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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

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Date of mailing
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Applicant's or agent's file reference
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FOR FURTHER ACTION
See paragraph 2 below

International application No.
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09.08.2017

International Patent Classification (IPC) or both national classification and IPC
INV. G01S3/20

Applicant
RAYTHEON BLACKBIRD TECHNOLOGIES, INC.

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually 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 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

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.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of this opinion

see form
PCT/ISA/210

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Box No. I Basis of the 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 43bis.1(a))
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 13ter.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 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.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 forming part of 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)	Yes: Claims	<u>1-13</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-13</u>
Industrial applicability (IA)	Yes: Claims	<u>1-13</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

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

see separate sheet

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:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

- D1 General Dynamics Mission Systems: "AN/PRC-155 Networking Manpack Radios 2-channel networking radio with embedded encryption and GPS Common Core Radio Approach",
, 29 March 2016 (2016-03-29), XP055524140,
Retrieved from the Internet:
URL:<https://gdmissionsystems.com/-/media/General-Dynamics/C4ISR-Technologies/Radios/PDF/radios-prc-155-manpack-radio-datasheet.ashx?la=en&hash=029E223AF85F550C00F45DE41315A3EB3F7E254A>
[retrieved on 2018-11-15]
- D2 General Dynamics Mission Systems: "How does the PRC-155 connect you?",
, 29 March 2016 (2016-03-29), XP055524160,
<https://gdmissionsystems.com/radios/networking-radios/prc-155-manpack-radio/>
Retrieved from the Internet:
URL:<https://gdmissionsystems.com/-/media/General-Dynamics/C4ISR-Technologies/Radios/Images/2016-manpack-prc-155-infographic.ashx>
[retrieved on 2018-11-15]
- D3 WO 2016/082091 A1 (HUAWEI TECHNOLOGIES CO LTD) 2 June 2016 (2016-06-02); & US 2017/332201 A1 (ZHANG XIAOPING [CN] ET AL) 16 November 2017 (2017-11-16)
- D4 US 2004/070515 A1 (BURKLEY RAYMOND [US] ET AL) 15 April 2004 (2004-04-15)
- D5 US 2007/060045 A1 (PRAUTZSCH FRANK R [US]) 15 March 2007 (2007-03-15)

D6 CHEVLI K R ET AL: "Blue force tracking network modeling and simulation",
PROCEEDINGS OF THE MILITARY COMMUNICATIONS
CONFER, XX, XX, 23 October 2006 (2006-10-23), page 7pp,
XP009087740,

In the following, references to D3 apply to document US 2017/332201, which is a family member of the Chinese document WO 2016/082091 (see GL-PCT B-X, 9.1.2).

Moreover, document D2 (the so-called "secondary" document) is an informative graphics providing more detailed information on certain features of the product described by D1 (the so-called "primary document".) The teaching of the secondary document is therefore to be regarded as incorporated into the primary document (see GL-PCT B X 9.2.1 and GL-PCT G IV 7).

- 2 The application does not meet the requirements of Article 6 PCT, because claims 1-13 are not clear.
- 2.1 Claim 1 does not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined.

The functional statements at the end of claim 1 (page 14, lines 17-20 - "wherein the multimode ... LOS modem") does not enable the skilled person to determine which technical features are necessary to perform the stated functions.

Moreover, it appears that the preceding features (page 14, lines 1-17) already allow the device to perform said function. The reader is left in doubt whether the features following such expression have or don't have a limiting effect on the scope of the claim.

- 2.2 Device claim 1 has been drafted using a means-plus-function (e.g. "modem for..." and so on) formulation. The subject matter of said claim shall be interpreted as a device having apparatus features merely suitable for carrying out the relevant functions (GL-PCT F IV 4.13).

It is instead apparent from the remainder of claim 1 (e.g. the processor generating the line of bearing using measured power and motion tracking information) and from the whole application, that the apparatus features are adapted for carrying out the relevant functions.

Such inconsistencies introduce ambiguities on the matter for which protection is sought, contrary to the requirements of Article 6 PCT.

For the examination of novelty and inventive step, the apparatus features of claim 1 are interpreted as adapted for carrying out the relevant functions (e.g. "an LOS modem adapted for ..." and so on).

- 2.3 The relative term "higher number of samples" used in claim 12 has no well-recognized meaning and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claims unclear (Article 6 PCT).

Moreover, it is also unclear how the "higher number of samples" contributes to "automatically calculate the line of bearing."

According to the description (paragraphs [0045]-[0047]) the higher number of samples refers to signals transmission of the target device, which shall occur "as frequently as possible (e.g., one second intervals)."

