INTELLECTUAL PROPERTY OFFICE

BL O/175/11

24 May 2011

PATENTS ACT 1977

APPLICANT Aesir Limited

ISSUE Whether patent application GB0508793.7 complies with section 1(1)(b)

HEARING OFFICER C L Davies

DECISION

Introduction

1 Patent application number 0508793.7 ("the application") entitled "A craft having a rotatable fluid propulsion device" was filed in the name of GFS Projects Limited on 3 May 2005, claiming a priority date of 23 March 2005 from an earlier application number 0505958.9. The application was published as GB2424405 on 27 September 2006. The application was subsequently assigned to Aesir Limited.

2 The search report identified five documents relevant to the novelty and inventive step of the invention claimed in the application and a further relevant document was identified when the search was later updated.

3 In his initial examination report the examiner maintained that all the claims lacked either novelty or inventiveness in light of four of the prior art documents from the search. Following two rounds of amendments to the specification the examiner maintained that the invention was obvious in light of the prior art. The applicant maintained their view that the invention involves an inventive.

4 The applicant was offered a hearing to resolve the issue and filed skeleton arguments on 22nd March. The matter came before me at a hearing on 23 March 2011, the applicant being represented by Mr. Tolfree of Tolfree Patents and Trademarks.

5 As a preliminary matter I shall deal with the compliance date of the application. The period for complying with the requirements of the Patents Act expired on 1 November 2010, 12 months from the first examination report. This has been extended under rule 108 three times, the third time following the hearing on 23 March 2011, and the compliance period now expires on 4 May 2011.

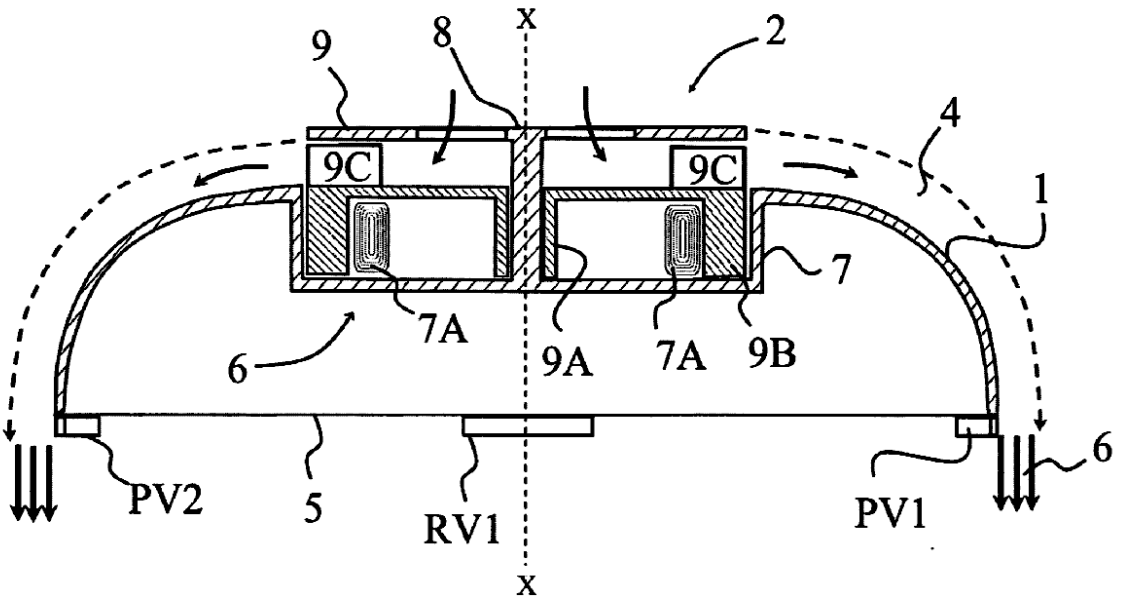
The application

6 The application relates to a craft employing a rotor whose fluid output is directed over a dome or canopy and thus diverted from a radial to an axial direction creating lift or thrust. More particularly the invention is concerned with improving the stability of such craft by means of the angular inertia or angular momentum of the rotating parts.

7 Whilst it is not brought out in the claims, the description of the application discusses maximising the angular momentum of the rotating components and an increased gyroscopic effect that this brings about.

