(12) AUSTRALIAN PATENT ABSTRACT
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(54) AIRCRAFT HAVING CANARD AND PARASOL WINGS

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(57) Claim

1. An aircraft of the canard type, comprising a fuselage, a pair of short canard wings at the front of said fuselage, a parasol wing having a wing span larger than the front canard wings and positioned rearwardly thereof, said parasol wing being mounted above, and separate from said fuselage and being connected to said fuselage by a pair of dihedral wing members.

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COMPLETE SPECIFICATION

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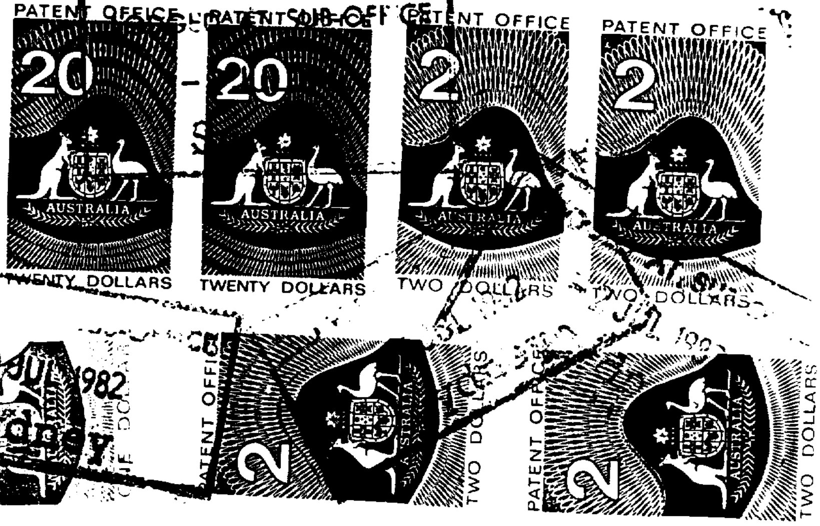

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Complete Specification for the invention entitled :

"COMPOSITE AIRCRAFT"

The following statement is a full description of this invention, including the best method of performing it known to me/~~us~~ :

P17

The present invention relates to a novel aircraft design. In particular, the invention is directed to a light aircraft having a combination of canard wing and parasol wing designs which results in a greater economic potential than known aircraft of equivalent power.

The aircraft according to the present invention comprises a blend of two distinct types of conventional light aircraft into a single design. The first type of known design is the "canard" design which has the smaller lifting or control wing in front of the larger main wing. Aircraft of this type have the inherent disadvantage that at take-off, the front of the aircraft lifts due to the action of the front canard wing but a cushion of air is created between the rear wing and the ground. Different forces act on the front and rear wings due to the different air conditions encountered by the wings. Not only is it more difficult to obtain "lift" from the rear wing, but also power and stability problems arise. Moreover, the aircraft has a different "feel" from conventional aircraft. Thus, even an experienced pilot must become accustomed to this aircraft through training before he would become confident and competant.

The other known aircraft design comprises a large wing mounted above the fuselage, the wing being known as a "parasol" wing. Such parasol wings are used as the main forward wing on certain conventional aircraft. Since the weight of the parasol wing acts at the front of the aircraft, the centre of gravity is moved towards the centre of the aircraft by extending the fuselage towards the rear, as in a conventional light aircraft. However, the rear portion of the fuselage generally contains unutilised space and increases the surface area of the aircraft, thereby increasing the drag.

It is an object of the present invention to overcome, or substantially ameliorate, the above described disadvantages by providing a composite aircraft which utilises the advantages of canard and parasol wings yet avoids the disadvantages normally associated with each type of wing design.

According to the present invention, there is provided an aircraft of the canard type, comprising a fuselage, a pair of short canard wings at the front of said fuselage, a parasol wing having a wing span larger than the front canard wings and positioned rearwardly thereof, said parasol wing being mounted above, and separate from, said fuselage and being connected to said fuselage by a pair of dihedral wing members.

In a preferred form, the aircraft comprises a set of front canard wings, a rear parasol wing of much greater wing span, the parasol wing being connected to the fuselage by dihedral rear side wings which correspond to the rear wings of a standard canard type aircraft but are positioned at a positive dihedral angle of approximately 35° to 50°. Preferably, the parasol wing is also connected to a rear fin of the fuselage. As the aircraft design is a combination of "canard" and "parasol" wing configurations, it is known as a "composite" aircraft, and is capable of exploiting more efficiently, from structural, volumetrical and aerodynamical considerations, the energy supplied by the power plant of the aircraft, to thereby facilitate the construction and improve the operation of the aircraft.