For achieving the technical effect of determining the bearing to the target, this feature is however inextricably connected to the bearing calculation method. This foresees that the "uses rotates through 360 degrees" and "estimates the line of bearing to the target by noticing which direction shows the highest RSSI value."

- 2.3.1 One possible way to remedy to the above objection is to avoid using the relative term "higher" in claim 12 and to incorporate the necessary features concerning the bearing calculation method from paragraphs [0045]-[0047] of the description.

- 2.4 Claim 13 refers to using GPS coordinates to generate the line of bearing. However, claim 1, from which claim 13 depends, clearly specifies using measured power and motion tracking information for the same purpose.

It is clear from the description (paragraphs [0047]-[0051]) that using GPS coordinates or measured power and motion tracking are two mutual alternatives. However, as claim 13 is drafted as a dependent claim, it includes the subject matter of claim 1. The two features are thus not claimed as alternative solutions.

This inconsistency renders the definition of the subject-matter of said claim unclear, contrary to the requirements of Article 6 PCT. For the examination of novelty and inventive step, the features of claim 13 are interpreted as an alternative to the bearing calculation of claim 1.

2.4.1 One possible way to remedy to the above objection would be to incorporate the features of claim 13 (and of corresponding claim 11) into claim 1, explicitly stating that the two bearing calculations are alternative (basis can be found on paragraphs [0047], [0051].)

3 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-13 does not involve an inventive step in the sense of Article 33(3) PCT.

3.1 D1 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses:

A multimode tracking device comprising:

(page 1, the *AN/PTRC-155 Manpack radio*)

a line of site (LOS) antenna;

an LOS modem for communicating with other multimode tracking devices ~~and for measuring power of a received signal~~, via the LOS antenna;

(page 1, section Overview;

implicit in the *self-forming ad-hoc networks* and in the *radio [...]* *supporting [...]* *SRW [...]* and *SINGARS waveforms*)

a satellite antenna;

a satellite modem for communicating with a satellite for receiving and sending text messages, data and commands to and from external devices including a tracking and locating (TTL) system, via the satellite antenna;

(page 1, section Overview;

implicit in the *radio [...]* *supporting [...]* *MUOS [...]* and *SATCOM waveforms*)

a Bluetooth or WiFi Direct interface for communicating with external mobile devices;

(page 2, section Features and Benefits;

implicit in the *Detachable Human Machine Interface (HMI) [...]* *utilizing ... Android*;

see also D2, section Commercial Devices, using *smartphones and tablets* to *access data* and for *sharing info*)

~~an inertia measurement unit (IMU) for providing motion tracking information;~~

a user interface including a display for interfacing with a user; and

(page 2, section Features and Benefits; the *Human Machine Interface (HMI)*)

~~a processor for generating and displaying a line of bearing to the target on the display, based on the measured power and the motion tracking information,~~ wherein

the multimode tracking device tracks assets and personnel and sends/receives text messages, data and commands to/from external devices both over the horizon (OTH) via the satellite and locally via the LOS modem.

(page 1, section Overview; page 2, section Features and Benefits; see previous comments for LOS and satellite antennas and modems; the *GPS receiver [that] supports display and transmission position location information (PLI)*)

The subject-matter of claim 1 therefore differs from D1 in that:

- a. the LOS modem is further adapted for (see also previous section 2.2) measuring power of the received signal;
- b. the device further comprises an inertia measurement unit (IMU) for providing motion tracking information; and
- c. a processor for generating and displaying a line of bearing to the target on the display, based on the measured power and the motion tracking information.

According to D1 (page 2, section Features and Benefits), the tracking device supports display of position of a target device via position reporting using a GPS receiver. In case the target device does not have a GPS receiver or GPS positions are not available (e.g. indoors), the target device cannot be tracked in D1. The above distinguishing features instead allow finding a target device by means of the line of bearing without resorting to GPS positioning.

The technical effects due to the above differences are that the device can find a target device when GPS positions are unavailable.

Accordingly, the objective technical problem to be solved may be regarded as how to modify or adapt the device of D1 in order to find a target device when GPS positions are unavailable.

The skilled person faced with this problem would look for relevant documents and would find D3, which relates to finding target devices without resorting to GPS positioning (paragraphs [0002]-[0003].) More precisely, D3 discloses:

a tracking device including a LOS antenna and modem (paragraph [0089], implicit in the *first device* [...] *including a smartphone*) adapted for measuring power of a signal received from a target device (paragraphs [0091]-[0092], the *RSSI*). User of tracking device rotates through 360 degrees, due to body shielding effects the bearing to the target shows the highest RSSI value (paragraph [0094]-[0095].) IMU is used to keep track of orientation (paragraphs [0140]-[0141], the *gyro sensor*). Bearing to target is shown on device display (paragraphs [0097], [0099]).