8 A single embodiment is described and figure 2, below, shows a cross-section of the craft in which radial fan 1 draws in air from above the craft, expels a radial jet 4, which is diverted along a dome shaped canopy 1 until it leaves the lower edge 5 of the canopy in an annular stream 6. The fan 2 includes a shaft 8 about which a rotor 9 is driven, the rotor including a heavy, annular, permanent magnet 9B and radial fan blades 9C, drive arising from fixed coils 7A. Vanes PV1, PV2, RV1 and RV2 control roll and pitch of the craft.

Fig 2



The claims

9 The latest set of claims on file were those filed on 25 November 2010 and this is the set upon which I will base my decision. There are 8 claims in total, with claim 1 being the only independent claim and reading:

> *1. A craft of the type in which a rotor directs a jet of fluid over a dome or canopy shaped to divert the jet from a radial or horizontal direction towards an axial or vertical direction, thereby providing lift or thrust, characterised in*

that by virtue of the angular inertia of the rotor and an associated drive unit when in, operation, the craft is caused to be in a state of positive stability such that when rotated from a datum orientational position, it will in response to such displacement, tend to return to that datum orientational position.

Issue to be decided

10 The issue I now have to decide is whether the claims satisfy section 1(1)(b) of the Patents Act 1977 (the "Act"), i.e. whether they comprise an inventive step.

The Law

11 The law regarding inventive step is found in sections 1 and 3 of the Act. The relevant parts read as follows:

> **Patentable Inventions**
>
> 1.-(1) A patent may be granted only for an invention in respect of which the following conditions are satisfied, that is to say –
> (a) ...
> (b) it involves an inventive step;
> (c) ...
> and references in this Act to a patentable invention shall be construed accordingly.

12 Section 3 defines what is meant by 'inventive step'.

> **Inventive Step**
>
> 3. An invention shall be taken to involve an inventive step if it is not obvious to a person skilled in the art, having regard to any matter which forms part of the state of the art by virtue only of section 2(2) above (and disregarding section 2(3) above).

13 I do not propose to quote sections 2(2) and 2(3) here, but it follows from these that the state of the art comprises all matter which has at any time before the priority date of the application been made available to the public, whether in the UK or elsewhere.

14 The correct test for determining inventive step is the structured approach found in *Windsurfing International Inc. v Tabur Marine (Great Britain) Ltd, [1985] RPC 59* as reformulated by Jacob LJ in *Pozzoli SPA v BDMO SA [2007] EWCA Civ 588* (see paragraph 23 of the Court of Appeal's judgment). The four steps of the test are now:

> (1)(a) Identify the notional "person skilled in the art"

(1)(b) Identify the relevant common general knowledge of that person;

(2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;

(3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed;

(4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?

Applying the Windsurfing/Pozzoli test

Step 1(a): Identify the notional "person skilled in the art"

15 The examiner believes that the skilled person would be skilled in the art of unmanned aerial vehicles, particularly those operating on the Coanda effect (see official letter dated 15 December 2010). The applicant asserts some things that would be known or unknown to the notional "person skilled in the art", but does not identify that person specifically. It seems to me that the notional "person skilled in the art" would be knowledgeable about craft of the type in which a rotor directs a jet of fluid over a dome or canopy shaped to divert the jet from a radial or horizontal direction towards an axial or vertical direction, which both the applicant and examiner refer to by the shorthand of Coanda type craft (a shorthand I will use for the remainder of this decision). To my mind this implies a knowledge of common physical and aerodynamic principles.

Step 1(b): Identify the relevant common general knowledge of that person

16 The examiner tells me that the skilled person would be aware of the stability that so-called Coanda craft experience during takeoff and landing and also when approaching vertical surfaces. He goes on to suggest that the skilled person would also understand the gyroscopic effect of rotating bodies and principles of angular momentum, inertia and velocity (see official letter dated 15 December 2010).

17 The introductory part of the description in the application discusses the need for control systems to achieve stability in helicopters and the conventional practice of reducing the weight of aircraft components. I take it that this would be common general knowledge to the notional skilled person. It seems from agent's letters dated 30 April 2010 and 25 November 2010 that gyroscopic stability of rotating masses is also common general knowledge. In particular attention is drawn to an extract from a text book published in 1909 showing that a spinning top has a speed of rotation above which it will return to a vertical position after a small displacement.