The advantages of the aircraft of the present invention results from:

(1) Its short fuselage, which is comparable to a car body, and consequently its reduced "wetted" area. Greater volume utilisation is possible in comparison to conventional light aircraft, and the fuselage configuration allows simplification of structural framework thereby minimising the (unladen) weight of the aircraft. The reduced "wetted" area results in a reduction of aerodynamic drag forces on the fuselage.

(2) Both the canard wings and the parasol wings contribute to the lift in a ratio of approximately 1/3:2/3.

(3) The parasol wing has a high aspect ratio and produces spanwise airflows which are characterized by a high ratio of coefficient of lift to coefficient of drag (C_L/C_D). Moreover, the high C_L/C_D ratios are achieved at low rates of weight penalty.

(4) The canard and parasol wings operate in respect of independent airflows. The airflow on the parasol wing is predominently two dimensional, while the airflow on the canard aspect of the design is predominantly three dimensional. Absence of critical interference between the two airflows results in improved handling characteristics and enables a quick recovery from stalling.

(5) The directional stability of the aircraft is enhanced by the combined effect of the positioning of the

rear canard side wings at a positive dihedral angle and the interaction of the rear side wings with the fin-rudder unit. In particular, the enhanced lateral stability allows a multi-engined aircraft to operate safely on the remaining engines in case of engine failure.

(6) The aircraft design allows the engine(s) to be optimally located for minimum loss of aerodynamic efficiency, for minimum noise level and for maximum safety in the case of emergency landings.

(7) The fuselage/cabin design allows greater visibility, and easy access/exit therefrom.

By way of example and illustration, preferred embodiments of the present invention will now be described with reference to the drawings in which:

Fig. 1 is a front elevational view of a 5-6 seater composite aircraft according to a preferred embodiment of the present invention;

Fig. 2 is a side elevational view of the embodiment of Fig. 1;

Fig. 3 is a plan view of the embodiment of Fig. 1;

Fig. 4 is a plan view of another embodiment having a tapered and swept parasol wing;

The embodiments described below referred to 5/6 seater aircraft but can be adapted to different sized aircraft, from two seaters to fourteen seaters. Furthermore, the described embodiments have a potential top speed limited to approximately two hundred miles per hour since the main object of the design was to obtain maximum operational economy rather than maximum velocity. However, it is to be understood that aircraft of higher speeds can be constructed according to the present invention.

As illustrated in Figs. 1-3, the aircraft comprises a fuselage 1 of the canard component of the composite design. Short canard wings 2 are mounted either side of the fuselage at the front thereof while comparatively larger rear side wings 3 are positioned at a positive dihedral angle of approximately 40°. A horizontal trailing edge flap 4 is provided at the rear end of the fuselage for pitching manoeuvrability.

As both forward and rear side wings, and the fuselage itself, are provided with flaps, the maximum lift generated by the canard component design in takeoff, landing and climb is of the order of approximatley 40° of the total lift generated by the composite aircraft. This lift is due partially to the air cushion effect between the canard component and ground, but undesirable consequences of the air cushion effect are minimised since the rear side wings are orientated at a positive dihedral angle, and the parasol wing is situated above the aircraft and well clear of the ground.

A vertical fin 5, and associated rudder, is provided at the rear of the fuselage. A large transverse parasol wing 6 is mounted above, and separate from, the fuselage 1 and is connected to the fin 5 via beam 7 so that the fin-rudder unit 5 achieves the torsional rigidity while the parasol wing 6 also achieves the structural rigidity required for supporting the aircraft engine 9. The parasol wing 6 is supported by the rear side wing 3 at two stations, far apart from its line of symmetry. This practice allows the use of a parasol wing

6 with unusually high aspect ratio and thin aerofoils of constant chord, along most of its band, without the generation of aeroelastic problems. Moreover, such a parasol/rear side wing arrangement makes available a range of mounting positions for the engines. For example, the engines may be mounted as shown in Fig. 1, or at the junction of the parasol wing 6 and the rear side wing 3, or in the case of a single engine, at the line of symmetry.

Since all of the wings 2, 3 and 6 are provided with lifting devices (flaps) 8, a high lift potential is obtained.

The power plant of the aircraft comprises two reciprocating engines 9 with pushing propellers having respective fuel tanks 10 located forward of the engines so as to keep the fuel weight as near as possible above the centre of gravity of the composite aircraft. As a consequence of the large engine frontal area, the fuel tanks 10 have a high capacity thereby obviating fuel cells within the parasol wing 6 which, therefore, can be constructed as thin as possible so as to obtain lightness, low aerodynamic drag and simplicity of construction.

Fig. 4 illustrates a further embodiment of the present invention in which the parasol wing 6 is tapered, and swept forward and back along its length.

It is to be noted that the detachment of the parasol wing from the fuselage allows unobstructed airflow therebetween, with a consequent increase in the efficiency of the parsole wing.

