

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

# PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

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Date of mailing	27 May 2020 (27-05-2020)
<i>(day/month/year)</i>	

Applicant's or agent's file reference <b>JD-G17092-00003</b>	<b>FOR FURTHER ACTION</b> See paragraph 2 below
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International application No. <b>PCT/CA2020/050387</b>	International filing date <i>(day/month/year)</i> 25 March 2020 (25-03-2020)	Priority date <i>(day/month/year)</i> 28 March 2019 (28-03-2019)
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International Patent Classification (IPC) or both national classification and IPC IPC: <b>B64C 27/08</b> (2006.01), <b>B64C 15/12</b> (2006.01), <b>B64C 27/52</b> (2006.01), <b>B64C 39/02</b> (2006.01)
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<p>1. This opinion contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Rule 43<i>bis</i>.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul> <p>2. <b>FURTHER ACTION</b></p> <p>If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1<i>bis</i>(b) that written opinions of this International Searching Authority will not be so considered.</p> <p>If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.</p> <p>For further options, see Form PCT/ISA/220.</p>
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Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Date of completion of this opinion  14 April 2020 (14-04-2020)	Authorized officer  Jean-Francois Goulet (819) 639-1568
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**Box No I**

**Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of:

- the international application in the language in which it was filed.
- a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2.  This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(b))

3.  With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

a.  forming part of the international application as filed:

- in the form of an Annex C/ST.25 text file.
- on paper or in the form of an image file.

b.  furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

c.  furnished subsequent to the international filing date for the purposes of international search only:

- in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
- on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4.  In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	SEE BELOW	YES
	Claims	SEE BELOW	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-97	NO
Industrial applicability (IA)	Claims	1-97	YES
	Claims	NONE	NO

2. Citations and explanations:

Novelty (N)

YES: 2, 3, 12-15, 21, 29, 43-48, 50, 51, 53-55, 58, 63, 66, 67, 77, 81, 82, 89, 94

NO: 1, 4 to 11, 16 to 20, 22 to 28, 30 to 42, 49, 52, 56, 57, 59 to 62, 64, 65, 68 to 76, 78 to 80, 83 to 88, 90 to 93, and 95 to 97.

Reference is made to the following documents:

- D1 EP2690012 A1 (FINK, A. et al.) 29 January 2014 (29-01-2014),
- D2 US20140158816 A1 (DELOREAN, P.J., et al.) 12 June 2014 (12-06-2014),
- D3 CN102730189 A (ZHENG, P.) 17 October 2012 (17-10-2012),
- D4 CN204895855 U (WANG, Q.) 23 December 2015 (23-12-2015),
- D5 WO2007014531 A1 (HAN, P.) 8 February 2007 (08-02-2007).

**Novelty:**

Claims 1, 4, 5, 10, 11, 16 to 20, 22 to 28, 30, 31, 33 to 36, 38, 39, 41, 42, 52, 57, 61, 62, 65, 68, 69, 72 to 76, 80, 83 to 87, 90 to 92, and 95 to 97 are not novel and therefore do not comply with PCT Article 33(2) in view of document D1.

With regard to claims 1, 42, 69, 76, 80 and 92, D1 discloses a multicopter helicopter (figure 1) comprising one main rotor (10) and two or more secondary rotors (12, 13) operatively connected to a frame, wherein each of the secondary rotors (12, 13) are smaller in diameter than the main rotor (10) (figure 1), and wherein each secondary rotor is pivotably connected to the frame (figures 1 to 4).

With regard to claim 4, D1 further discloses a main rotor that is responsible for most of the lift of the multicopter helicopter (paragraph 0044).

With regard to claims 5 and 11, D1 further discloses each secondary rotor pivots around an axis defined by a generally horizontal line passing through itself (figure 1).

With regard to claim 10, D1 further discloses a main rotor that is canted (paragraph 0047).

With regard to claims 16 to 18, D1 further discloses the secondary rotors (12, 13) each have a diameter that is from about 10% to about 75% the diameter of the main rotor (10) (figure 1, paragraph 0045).

With regard to claims 19, 20, 22, 25 to 28, D1 further discloses a multicopter helicopter that is about the size of a conventional helicopter.

With regard to claims 23 and 24, D1 further discloses a main rotor that is from about 0.1 meters to about 22 meters, or more, in diameter.