18 In the skeleton arguments provided before the hearing reference is made to an

unpublished internal document. It is not entirely clear to me whether this is intended to illustrate common general knowledge at the priority date. However, given the document is acknowledged as being produced after the priority date I do not think that I can assume it represents common general knowledge.

19 It seems appropriate to discuss positive stability at this point. There seems to be an implication from the agent's letters and indeed from the description that "positive stability" somehow has a special meaning in the context of this application. However, helpfully the applicant chooses to define positive stability in the specification (see page 7 lines 11 and 12) as follows: "*a state in which a body, when displaced from a datum position, will, in response to such displacement, tend to return to that position.*". It seems to me that this is in fact virtually a dictionary definition of positive stability in the motion of a body, especially in aerodynamics. I also take it that the skilled person would understand the concept of stability, including positive stability. It does not necessarily follow to my mind that the skilled person would immediately understand how to achieve a state of positive stability in any particular body.

Step 2: Identify the inventive concept of the claim in question or if that cannot readily be done, construe it:

20 It seems from the skeleton arguments that the examiner and applicant disagree as to the inventive concept of the claim. In his letter of 15 December 2010 the examiner identifies the inventive concept as "*the sufficient increase of the angular inertia of the rotor and drive unit of a Coanda type craft will cause the craft to be in a state of "positive stability" such that when rotated from a datum orientational position it will, in response to such displacement, tend to return to that datum orientational position*".

21 In the skeleton arguments the applicant suggests that the inventive concept is "*to increase the stability of a 'coanda type' craft by placing it in a state of positive stability*".

22 It seems to me that the notions of "*increase*" and "*sufficient*" are important here and I will return to them later. For now suffice it to say that I cannot find any notion of sufficient or increase in the invention as claimed.

23 Since I do not agree with the inventive concepts identified by the examiner and the applicant, I shall construe the claim. To do so I will follow the standard principles of claim construction set out in *Kirin-Amgen Inc v Hoechst Marion Roussel Ltd* [2005] RPC 9. I should put a purposive construction on the claims and follow section 125(1) of the Patents Act 1977 and the Protocol on the Interpretation of Article 69 of the European Patent Convention by interpreting the claims in the light of the description and drawings. In other words, the question is always what the person skilled in the art would have understood the patentee to be using the language of the claim to mean.

24 I have considered the person skilled in the art above, but to reiterate: that person would understand craft of the type in which a rotor directs a jet of fluid over a dome or canopy shaped to divert the jet from a radial or horizontal direction

towards an axial or vertical direction, based upon a knowledge of common physical and aerodynamic principles.

25 Moving to the language of claim 1, the opening or pre-characterising part of the claim is directed to "*a craft of the type in which a rotor directs a jet of fluid over a dome or canopy shaped to divert the jet from a radial or horizontal direction towards an axial or vertical direction, thereby providing lift or thrust*" in other words the invention is concerned with what the applicant and examiner call a Coanda type craft (although I note that the application makes no mention of Coanda or the effect named after him).

26 Leaving the next clause and skipping to the final clause of the claim we have: "*the craft is caused to be in a state of positive stability such that when rotated from a datum orientational position, it will in response to such displacement, tend to return to that datum orientational position*". This seems to be to me virtually a tautology, I construe this clause as simply saying the craft is caused to be in a positive state of stability. There is a small proviso to this however. The clause refers to rotational displacement, which begs the question rotation about which axis or axes? From the description and the discussion of problems with this type of craft when taking off, landing or approaching a vertical wall, the rotation in question seems to be about any axis parallel to the radial or horizontal direction referred to in the pre-characterising part of the claim. In fact it seems that the radial or horizontal direction is made up of multiple directions since it is to be presumed that the jet will emanate from the whole periphery of the rotor, in fact the undiverted jet defines a plane. In aeronautical terms we are dealing with positive pitch and roll stability.

27 That leaves one clause: "*characterised in that by virtue of the angular inertia of the rotor and an associated drive unit when in operation*". Thus the state of positive stability is required to derive somehow from the angular inertia of the rotor and an associated drive unit.