The foregoing describes only two embodiments of the present invention, and modifications, obvious to those skilled in the art, may be made thereto without departing from the scope of the present invention. For example, although the invention has been described in respect of a 5/6 seater light aircraft, the design can be applied to jet aircraft as well. Furthermore, the engines can be either of the tractive or propulsive type.

The claims defining the invention are as follows:

1. An aircraft of the canard type, comprising a fuselage, a pair of short canard wings at the front of said fuselage, a parasol wing having a wing span larger than the front canard wings and positioned rearwardly thereof, said parasol wing being mounted above, and separate from said fuselage and being connected to said fuselage by a pair of dihedral wing members.

2. An aircraft as claimed in claim 1 further comprising a vertical fin and rudder assembly at the rear of said fuselage, said parasol wing being connected to said fin.

3. An aircraft as claimed in claim 1 further comprising a trailing edge elevator at the rear end of said fuselage.

4. An aircraft as claimed in claim 1 wherein said dihedral wing members are orientated each at a positive dihedral angle of approximately 35° to 50°.

5. An aircraft as claimed in claim 4 wherein said front canard wings, said parasol wing and said dihedral wing members have substantially the same aerofoil section.

6. An aircraft as claimed in claim 5, wherein said fuselage has a rear portion of substantially constant width.

7. An aircraft as claimed in any preceding claim, said aircraft having a single engine located substantially in the plane of symmetry of said aircraft.

8. An aircraft as claimed in any one of claims 1 to 5, said aircraft having a plurality of engines, at least two of said engines being mounted on the parasol wing symmetrically on opposite sides of the plane of symmetry.

