Advanced Aerodynamics, Performance and Stability & Control Analysis for Light Aircraft in Detail Design Stage

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Abstract

캔위성은 대기권 내에서 낙하하며 실제 위성을 모사하는 초소형위성으로 저렴한 비용과 용이한 접근성으로 인공위성 시스템 교육과 실험 등에 있어서 많은 주목을 받고 있다. 이러한 점을 착안하여 Argos는 촬영위성과 통신위성 2기로 구성된 캔위성 시스템을 개발하였다. Argos는 해당지역의 영상을 수집하고 위성 간 통신을 하는 것을 주 임무로 하였다. 또한 자세데이터, 위치데이터, 온도, 압력을 수집하고 지상국으로 전송 하는 것을 부 임무로 하였다. Argos는 실제 발사된 이후 제한적인 임무를 수행하였고, 위성간의 통신으로 임무데이터를 지상국으로 전송하였다. 본 논문에서는 광범위 데이터 수집의 역할을 하는 Argos의 개발과정과 운용결과를 소개하고자 한다.

1. Introduction

The accuracy of analysis results requires to be improved by implementing the wind tunnel test data, propulsion data, and detail mass breakdown at the detail design stage for complying with the certification regulations such as KAS-VLA and CS-VLA. The advanced aerodynamics database construction, performance and stability and control analysis method for Light Aircraft Development Project which is developed by Konkuk University, funded by Ministry of Land, Infrastructure and Transport of Korean government. is proposed and developed to provide more reliable and accurate analysis results complied with KAS-VLA Subpart B: Flight at the detail design stage.

2. Aerodynamics Database Construction Process

The AeroDB construction process is proposed and developed by using the wind tunnel test data for the free flight condition at full flight envelope [1, 2]. It includes trim analysis, Reynolds and Mach number correction, center of gravity (CG) location change effects, interpolation, and additional analysis shown in Figure 1.

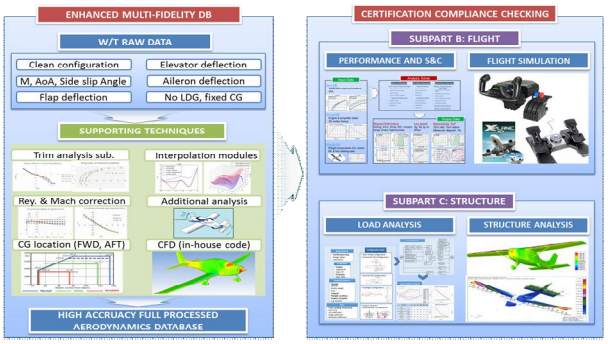

Figure 1. AeroDB process from wind tunnel test data

3. Advanced Performance Analysis

The advanced performance analysis is developed and validated for several types of aircrafts such as UAVs, and light aircraft including 2 seaters and 4 seaters aircraft [3-5]. The point performance and time simulation method are developed as a main solver as shown in Figure 2. It can be inputted from AeroDB, propulsion test data, and mass breakdown report as shown in Figure 2.

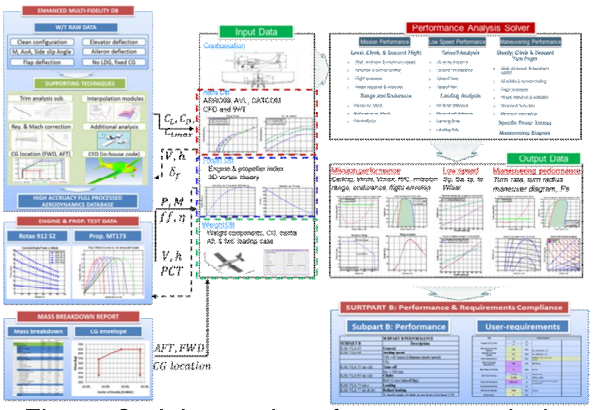

Figure 2. Advanced performance analysis

4. Advanced Stability and Control Analysis

The advanced stability and control analysis process is developed and validated for the 2 seaters light aircraft flight test data [6]. It includes the static, dynamic S&C analysis for the longitudinal and lateral motions, and others such as stick force per. knot, stick force per. g. The S&C analysis results using AeroDB, propulsion test data, and loading cases from mass breakdown are used to comply with the KAS-VLA Subpart B.

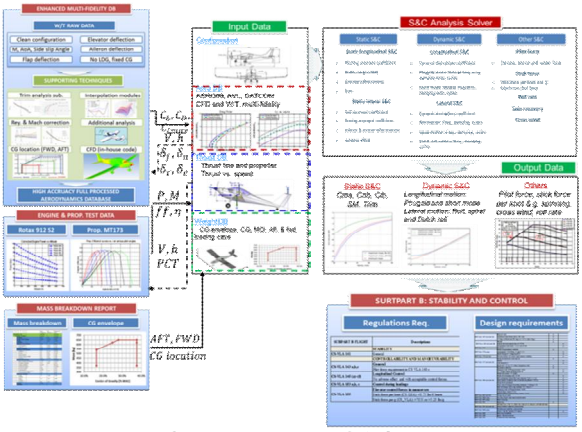

Figure 3. Advanced S&C analysis

5. VLA Implementation

The advanced aerodynamics, performance, and stability & control analysis process is applied for the VLA analysis at the detail design stage. The process is repeatedly performed and recommended for the small changes of VLA configuration during the critical design review (CDR) and post CDR stage [6].

6. Conclusions

The advanced aeroDB process, performance and S&C analysis is developed and presented for the VLA development project. It demonstrates the reliability and feasibility of analysis results to comply with the KAS-VLA Subpart B.

Acknowledgements

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