Notes for Author

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The prospective authors are required to follow the guidelines below.

1. **Submission of Manuscripts:**
   Prepare the manuscript and upload Word (".doc") files via the journal website: http://www.ipress.tw/J0039 and click on "Submit". Please specify name and contact information (mailing and e-mail addresses, phone and fax numbers) of the author to whom subsequent correspondence should be directed, and , if preferred, names and contact information (e-mail address, phone numbers, etc.) of up to three suggested reviewers in the Suggested Reviewers column for editor's reference.
2. **Length:**
   The text of a full paper normally should not exceed 8 printed pages. A technical note should not exceed 6 printed pages.
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6. **Title & Author:**
   Use a clear and descriptive title. The title of the paper should be concise, informative and in capital letters. The author's name and affiliation (with mailing address) should appear below the title.
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8. **Keywords:**
   Several keywords (no more than 5 words) for the paper should be given below the abstract.
9. **Text Format:**
   The title of each section should be numbered by I, II, III and placed in the middle of a line. Titles of sub-

sections are placed to the left with or without a preceding number.

10. **Equations and Mathematical Formulas:**

    All equations and mathematical formulas should be typewritten. Equations should be numbered serially on the right hand side by Arabic numerals in parentheses. Leave proper space above and below all of the mathematical expressions.

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    The International System of Units (SI system) should be used. Non-metric equivalents can be included in parentheses wherever desirable.

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    The authors are requested to submit professional quality illustrations with sharp lines and good contrast. Once the paper is accepted, the authors should promptly supply original copies (or electronic files) of all illustrations. All illustrations should be numbered, titled and have descriptive captions. Illustrations may be reduced to a 8-cm column width. It is therefore important that lettering be legible after reduction by as much as 4:1.

13. **Acknowledgments:**

    Acknowledgments should be kept in minimum words and be given as a paragraph at the end of the text.

14. **Nomenclature:**

    All symbols and units should be listed in English alphabetical order with indication of their meaning and dimensions.

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    DOI: https://doi.org/10.6125/JoAAA.202203_54(1).02

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English Title (Arial 18-Point)
On the Experimental and Application Study of High-Curvature Wing for Load-Task UAV *

First Author [1], Second Author [1], and Third Author [2] (Arial 11-point)
[1]*Affiliation-1 (Times New Roman 10-point)*
[2]*Affiliation-2 (Times New Roman 10-point)*
Chieh-Nin Sun [1] and Yung-Lan Yeh [2] **

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ABSTRACT

Abstract Context: Times New Roman 10-Point)

Present work studies the aerodynamic properties of high curvature wing for UAV using wind tunnel test and CFD simulation. The high curvature S1210 wing is adopted for experiment and simulation. The lift condition with different AoA, the ground effect and wind speed effect are key topics to be examined and discussed in detail. The real flight test also be carried out in this work to verify the experiment and simulation results. Experimental results indicate that the high curvature wing not only has high AoA flight performance but also possesses ground effect when flies near ground. The ground effect is dependent on wing span and happens at distance lower than 1/4 span from the ground. Moreover, the flow over the wing surface does not separate till 18° AoA. It illustrates that the high curvature S1210 wing is a good choice for task UAV. Especially the UAV needs to takeoff in short

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distance and fly at bad weather or strong head wind.

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Keywords: High curvature, Task UAV, S1210, Ground effect

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I. INTRODUCTION

In past decade, there were more and more contraries committed to develop and research on unmanned aerial system (UAS) and unmanned aerial vehicle (UAV). Most obvious features of UAV are low-cost, high-flexibility, high-automation and high-resolution for detection. Based on previous causes, UAV gradually replaced manned aircraft to execute common mission including disaster relief, airborne support. As for special missions are landscape photography and military reconnaissance. Special UAV likes USA RQ-4 Global Hawk. Its endurance and flight range are over 24 hours and larger than 25,000 km. It can perform long-term military reconnaissance mission in the battle. In order to simulate flight trajectory of cruise missile and improve training efficiency, the Flamingo II UAV in Taiwan was developed to be a military drone aircraft. Until today, more and more different types UAV were used for different military or civilian purposes.