28 So far I can construe the claim as being directed a Coanda type craft caused to be in a state of positive pitch and roll stability by virtue of the angular inertia of the rotor and an associated drive unit.

29 However, I have some difficulty reconciling the claim with the description. A problem is described that arises for this type of craft when approaching a vertical wall, specifically the effect of the wall is to cause the craft to tilt towards the wall and then to move towards the wall until it hits the wall. The invention is said to overcome this problem by means of precession such that the craft moves parallel to the vertical wall without coming into contact. Whilst this effect may well be beneficial, it does not seem to be the effect required by claim 1, in other words it does not appear that this precessional effect will mean that "*when rotated from a datum orientational position, it will in response to such displacement, tend to return to that datum orientational position*", what is described is a lateral displacement parallel to the wall and no comment is made on the rotational orientation of the craft.

30 Quite how the improvement in stability on take off or landing comes about is not clear. The effect is described between line 28 on page 6 and line 6 on page 7,

ending with the following explanation: "*The positive stability, provided by the gyroscopic effect of the invention, eliminates this problem, allowing stable take-off and landing to take place.*". So it seems the craft is made stable by virtue of its rotor and drive unit acting as a gyroscope.

31 However, in the application the stability and control of the craft is not left entirely to angular momentum. In the specific embodiment, whilst angular momentum of the rotating parts is increased to improve stability, its effects are combined with the active control of pitch and roll control vanes. Thus to my mind the scope of claim 1 should be understood to include producing the required state of positive pitch and roll stability by means of the angular momentum alone, but also producing that state by means of angular momentum combined with other control means, such as the control vanes. In other words I should not construe claim 1 to be directed to positive pitch and roll stability arising from angular momentum alone.

32 As I noted above, both the examiner and the applicant's skeleton arguments refer to the inventive concept residing in an increase in either angular inertia or stability. Whilst I have already noted that such a notion does not appear in claim 1, nor in the remaining claims, I have some sympathy with this view. The description makes it clear that a beneficial effect on stability arises from designing the rotor to have a large angular inertia (see lines 13 to 15 on page 5 for example) and it seems that the effect arises from gyroscopic effects "*maximise the angular momentum of the rotating parts ... can increase their gyroscopic effect such that the craft is given positive stability*" (page 2 lines 2 to 4).

33 Should I therefore construe claim 1 to implicitly require a rotor and drive unit having a large angular inertia? At the hearing Mr. Tolfree also referred to a threshold of angular inertia above which the condition of positive stability arises. Certainly there is support for the notion of increasing angular momentum or large angular momentum. However, my problem with this is that the notions of large, sufficient, increased or threshold are undefined and relative terms. In other words how large is large or sufficient? Although referring to a slightly different claim set considered by the European Patent Office, from an agent's letter of 25 November 2010 it seems that the applicant acknowledges that the invention is effectively a result to be achieved and that a skilled person would be required to perform some experimentation in order to perform the invention. It seems the contention is that the skilled person would have to increase the angular inertia of the rotating parts of a particular craft until the desired effect was achieved.

