

MODIFIKASI UAV V-SKY 14 DAN ANALISIS KEKUATAN STRUKTUR SAYAP, FUSELAGE, DAN TAIL UAV V-SKY 14 NG MENGGUNAKAN SOFTWARE MSC PATRAN/NASTRAN

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ABSTRAK

Penelitian dan pengembangan pesawat nirawak UAV (Unmanned Aerial Vehicle) telah dilaksanakan oleh kampus Sekolah Tinggi Teknologi Adisutjipto Yogyakarta. Salah satu pesawat yang saat ini terus dikembangkan adalah UAV V-SKY 14 dengan kemampuan khusus take off dan landing secara vertikal atau VTOL. Pada hasil penelitian kekuatan struktur UAV V-SKY 14, telah dilakukan analisis komponen sayap pada kondisi beban Manuver (Pull Up) dan Vertical Take Off Landing (VTOL). Akan tetapi, terdapat satu beban yang sangat kritis belum diperhitungkan dalam analisis ini, yaitu beban torsi. Beban ini terjadi saat fase transisi dari vertical take off ke cruising. Pada tahap uji fungsi pesawat, beban ini menjadi kendala, hingga dipasanglah penguat tambahan pada saat proses manufaktur. Selain permasalahan tersebut, ditemukan juga beberapa kendala teknis lain yaitu, ruang fuselage yang terbatas, dan struktur tail memiliki nilai Margin of Safety yang kecil akibat pembebanan aerodinamik. Oleh karena permasalahan ini, penulis mengangkat menjadi bahasan dalam modifikasi UAV V-SKY 14 dan analisis kekuatan struktur UAV V-SKY 14 NG.

Proses pemodelan menggunakan software DS CATIA V5R21, perhitungan kekuatan struktur menggunakan software MSC Patran/Nastran 2012, dan simulasi aerodinamika menggunakan software ANSYS R15.0. Pembebanan pada struktur UAV V-SKY 14 menggunakan load factor 3,8 berdasarkan regulasi UAV negara di Australia (C.A.S.A. Australia Subpart C - Structure UA25.337). Terdapat empat kasus pembebanan yaitu terbang manuver (pull up), Vertical Take Off Landing (VTOL), beban torsi, dan beban aerodinamik. Setelah dianalisis dan didapatkan nilai tegangannya, lalu dilakukan perhitungan untuk mengetahui Margin of Safety.

Setelah melalui tahap analisis kekuatan struktur, didapat bahwa tegangan tertinggi pada struktur terjadi dikondisi pull up 15 degree, tepatnya di stringer horizontal tail sebesar 257 MPa dengan nilai Margin of Safety 2,374. Untuk nilai Margin of Safety terendah berada pada struktur core horizontal tail dikondisi beban torsi sebesar 0,376 dengan tegangan sebesar 0,466 MPa.

Kata kunci: *Modifikasi, UAV, Sayap, Fuselage, Tail, Vertical Take Off Landing xxi*

MODIFICATION OF UAV V-SKY 14 AND STRUCTURE STRENGTH ANALYSIS OF WING, FUSELAGE, AND TAIL UAV V-SKY 14 NG USING MSC PATRAN/NASTRAN SOFTWARE

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ABSTRACT

Research and development of the Unmanned Aerial Vehicle (UAV) has been carried out by Adisutjipto College of Technology, Yogyakarta. One of the UAV that is currently being developed is the V-SKY 14 UAV with special vertical take-off and landing capabilities. On the results of the research strength UAV V-SKY 14, wing section analysis has been carried out under load Maneuver (Pull Up) and Vertical Take Off Landing (VTOL) conditions. However, there is one very critical load that has not yet been taken into this analysis, namely the torque load. This load occurs during the transition phase from vertical take off to cruising. At the aircraft function test stage, this load becomes a problem, so an additional structure is installed during manufacturing. In other hand, there are also obtained several technical problems, such as limited fuselage space, and the tail has a small Margin of Safety value due to aerodynamic loads. Because of this problem, the authors raised the discussion in the modification V-SKY 14 UAV and analysis of the structure strength V-SKY 14 NG UAV. The modeling process uses DS CATIA V5R21 software, calculation of structural strength using MSC Patran/Nastran 2012 software, and aerodynamic simulation using ANSYS R15.0 software. Loading on the UAV V-SKY 14 structure uses a 3.8 load factor based on Australia state UAV regulation (C.A.S.A. Australia Subpart C - Structure UA25.337). There are four loading cases, that is flying maneuver (pull up), Vertical Take Off Landing (VTOL), torque load, and aerodynamics load. After analyzed and obtained the value of the stress, then do the calculation to find out the Margin of Safety. After going through the structural strength analysis phase, the highest stress on the structure is obtained in a 15 degree pull up condition, precisely in the horizontal tail stringer with stress value 257 MPa and a Margin of Safety value 2,374. For the lowest Margin of Safety value is 0.376 with a stress value 0.466 MPa, it is in the horizontal tail core structure, conditioned by a torque load.

Keywords: Modification, UAV, Wing, Fuselage, Tail, Vertical Take