9. An aircraft as claimed in claim 6 or 7, wherein said engines are jet engines.

DATED this SECOND day of JULY, 1982

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FIG.1

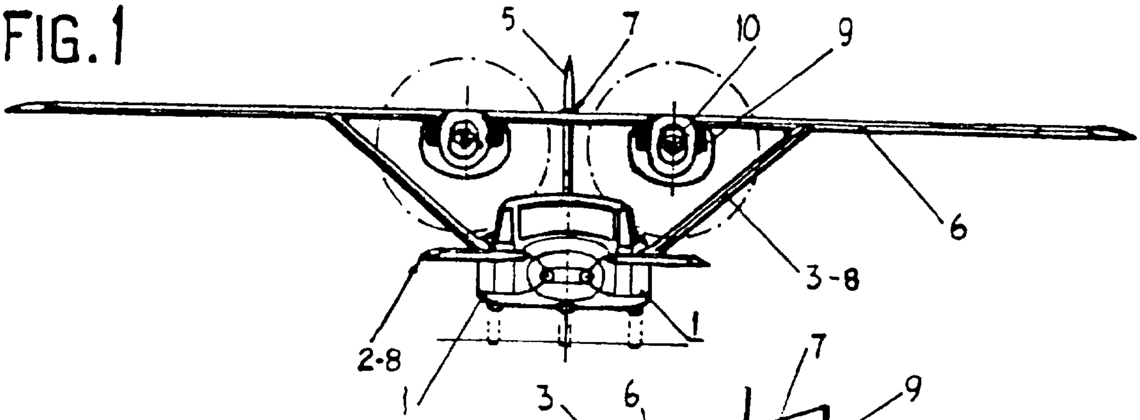


FIG.2

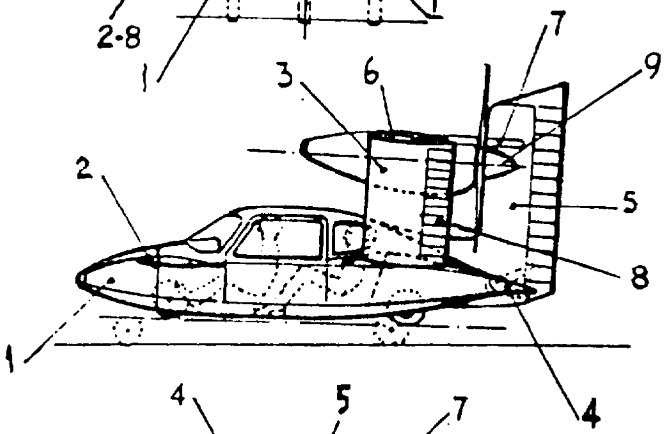
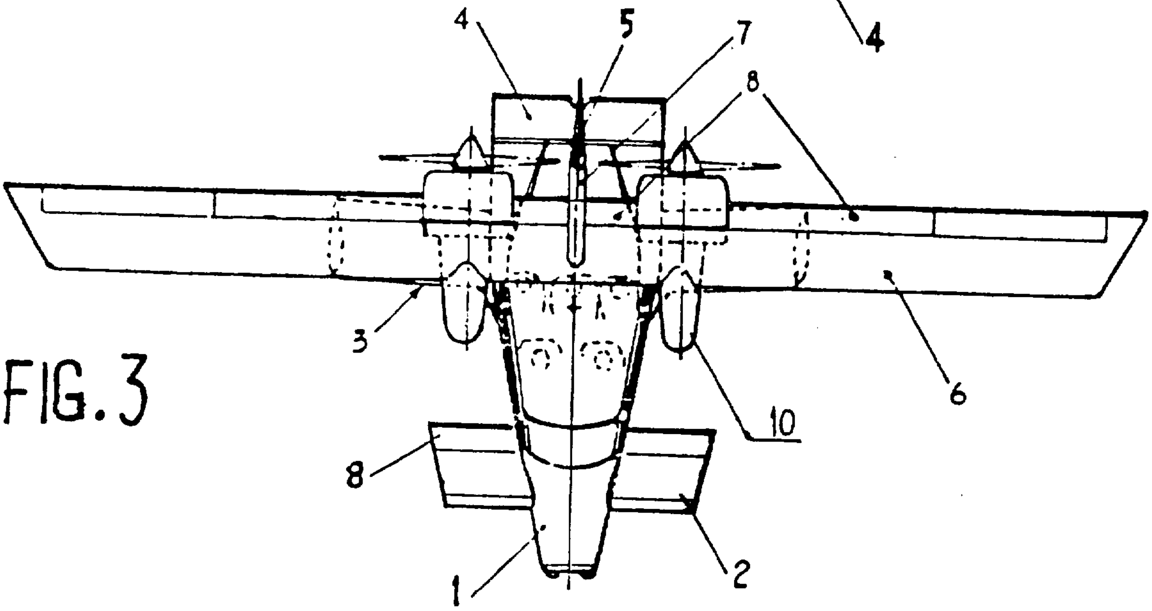


FIG.3



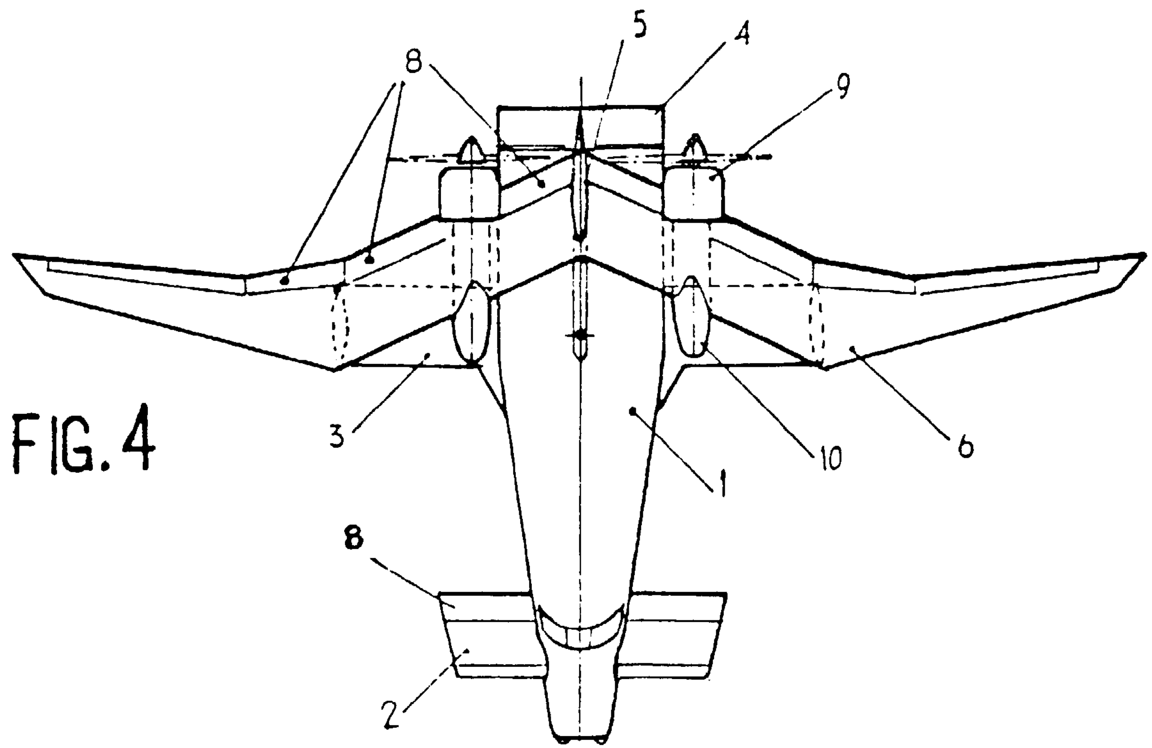


FIG. 4