With regard to claims 30, 31 and 36, D1 further discloses a frame that comprises a main body, and two or more arms extending from the main body upon which to connect the rotors (12, 13) (figure 1).

With regard to claim 33, D1 further discloses a frame that holds most of the electronics and/or batteries required to operate the multicopter (figure 1).

With regard to claims 34 and 35, D1 further discloses the main rotor and its power unit are directly attached to the main body (figures 1 and 2).

With regard to claims 38 and 39, D1 further discloses secondary rotors that can pivot in a way that allows them to counter the torque of the main rotor; to control the multicopter helicopter's yaw; and/or to contribute thrust for lift (figures, paragraph 0053).

*Continued in Supplemental Box No. 1*

**Box No. VII    Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

The description does not comply with PCT Rule 10.1. Units of weights and measures shall be expressed in terms of the metric system. Paragraphs 0003, 0014 and 0122 refers to inches.

The statement found on paragraph 0007, line 2 of the description does not comply with PCT Article 6. This is a general statement which implies that the extent of protection may be expanded in some vague and imprecise way.

The drawings and/or the description do not comply with PCT Rule 11.13(m). The same features, when denoted by reference signs, shall, throughout the entire application, be denoted by the same signs. Reference character is used to denote a servo (paragraph 0121) and a pivoting mechanism (throughout the description).

**Box No. VIII Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claims 2, 3, 5, 8, 9, 30, 35, 44, 47, 49, 55, 63, and 77 do not comply with PCT Article 6 due to a lack of clarity as per the following:

In claims 2, 3, 30, 55, the following term lacks a proper antecedent basis: “rotor”. It is unclear if it refers to the secondary rotors only or also to the main rotor.

In claim 5, the term “itself” lacks clarity.

In claim 8, the following expression lacks a proper antecedent basis: “the corresponding arm”.

In claim 9, the following expression lacks a proper antecedent basis: “the horizontal plane”.

In claim 35, the following expression lacks a proper antecedent basis: “the main body”.

In claim 44, the following expression lacks a proper antecedent basis: “the servo”.

In claim 47, the following expression lacks a proper antecedent basis: “the control unit”.

In claim 49, the double inclusion of any element renders a claim indefinite. The expression “a pivoting mechanism” has already been defined previously in the claims and should therefore be referred to using a definite article.

In claim 49, the following expression lacks a proper antecedent basis: “the pivot point”.

Claim 63 is in contradiction with claim 60.

In claim 77, the following expressions lacks a proper antecedent basis: “the body”, “the front landing gear”, “the body part”, “the rear landing gear”, “the rear rotor units”, “the motor bracket”.

In claim 77, the double inclusion of any element renders a claim indefinite. The expression “a motor mount”, “a servo”, “a pivot point” have already been defined previously in the claims and should therefore be referred to using a definite article.

**Supplemental Box I**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box No. V

With regard to claim 41, D1 further discloses by being able to counter the torque of the main rotor, contribute thrust for lift, and/or control the multicopter helicopter's yaw by pivoting the secondary rotors, less power is used, and longer flight times are achieved.

With regard to claim 52, D1 further discloses secondary rotors that are each a ducted propeller or a ducted fan (paragraph 0043).

With regard to claim 57, D1 further discloses a multicopter helicopter that is a manned vehicle (paragraph 0022).

With regard to claims 61 and 62, D1 further discloses secondary rotors that are on a different horizontal plane than the horizontal plane of the main rotor (figure 7) and outside of the circumference created by spinning the blade of the main rotor (figure 1).

With regard to claim 65, D1 further discloses secondary rotors that are distributed asymmetrically around the main rotor (figure 1).

With regard to claim 68, D1 further discloses a frame that is shaped in a "T" form (figure 1).

With regard to claim 72, D1 further discloses two secondary rotors and the main rotor that are arranged in a way that, when viewed from above or below, they form a relatively isosceles triangle where the main rotor's position is at the apex of the triangle (figure 1).

With regard to claims 73 to 75, 84, 85, D1 further discloses a center of gravity of the multicopter helicopter that is located within the triangle formed by the placement of the rotors (paragraph 0028).

With regard to claim 83, D1 further discloses a center of gravity of the multicopter helicopter that is positioned centrally, above or below the main rotor (paragraph 0022).

With regard to claims 86 and 87, D1 further discloses secondary rotors that are positioned vertically (figure 2) and horizontally (figure 3).