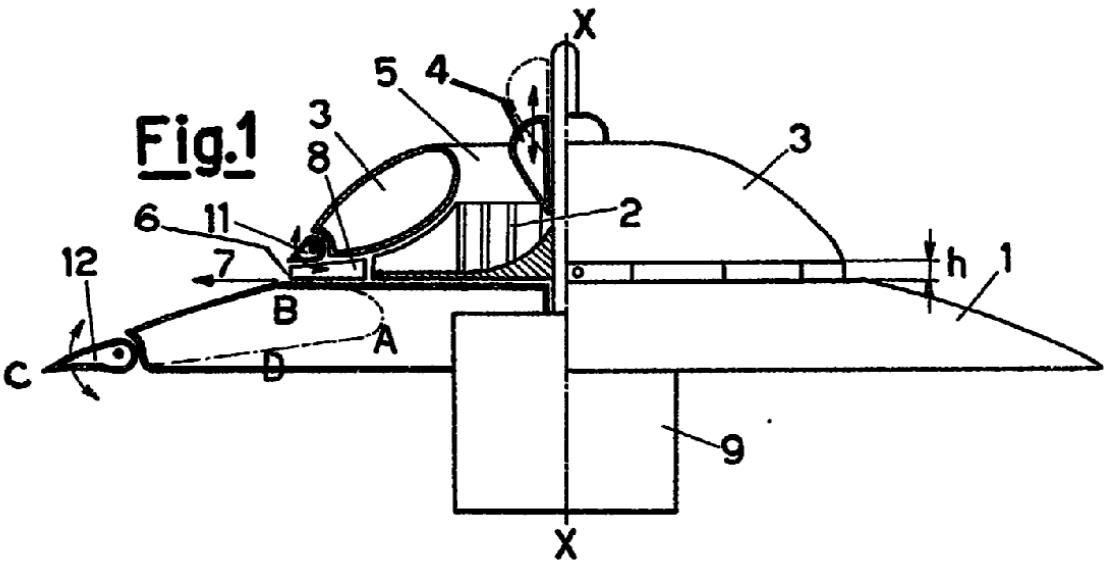
34 If I accept this, it seems that I should construe the claim as being directed to a Coanda type craft whose rotor and associated drive unit have sufficient angular inertia to cause the craft to be in a state of positive pitch and roll stability. I think this is essentially the same point I considered above, i.e. does claim 1 require the positive stability to be produced by angular momentum alone? As I said above, I do not see that this is what the skilled man would understand the claim to mean.

Step 3: Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed

35 The prior art cited as state of the art is brought to my attention from the official letter dated 15 December 2010 and comprises four patent specifications, namely GB2387158, GB912087, US5054713 and WO02070342, although these are said by the examiner to merely exemplify Coanda type craft.

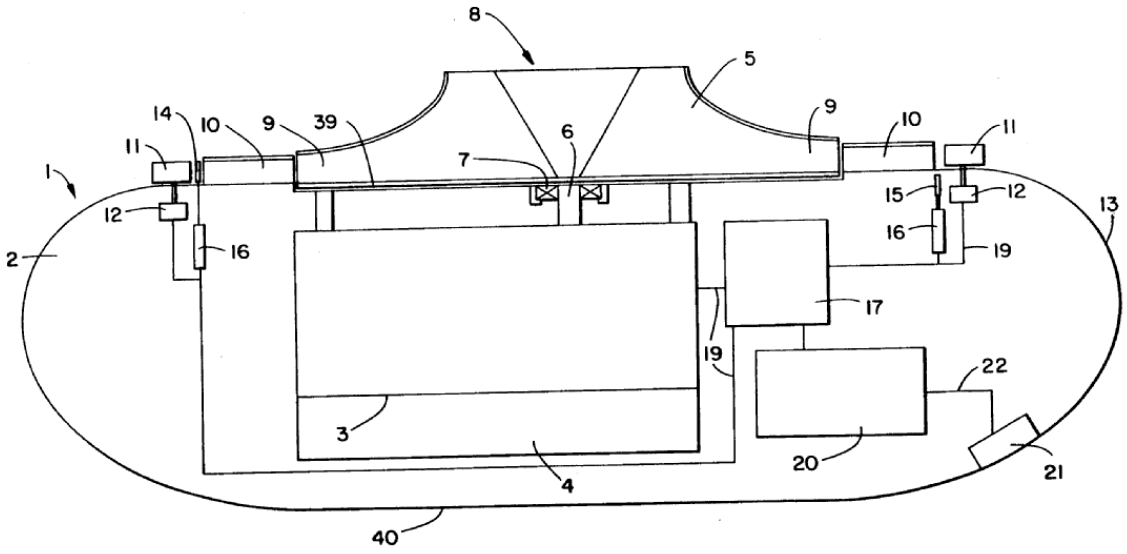
36 It seems it me that WO02070342 does not concern "*a craft of the type in which a rotor directs a jet of fluid over a dome or canopy shaped to divert the jet from a radial or horizontal direction towards an axial or vertical direction, thereby providing lift or thrust*", but rather shows a craft with a rotor which emits a jet downwards with no diversion over a dome or canopy. I will not consider this document further. The remaining documents all correspond to the pre-characterising part of claim 1 and were published well before the priory date of the present application.

