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High performance tilt rotor aircraft in which a nacelle tilt angle and a flaperon angle mechanically interwork with each other

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• US : 8544787

Title
• HIGH PERFORMANCE TILT ROTOR AIRCRAFT IN WHICH NACELLE TILT ANGLE AND FLAPERON ANGLE MECHANICALLY INTERWORK WITH EACH OTHER

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Outline of Technology

In a tilt rotor aircraft, a nacelle and a flaperon are mechanically connected by a power transmission mechanism such as a linkage system, and therefore the flaperon moves in connection with changes of a nacelle angle.

The present invention is designed to provide a result in which a lift-to-drag ratio of a flying vehicle increases as an aspect ratio of wings increases so that endurance performance is improved, and also to complement and improve a concept of mounting an extension wing which has previously invented (Korean Patent Document No. 10-0822366).

< Helicopter Mode >

< Conversion Mode >

< Airplane Mode >

Technical features and advantages

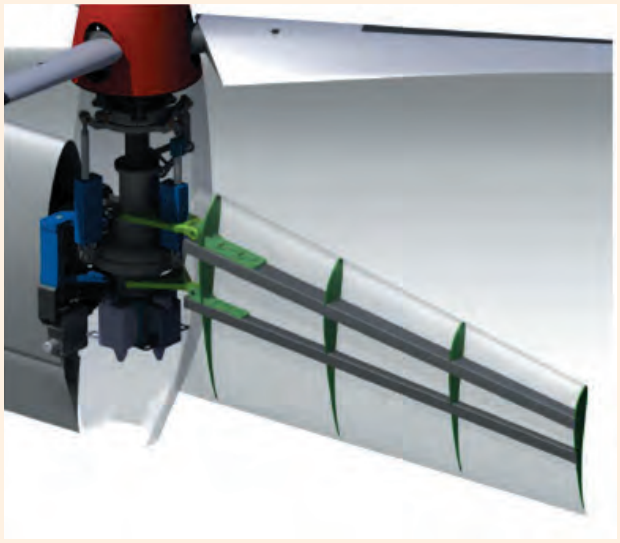
Distinctiveness

- A separate flaperon operator is not required, and therefore the flaperon can be alternatively used to adjust an angle of the extension wing so that an auxiliary angle of the extension wing is independently adjusted from the nacelle angle depending on a flight mode.

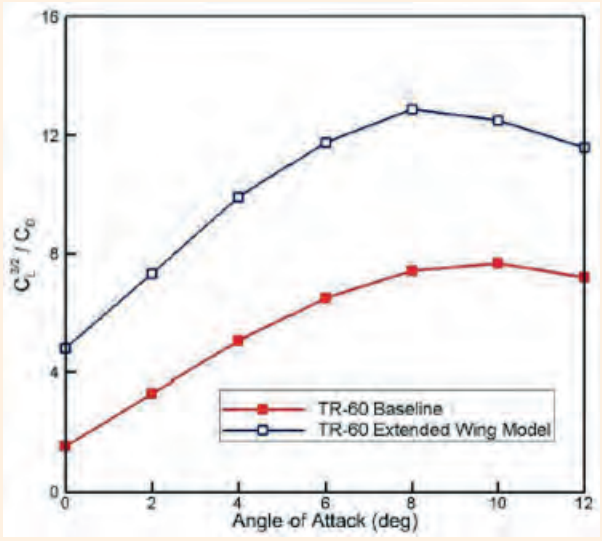
Technical effects

- In the aspect of the flying vehicle as a whole, the present invention is directed to providing a tilt rotor aircraft in which an endurance time and a flight distance are improved without an increase in the number of separate driving operators.
- A downward load acting on an auxiliary wing by propeller wash of a rotor is minimized through relative adjustment of the auxiliary wing so that performance degradation may be prevented in a rotary wing flight mode, and a drag acting on the extension wing may be reduced in forward flight of the rotary wing flight mode and a transition flight mode. In addition, in a fixed wing flight mode, the endurance time and the flight distance can be largely improved.

< Design of Extended Wing and Supporting Structures >



< Life to Drag Ratio (Baseline vs Extended Wing Model) >



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Technical detail

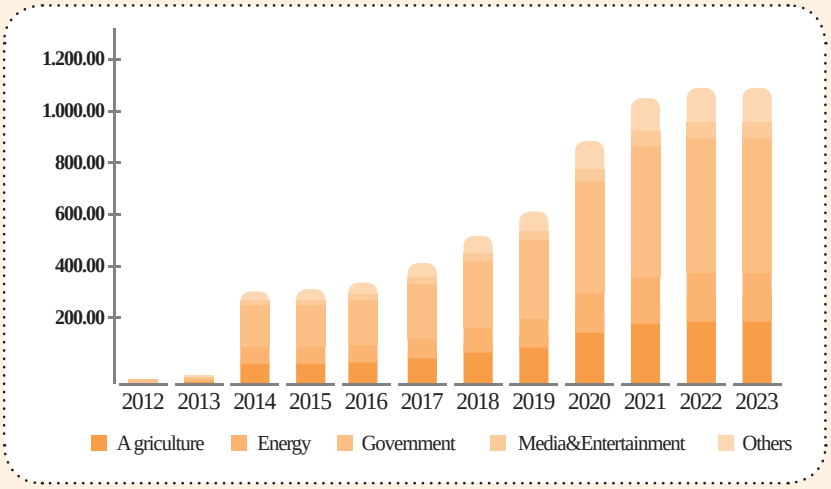
In order to confirm effects of performance improved by mounting an extended wing, a computational flow analysis is conducted for the entire body of a TR60 basic model and an extended wing-mounted model, and endurance time and a lift-to-drag ratio increased about 68% in the results.

<Performances and Physical Properties of TR60 & TR100>

	TR60	TR100
Body length	3m	5m
Maximum speed	250km/h	500km/h
Endurance time	6 hours	5 hours
Weight on board	30 kg	40~100 kg
Maximum weight	200 kg	1,000 kg

Market and future prospect

The global commercial UAV market is expected to reach $2.07 billion by 2022, according to a new study by Grand View Research Inc.



In view of the size of the market, it is expected that high performance tilt rotor unmanned aerial vehicles could conquer a global UAV market which is a blue ocean.

Market and future prospect

The endurance performance is affected by various factors besides a lift-to-drag ratio. In the purpose of substantial comparison of endurance performance, as a result of measuring engine power through a flight test and comparing fuel consumption of two models through a static test, fuel reduction of about 30% is shown when an extended wing is mounted, and thereby the improvement of endurance performance of the extended wing was indirectly confirmed from this result.

<Flight Test of Extended Wing Model>

Applications

- When a tilt rotor unmanned aerial vehicle is operated on a battleship, real-time surveillance by navy or maritime police is improved.
- When an automatic aviation technique of a tilt rotor UAV is applied to a compact trigger aircraft, a personal air vehicle (PAV) which automatically lands on a helipad of a destination based on a destination which is input into the PAV on a helipad of an apartment rooftop can be developed.
- The PAV automatically flies on a sky highway so that it can be flown to a destination with the driving skill of an automobile driving license.