Hence, the person skilled in the art would readily include without any inventive activity the additional features disclosed in document D3 in the system described in D1 in order to solve the problem posed.

Therefore, the subject-matter of claim 1 does not involve any inventive step over the combination of documents D1 and D3 within the meaning of Article 33(3) PCT.

3.1.1 For the sake of completeness, it is noted that the lack of inventive step of claim 1 could be ascertained even considering document D4 or D5 as being the closest prior art, which disclose (see passages cited in the search report):

D4.

Tracking device (figure 1, field device 20000, including radio 21000) allows communicating with and tracking position of other devices in emergency and search and rescue applications. Device (figure 6, radio 21000) supports LOS, satellite, and Bluetooth communications. Position location is achieved using a GPS receiver (figure 6). Where GPS accuracy degrades, device supports position determination using RF *identification/direction finder (RFID/DF) technology* (paragraph [0085]). Individual positions are mapped and shown on display (paragraph [0090]).

D5.

Tracking device comprising line of sight, LOS, and beyond LOS, BLOS, communication capabilities (figure 2C). Device has display on which a line of bearing to a target can be shown (figure 6). Target position is obtained by GPS position dissemination (paragraph [0053].)

Following the same line of argument as above, the person skilled in the art would combine the subject matter disclosed in D4 or D5, with the teachings of document D3 to arrive at the subject matter of claim 1 without any inventive activity.

3.2 Documents D1, D3, D4 or D5 define also the additional features of the following dependent claims:

Claim 2.

D4: paragraphs [0055], [0091], the *multi-hop routing*.

Claim 4.

D1: page 2, section Features and Benefits, the *Detachable Human Machine Interface (HMI) [...] utilizing ... Android application*; see also D2, section Commercial Devices, using *smartphones and tablets to access data and for sharing info*;

D3: paragraph [0089], implicit in the *first device [...] including a smartphone*.

Claims 6-7.

D1: page 1, implicit in the *ad-hoc networks*; see also D2, section Ground to Air.

D5: figure 1B.

Claim 8, 10.

D1: page 2, section Features and Benefits, Waveform Support, implicit in the *SRW, MUOS, SINCGARS and SATCOM waveforms*; see also D2, section Command to Edge.

D4: paragraphs [0053], [0087].

D5: paragraphs [0048]-[0049], [0053], [0057]; figures 6, 8.

Claim 9.

D1: page 2, section Features and Benefits, implicit in the *Detachable Human Machine Interface (HMI)* and in the *Remote control software application available for both existing dismounted and vehicle displays*; see also D2, section Commercial Devices.

Claim 11.

D1: page 2, section Features and Benefits, the *GPS receiver*.

D4: figure 6.

D5: figure 2C.

Claim 12.

D3: paragraph [0094]-[0095].

Claim 13.

D4: paragraphs [0085], [0088].

D5: figure 6.

Therefore, the subject-matter of such claims does also not involve an inventive step.

- 3.3 The subject matter of claim 3 differs from the one of claim 1 in that the device comprises a digital compass and a signal strength indicator. Moreover, their outputs are displayed on the display.

The device of D3 also comprises a digital compass and a signal strength indicator (paragraphs [0087], [0141]). Displaying the outputs of such sensors on the device display is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, to achieve an increased awareness of the target's bearing.

Therefore, the subject-matter of claim 3 does also not involve an inventive step.

- 3.4 The device of D1 (page 2, section Technical Specifications, Frequency Range) uses ISM-band for LOS communications. A similar disclosure is also available in D4 (figure 6, the *RX UHF/VHF*) or in D5 (figure 2C, the *UHF antenna*.)

Moreover, using Iridium short burst data (SBD) is an usual design measure for communicating beyond LOS in similar applications (see D6, figure 1; paragraphs [0019] - [0025], for instance.)

Therefore, the subject matter of claim 5 does not involve an inventive step.

Re Item VII

Certain defects in the international application

- 4 The application does not meet the criteria of the PCT due to the following formal defects.
- 4.1 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1-D5 is not mentioned in the description, nor is it identified therein.

- 4.2 The independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 4.3 The features of claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

Re Item VIII

Certain observations on the international application

- 5 Clarity of the application and the fulfilment of the requirements laid down in Article 6 PCT have been discussed in Re Item V above, given their relevance for the assessment of novelty and inventive step.