With regard to claims 90 and 91, D1 discloses a multicopter helicopter comprising one main rotor (10) and two or more secondary propulsion equipment pieces (12, 13) operatively connected to a frame (figure 1), wherein each of the secondary propulsion equipment pieces (12, 13) produces less thrust than the main rotor (paragraph 0044), and wherein each secondary propulsion equipment piece is pivotably connected to the frame (figures), wherein the secondary propulsion equipment pieces are rotors, including ducted propellers or ducted fans (paragraph 0043); turbofans; or jets.

With regard to claims 95 to 97, D1 further discloses a multicopter helicopter for use in transportation of goods and people (paragraph 0017).

Claims 1, 11, 16 to 20, 22 to 24, 26 to 28, 30, 32, 33-35, 38, 42, 52, 57, 59 to 62, 65, 69, 76, 80, 87, 90 to 92, 97 are not novel and therefore do not comply with PCT Article 33(2) in view of document D2.

With regard to claims 1, 11, 42, 69, 76, 80 and 92, D2 discloses a multicopter helicopter (figure 24A) comprising one main rotor (at front) and two or more secondary rotors (at rear) operatively connected to a frame, wherein each of the secondary rotors are smaller in diameter than the main rotor (figure 24A), and wherein each secondary rotor is pivotably connected to the frame (paragraph 0124).

With regard to claims 16 to 18, D2 further discloses secondary rotors that each have a diameter that is from about 10% to about 75% the diameter of the main rotor (figure 24A).

With regard to claims 19, 20, 22 to 24, 26 to 28, 57, and 97, D2 further discloses multicopter helicopter is at least about the size of a conventional helicopter (figure 24A).

With regard to claim 30, D2 further discloses a frame that comprises a main body, and two or more arms extending from the main body upon which to connect the rotors (figure 24A).

With regard to claim 32, D2 further discloses a frame that is made of wood, plastics, carbon fiber, metals and alloys, or combinations thereof, preferably carbon fiber (paragraph 0052).

With regard to claim 33, D2 further discloses a frame that holds most of the electronics and/or batteries required to operate the multicopter (figure 24A).

With regard to claims 34-35, D2 further discloses a main rotor and its power unit that are directly attached to the main body (figure 24A).

With regard to claim 38, D2 further discloses secondary rotors that can pivot in a way that allows them to contribute thrust for lift (figure 24A).

With regard to claims 52, 90 and 91, D2 further discloses a main rotor and/or each secondary rotor that is a ducted propeller or a ducted fan (paragraph 0037).

With regard to claim 59, D2 further discloses secondary rotors and/or the main rotor that are each made of contra-rotating rotors (paragraph 0103).

With regard to claims 60 and 61, D2 further discloses a main rotor and secondary rotors that are on the same or different horizontal planes (paragraph 0043).

With regard to claim 62, D2 further discloses rotors that are outside of the circumference created by spinning the blade of the main rotor (fig. 24A).

With regard to claim 65, D2 further discloses rotors that are distributed asymmetrically around the main rotor.

With regard to claim 87, D2 further discloses secondary rotors that are positioned horizontally (fig. 24A).

*Continued in Supplemental Box II*

**Supplemental Box II**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Supplemental Box I

Claims 1, 4 to 9, 11, 16 to 20, 23, 24, 26, 27, 30, 31, 35 to 42, 52, 56, 59, 61, 62, 64, 69 to 71, 78, 87, 90 to 92, and 95 to 97 are not novel and therefore do not comply with PCT Article 33(2) in view of document D3.

With regard to claims 1, 42, 56, 92, D3 discloses a multicopter helicopter comprising one main rotor and two or more secondary rotors operatively connected to a frame, wherein each of the secondary rotors are smaller in diameter than the main rotor, and wherein each secondary rotor is pivotably connected to the frame (figures 1, 2, 16).

With regard to claim 4, D3 further discloses a main rotor that is responsible for most of the lift of the multicopter helicopter (figure 2).

With regard to claims 5 to 9, 11, D3 further discloses secondary rotor pivots around an axis defined by a generally horizontal line passing through itself (figure 2).

With regard to claims 16 to 18, D3 further discloses secondary rotors that each have a diameter that is about 50% the size of the main rotor in diameter (figure 8).

With regard to claims 19-20, 23,24, 26-27, D3 further discloses a multicopter helicopter that is at least about 200mm in size (figure 19).