37 In figure 1, below, GB912087 shows a craft with a body 1 across whose surface B-C a jet from an impeller 2 is diverted, the operation of the device being governed by a slidable throttle 4, flaps 11, ailerons 12 and varying the speed of the impeller 2. There is no discussion of stability, gyroscopic effects or angular inertia.



38 US5054713 shows in figure 1, below, a craft having a fan 5 whose output flows along the outer contour of a body 2, the craft including fixed vanes 10, movable control vanes and gates 14, 15. There is only a passing reference to the gyroscopic effects of the rotating parts of the craft (column 3 lines 36 to 41) and it is stated that stability is maintained by a flight control computer 17 (column 8 lines 24 to 27).

FIG. 1



39 Finally GB2387158 in figure 15, below, shows a craft with a fan 2 directing a jet across the upper surface 1a of a body 1 with control means 6, 7 and 8. There is no reference to gyroscopic effects and no discussion of the stability of the craft, as distinct from the control of the craft using control means 6, 7 and 8.

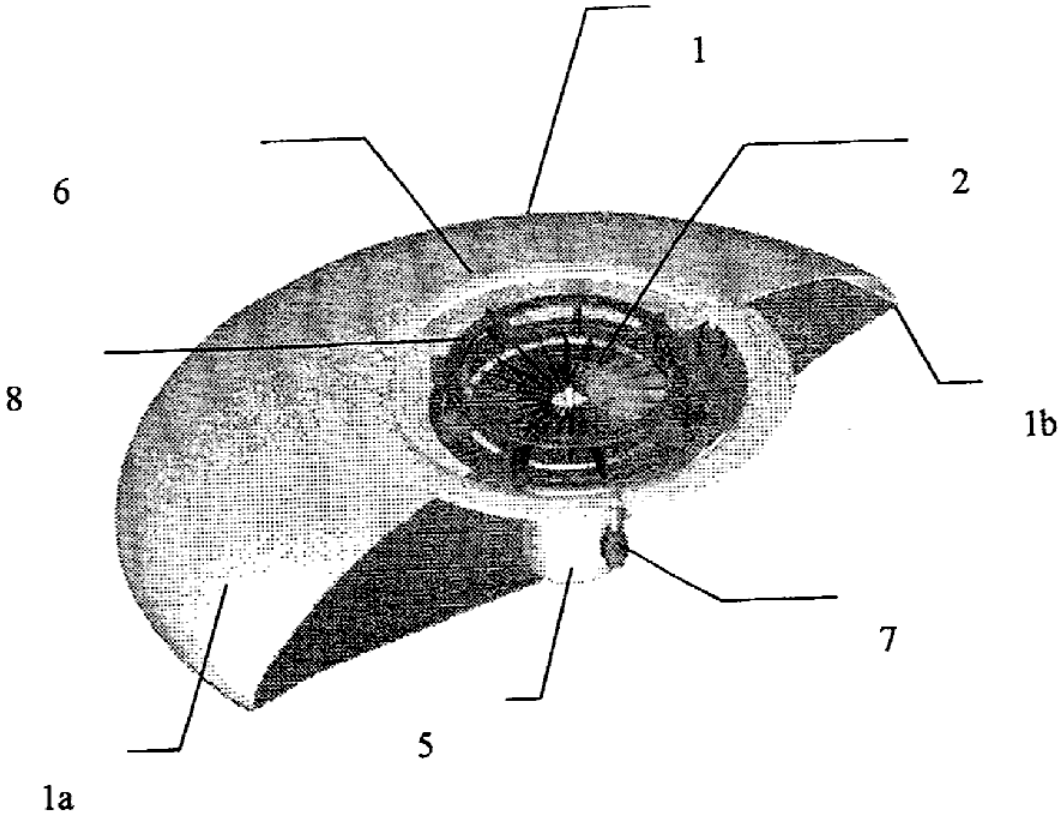


Figure 15

40 All three of these documents show craft with the same general arrangement as the present invention. Since they all employ rotating fans they must all possess angular inertia to some extent.

