Use of Structured Total Approach in Developing a System for Emergency Power Generation for Aircraft with Fly by Wire

Dinah Eluze Sales Leite\textsuperscript{a}, José Lourenço de Oliveira\textsuperscript{b,1} and Geilson Loureiro\textsuperscript{b}

\textsuperscript{a}Embraer SA.
\textsuperscript{b,1}Embraer SA.
\textsuperscript{b}INPE – Instituto Nacional de Pesquisas Espaciais.

Abstract. This paper presents a Systems Engineering (SE) approach for development of the Emergency Electrical System (EES) for aircraft with Fly by Wire. After creating the model of the EES and its components relationship, these components were analyzed using the method Total View Framework, which has proved to be an important tool in the design and development of complex products. The proposed method, which includes aspects of the product, the processes and the organization, is justified in light of the failure of performance of traditional project management. In traditional approaches, the inherent complexity in product development is not taken into account. The authors believe this approach will promote the identification of items that meet the requirements related to quality, safety and reliability of multiple factors at the stage of project design.

Keywords. System Engineering, Emergency Electrical System, Aircraft, Fly by Wire

1 Introduction

The contemporary world is characterized by the development of extremely complex technologies and products and, therefore, an increasing number of variables and attributes to meet the requirements. Among the main features that can be mentioned: reliability, security, maintainability, robustness, precision and durability. These technologies and products of high complexity have the outset of the development marked by a need, desire or expectation of the stakeholders, which are defined by requirements.

An important and competitive market of the aviation industry is occupied by vendors of aircraft manufacturers. In many cases a given system can contribute up to 30\% of the final cost of the product and subsystems may have an even higher

\textsuperscript{1} Embraer SA, Desenvolvimento Tecnológico, Av Brigadeiro Faria Lima, 2170 - Putim, CEP: 12227-901, São José dos Campos, SP, Brazil Tel: +55 (12) 8116-6443; Email: dinah.leite@embraer.com.br
technological level of complexity than the product that receives it. This scenario requires strong competition among system suppliers, demanding that you understand fully, the aircraft manufacturer's business, as well as the company operating the aircraft. In this context, this paper discusses the development of an Emergency Electric System (EES) for an aircraft also under development. The model anticipates the needs of the system with the breadth of product lifecycle host, considering the simultaneous development of the aircraft and emergency system.

2 Objective

One of the inspiring aspects of System Engineering (SE) is its applicability across a broad range of industries. This paper aims to present the main concepts of SE, including the Total View Framework, a method for managing the complexity of the relationship among products, processes and organization elements, their interactions, as illustrated in Figure 1, and its application during the development of an Emergency Electrical System (EES).

![Figure 1. Total View Framework. Source: [5]](image)

3 The Traditional Model

The reference model for comparison, which in this article will be called “The Traditional Model”, is supported in the application cited by [1], in which the focus on the product is clear. An enhancement of the original model was described by [2] who suggests the introduction of new elements in the product design team with the modification of the previous approach procedure.