With regard to claims 30, 31, and 36, D3 further discloses a frame that comprises a main body, and two or more arms extending from the main body upon which to connect the rotors (figure 8-3).

With regard to claim 35, D3 further discloses a rotor that is operatively attached to the main body via a motor mount of sorts (figure 3).

With regard to claim 37, D3 further discloses the frame of the multicopter helicopter is smaller in size, and lighter in weight, than conventional multicopter helicopter frames.

With regard to claim 38-41, D3 further discloses secondary rotors can pivot in a way that allows them to counter the torque of the main rotor; to control the multicopter helicopter's yaw; and/or to contribute thrust for lift (figures 1, 2, 12, 22).

With regard to claims 52, 90, 91, D3 further discloses a main rotor and/or each secondary rotor that is a ducted propeller or a ducted fan.

With regard to claim 59, D3 further discloses a main rotor made of contra-rotating rotors (figure 2).

With regard to claims 61, 62 and 64, D3 further discloses secondary rotors are on a different horizontal plane than the horizontal plane of the main rotor and outside of the circumference created by spinning the blade of the main rotor (figs. 2, 8).

With regard to claims 69-71, 78, 87, D3 further discloses multicopter helicopter has two secondary rotors (fig. 8; has at least two secondary rotors); a pair of rotors that spin in a first direction and a pair of rotors that spin in a second direction (figure 1).

With regard to claims 95-97, D3 further discloses a helicopter for use in land surveying for construction or mining, situational awareness for civil security applications (fire fighting and police situations, for example), transportation of goods, or photography (paragraph 0002).

Claims 1, 5 to 8, 11, 16 to 20, 26, 30, 31, 32, 34 to 39, 42, 56, 61, 62, 64, 69, 78, 87, 88, 90, and 92, are not novel and therefore do not comply with PCT Article 33(2) in view of document D4. D4 discloses A multicopter helicopter comprising one main rotor and two or more secondary rotors operatively connected to a frame, wherein each of the secondary rotors are smaller in diameter than the main rotor, and wherein each secondary rotor is pivotably connected to the frame (figures).

Claims 1, 5, 8, 11, 16 to 20, 22, 24 to 28, 30 to 36, 38, 39, 42, 49, 57, 59 to 62, 65, 68, 69, 72, 73, 76, 80, 87, 88, 90, 92, 93, and 95 to 97 are not novel and therefore do not comply with PCT Article 33(2) in view of document D5. D5 discloses a multicopter helicopter comprising one main rotor and two or more secondary rotors operatively connected to a frame, wherein each of the secondary rotors are smaller in diameter than the main rotor, and wherein each secondary rotor is pivotably connected to the frame (figures 1-3, 13, 15).

Claims 2, 3, 12-15, 21, 29, 43-48, 50, 51, 53-55, 58, 63, 66, 67, 77, 81, 82, 89, 94 are novel and therefore comply with PCT Article 33(2). None of the cited documents, when taken alone, discloses the additional claimed features. Claims 2, 3, 12-15, 21, 29, 43-48, 50, 51, 53-55, 58, 63, 66, 67, 77, 81, 82, 89, 94 are therefore novel.

*Continued in Supplemental Box III*

**Supplemental Box III**

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Supplemental Box II

**Inventive Step:**

Claims 1, 4 to 11, 16 to 20, 22 to 28, 30 to 42, 49, 52, 56, 57, 59 to 62, 64, 65, 68 to 76, 78 to 80, 83 to 88, 90 to 93, and 95 to 97 do not involve an inventive step and therefore do not comply with PCT Article 33(3). Given the above novelty objection, claims 1, 4 to 11, 16 to 20, 22 to 28, 30 to 42, 49, 52, 56, 57, 59 to 62, 64, 65, 68 to 76, 78 to 80, 83 to 88, 90 to 93, and 95 to 97 do not involve an inventive step.

Claims 2, 3, 12-15, 21, 29, 43-48, 50, 51, 53-55, 58, 63, 66, 67, 77, 81, 82, 89, 94 do not involve an inventive step and therefore do not comply with PCT Article 33(3) having regard to document D1 or D2 or D3 or D4 or D5, in view of the common general knowledge. The defined features are deemed mere design options available to the person skilled in the art and cannot be considered inventive.

**Industrial Applicability:**

The subject matter of claims 1-97 is considered to be industrially applicable and thus complies with the requirements of PCT Article 33(4).