II. SETUP AND METHODOLOGY

S1210 is a typical high-performance wing because of its high curvature. Based on the theorem of aerodynamic [3], wing with high curvature has ground effect when near ground and flow on wing surface is not easy to separate at high angle of attack. Especially at relative low-speed flight,

All equations and mathematical formulas should be typewritten. Equations should be numbered serially on the right hand side by Arabic numerals in parentheses. Leave proper space above and below all of the mathematical expressions.

$$f_i(\vec{r} + \vec{c_i}\Delta t, t + \Delta t) - f_i(\vec{r}, t) = \frac{-1}{\tau}\left(f_i - f_i^{eq}\right) \quad (1)$$

$$\rho(\vec{x}, t) = \sum f_i(\vec{x}, t) \quad (2)$$

$$\vec{u}(\vec{x}, t) = \sum \vec{c}_i f_i(\vec{x}, t) / \rho(\vec{x}, t) \quad (3)$$

The authors are requested to submit professional quality illustrations with sharp lines and good contrast. Once the paper is accepted, the authors should promptly supply original copies (or electronic files) of all illustrations. All illustrations should be numbered, titled and have descriptive captions. Illustrations may be reduced to a 8-cm column width. It is therefore important that lettering be legible after reduction by as much as 4:1.

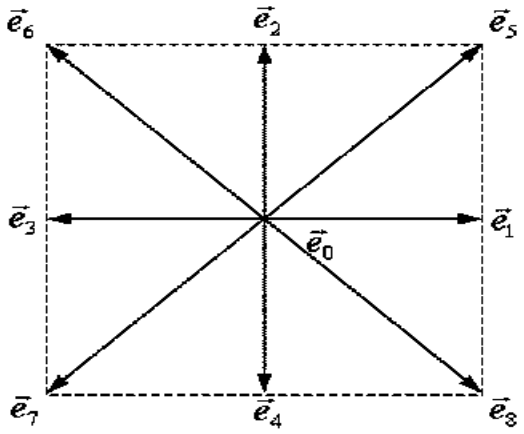

Figure 1 D2Q9 model (Arial 10-Point)

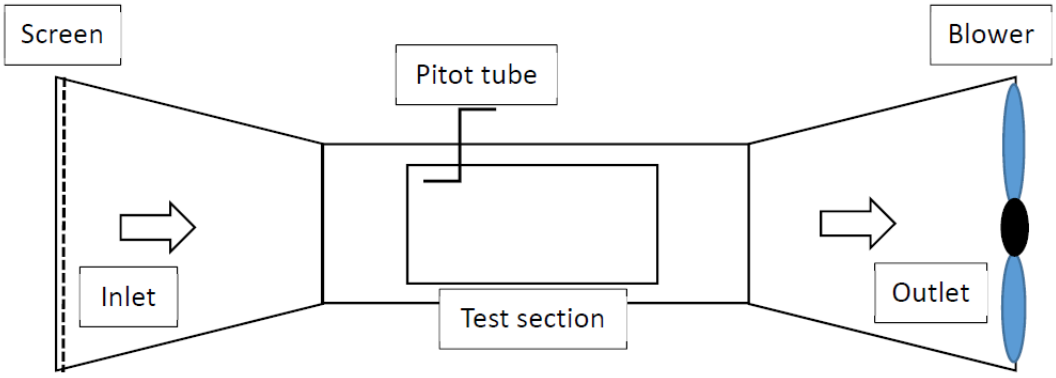

Figure 2 Low-speed suction type wind tunnel in Hsin-Chu campus of CUST

Table X Time-Averages of Estimation Errors (Arial 10-Point)

State Filter	Position (km)	Velocity (km/s)
EKF 1	7.98	0.11
EKFIF 1	0.02	0.03
RF	0.02	0.03
RLSEIF	0.02	0.03

III. RESULTS AND DISCUSSION

This section will well discuss the experimental results. Firstly, the fundamental concept of the ground effect will be examined from some important references to identify the key control factor. Then the wind tunnel experiment and CFD simulation are executed to investigate the ground effect, high AoA performance and wind speed effect in the second step. In the final stage, the real flight test will be implemented to further confirm the ground effect. An airborne digital GPS is used to know the altitude variation during takeoff process.

IV. CONCLUSIONS

Present work studies the aerodynamic properties of high curvature wing for UAV using wind tunnel test and CFD simulation in detail. The high curvature S1210 wing was adopted for experiment and simulation. The lift condition with different AoA, the ground effect and wind speed effect are key topics to be examined and discussed in detail. The real flight test also be carried out in this work.

ACKNOWLEDGMENTS

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REFERENCES

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