SYLLABUS

U.A.V. System Reliability and Safety Engineering

(FLY Course code: 029-C)

Issue of 19.09.2017

Introduction

This course presents the fundamentals of systems engineering and is structured to provide an overview of the systems engineering practices. It explains the system engineering process across the entire system life cycle and analyze all the critical activities and responsibilities of the systems engineers during the system development phases, from the definition of the operational requirements to the system verification and validation activities. Systems engineering methods and tools and planning, organization and management issues are also covered. The curse approach is based on the instructor's hands and experience and on the lessons learned from a lengthy career in developing systems.

Summary

Course type	Classroom course
Target	• Certifying Staff • Technicians • Quality Personnel • Competent Authority Members Staff • Maintainer
Duration	3 days
Course location	FlyOn.Aero Aviation Training Center – Tortona
Language	Italian / English
Contents	• Introduction to Systems Engineering applied to Mission Systems • Systems Engineering applied to U.A.V. • Reliability and Security • Workshop and practical exercises
Exam	Yes
Certificate	FlyOn.Aero certificate

Syllabus

SECTION 1

1. INTRODUCTION TO SYSTEMS ENGINEERING APPLIED TO MISSION SYSTEMS

1.1. Definitions and Basic Concepts

1.2. Systems Engineering

1.3. Systems Engineering Process

1.4. Mission Systems

1.5. Man Machine Interface

SECTION 2

2. SYSTEMS ENGINEERING APPLIED TO UAV’ S

2.1. Operational Requirements

2.1.1. General

2.1.2. UAV’ s Typical Missions

2.1.3. Classification

2.1.4. Operational and Systems Functions

2.1.4.1. Safety/Flight Critical Functions

2.1.4.2. Mission Critical Functions

2.1.5. Failure Tolerance, Integrity and Criticality

2.1.6. UAV Specific Reliability and Safety Requirements

2.2. Certification Requirements

2.2.1. Current Situation

2.2.2. Roadmap

2.3. UAV Systems Functional and Physical Architecture

2.3.1. Functional Architecture

2.3.2. Physical Architecture

2.3.2.1. Airborne Segment

2.3.2.2. Ground Segment

2.3.3. Software Design/Architecture

2.3.4. System Safety Concepts

2.4. Automation/Autonomy Criteria

SECTION 3

3. RELIABILITY AND SAFETY ENGINEERING

- 3.1. Failure Definition and Classification
- 3.2. Reliability
  - 3.2.1. Reliability Block Diagram (RBD)
  - 3.2.2. Multimission Reliability
  - 3.2.3. Design for Reliability
  - 3.2.4. Reliability Design Cycle
  - 3.2.5. Reliability Allocation
  - 3.2.6. FMECA
  - 3.2.7. Reliability Prediction
    - 3.2.7.1. Data Collection
    - 3.2.7.2. MIL – HDBK – 217
    - 3.2.7.3. Bellcore
    - 3.2.7.4. NPRD and EPRD
  - 3.2.8. Practical Examples
- 3.3. Safety
  - 3.3.1. Risk Definition and Classification
  - 3.3.2. Risk Assessment
  - 3.3.3. Safety Techniques and Methods
    - 3.3.3.1. Event Tree
    - 3.3.3.2. Fault Tree
    - 3.3.3.3. Sneak Circuit Analysis
    - 3.3.3.4. Hazop (Hazard and Operability)
- 3.4. Maintainability
  - 3.4.1. Maintainability Prediction
  - 3.4.2. Mean Time to Repair (MTTR)
  - 3.4.3. Mean Preventive Maintenance Time
  - 3.4.4. Mean and Maximum Corrective Maintenance Time
  - 3.4.5. Reliability Centered Maintenance (RCM)

3.5. Availability

3.5.1. Availability in Systems Effectiveness

3.5.2. Dependability

3.5.3. Availability Analysis

3.5.3.1. Markov

3.5.3.2. Monte Carlo Simulation

SECTION 4

4. WORKSHOP ON PRACTICAL EXAMPLES

4.1. Basic reliability computations (series, parallel and bridge systems)

4.2. Reliability computations of stand by redundant systems with Weibull failure distribution

4.3. Safety, Reliability and Availability analysis of a typical system with multiple failure modes

4.4. MTTF and Availability computations