41 Previously I construed claim 1 of the application as being directed to a Coanda type craft caused to be in a state of positive pitch and roll stability by virtue of the angular inertia of the rotor and an associated drive unit, although not necessarily by virtue of the angular inertia alone.

42 I now turn to the question of the differences between GB2387158, GB912087, US5054713 and the claim as construed in this way. None of the documents explicitly refer to positive stability or indeed any degree of stability and as I have noted none of them make much reference to angular inertia and no connection is made between stability and angular inertia, although angular inertia is inherent in any rotating body. So the differences between the state of the art and this construction of the claim are causing a Coanda type craft to be in a state of positive pitch and roll stability and that this stability comes about in part by virtue of the angular inertia of the rotor and an associated drive unit.

43 Previously I resisted an alternative construction of claim 1 of the application as relating to a Coanda type craft whose rotor and associated drive unit have sufficient angular inertia to cause the craft to be in a state of positive pitch and roll stability. It follows from my comments above that the differences between the state of the art and this construction of the claim are providing the rotor and associated drive unit of a Coanda type craft with sufficient angular inertia to cause the craft to be in a state of positive pitch and roll stability. This roughly corresponds to the differences identified by the examiner in his letter of 15 December 2010 and the applicant's skeleton arguments, although I do not think that it is common ground between them that the craft shown are in a state of positive stability.

Step 4: **Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?**

44 This brings me to the final step of the test.

45 Firstly would it be obviously beneficial to ensure that a Coanda type craft was in a state of positive stability? I have already said that the concept of positive stability is common general knowledge, not least in the field of aeronautical craft. I believe that it would be obvious to ensure a vehicle demonstrated positive stability in operation. Of course a state of positive stability does not necessarily mean that a vehicle would be inherently stable. For example in some cases a control system may be required to provide such stability, such as the flight control computer in US5054713. Indeed the application describes a control system to achieve desired pitch and roll angles using sensing gyroscopes and actively controlled vanes (pages 5 and 6). So to my mind it would be obvious to a skilled person that making a Coanda type craft positively stable in the manner required would be beneficial.

46 Further, would it be obvious that the angular inertia of its rotating components could be used to contribute to a state of positive stability? To my mind a skilled person would be aware from common general knowledge that a rotating body would exhibit gyroscopic properties, one of which is a tendency to maintain its orientation or a resistance to disturbance, the tendency being in proportion to the angular momentum of the rotating body. I think it is worth noting here that the question is not would it be obvious to incorporate a gyroscopic body into a craft that would not otherwise have such a body in order to improve stability, but rather would it be obvious that an essential element of the craft, namely the rotor and drive unit, would contribute to its stability. I believe that the answer to this question is yes, common general knowledge would teach the skilled person that a spinning rotor would demonstrate resistance to rotational disturbance and contribute to stability.

47 That is not to say that I think it would be obvious for the skilled person to take the next step, which is to produce a state of positive pitch and roll stability in a Coanda type craft by means of the angular momentum of its rotor alone. Or stated another way I see nothing in the prior art that would suggest to the skilled man that he should equip the rotor of a Coanda type craft with sufficient angular momentum to produce a state of positive pitch and roll stability. As the applicant points out, increasing angular momentum would be likely to involve increased weight and power requirements, something conventionally resisted in aeronautical design.

Conclusion

48 I find that claim 1 does not comply with section 1(1)(b) of the Act insofar as it does not involve an inventive step.

49 However, I believe that the inventive step objection could possibly be overcome by suitable amendment to claim 1 to limit the invention to a craft in which a state of positive pitch and roll stability came about by sufficient angular momentum of its rotor and drive unit.

50 As things stand, I note the compliance period (as extended) expired on 4 May 2011. Therefore I order as follows:

(i) If the applicant requests a discretionary extension to extend the compliance period to 4 July 2011 by filing F52, appropriate fee and amendments to address the outstanding inventive step objection, the application will be remitted to the examiner for consideration;

(ii) If the applicant does not request a discretionary extension to extend the compliance period, the application will subsequently be treated as having been refused for non-compliance with section 18(3) at the 4 May 2011.

Appeal

51 Under the Practice Direction to Part 52 of the Civil Procedure Rules, any appeal must be lodged within 28 days.

C L Davies
Deputy Director acting for the Comptroller