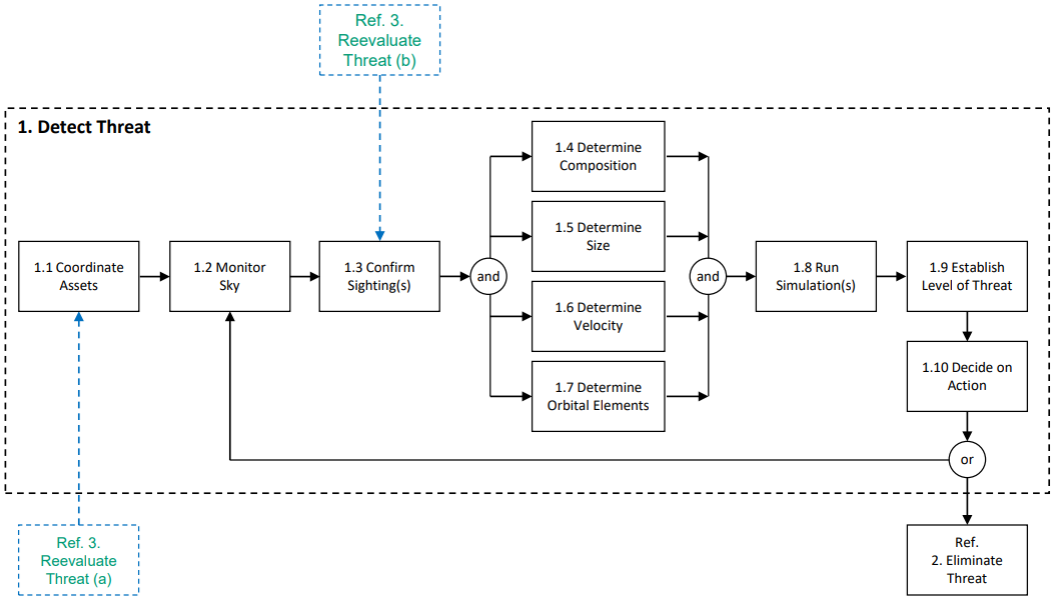

Figure 2: Functional Flow Block Diagrams.

4.3 N-Squared Diagram

1. Also known as design structure matrix (DSM).
2. Used to develop sub-function interfaces.

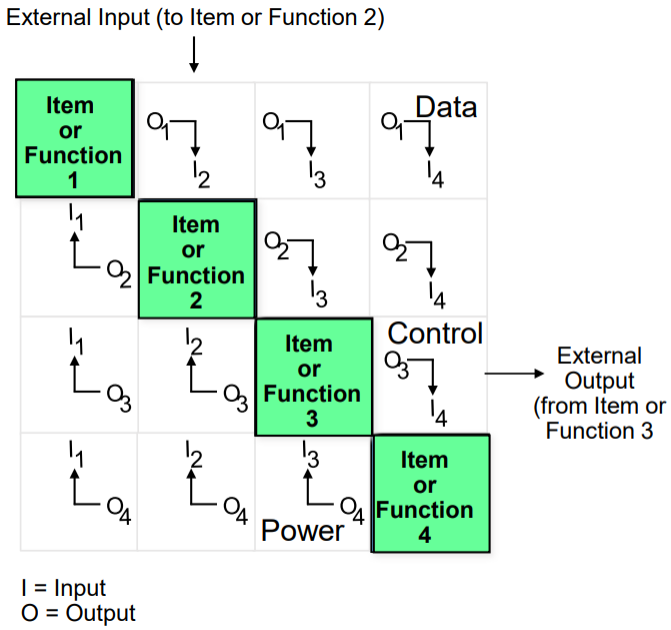

Figure 3: N Squared Diagram.

4.4 Timelines

1. Adds consideration of functional duration.
2. To understand time-critical requirements, a Time Line Analysis(TLA) is used.
3. TLA defines concurrency, overlapping, and sequential relationships of functions.
4. TLA is used to identify specific time-related design requirements.

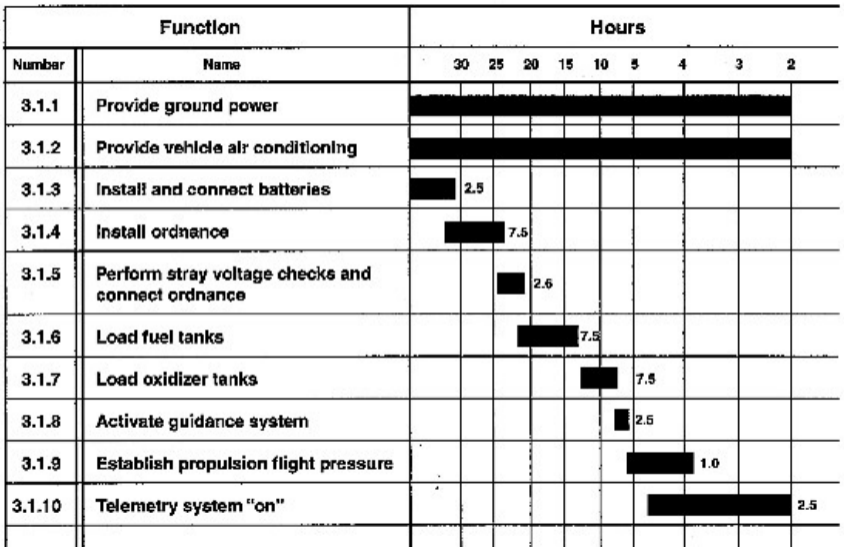

Figure 4: Time Line Diagram.