Intellectual Property Office

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PATENTS ACT 1977

APPLICANT	Accipiter Radar Technologies Inc.
ISSUE	The Patents Act 1977: whether patent application GB1405236.9 complies with sections 1(1)(a), 1(2) and 14(5)(b) of the Act
HEARING OFFICER	Dr L Cullen

DECISION

Introduction

1 This decision concerns patent application GB1405236.9 entitled *"Device and method for 3D sampling with avian radar"*. More specifically, it concerns whether the invention claimed in this application is novel as defined in Section 1(1)(a) of the Patents Act 1977 (hereafter the Act); whether it relates to excluded matter as defined in Section 1(2) of the Act; and whether the claims are clear in accordance with Section 14(5)(b).

Background

2 The application was filed under the provisions of the Patent Cooperation Treaty (PCT) on 07 September 2012, claiming an earliest priority date of 9 September 2011, and was initially published as WO 2013/036727 on 14 March 2013. On entering the national phase in UK, it was subsequently re-published as GB 2508770 on 11 June 2014. The compliance date has been extended under rules 108(2) and 108(3) of the Patent Rules 2007, as amended (hereafter the Rules), with the relevant forms and fees, to 09 July 2017.

3 Between November 2015 and May 2017, there was an extensive series of correspondence, including proposed amendments, between the applicant and the examiner dealing with this case. The examiner has maintained throughout that the invention (as variously claimed) lacks novelty over published US patent application, US 2008/266171 (Weber), and the scientific journal article entitled '*Affordable avian radar surveillance systems for natural resource management and BASH applications*' by Nohara et al. (which I will hereafter refer to as 'WEBER' and 'NOHARA' respectively). Latterly, the examiner has also argued that the application falls in the field of excluded matter, specifically, as a computer program and the presentation of information as such.

4 In the Agents letter dated 02 March 2017, the applicant requested a decision from a hearing officer based on the papers currently on file. They also included a main set of amended claims, a first auxiliary amended claim set and a second auxiliary amended claim set and asked that the Hearing Officer consider each of these in turn as part of their decision.

5 The matter came before me for a decision from the papers. Senior examiner Amanda Mason acted as an assistant to the Hearing Officer on this case.

6 In response to the applicant's letter of 02 March 2017 and the various enclosures, the Hearing Officer requested the examiner to consider the main set of amended claims which had been formally filed by the applicant. The examiner issued an official examination report, dated 18 May 2017, which set out all current objections to the application based on this latest set of claims. The examiner maintained his novelty objection against the independent claims and considered that the remaining dependent claims lacked either novelty or an inventive step. The examiner also maintained their objection under excluded matter. In addition, the examiner raised an objection to lack of clarity of amended claim 1. A latest date for reply of 15 June 2017 was set by the examiner.

7 In their response, dated 15 June 2017, the agent, acting for the applicant, explained why they consider that the objections under novelty, excluded matter and clarity are not well founded. They also suggested a possible amendment in relation to the clarity objection. However, as the latter has not been filed formally, I have not considered it.

8 This decision is based on all the correspondence on file including the amended claims filed on 02 March 2017 identified as the main request.

9 The terms '3D' and '2D' are used throughout this decision to refer to three dimensional (i.e., range, azimuth and elevation) and two dimensional (i.e., range, azimuth) radar systems respectively.

The Claims

10 The latest set of claims for this application include two independent claims, claim 1 to a sampling system and claim 16 to a method of sampling. These claims read as follows:

> ***Claim 1***
>
> *A 3D radar sampling system used to continuously monitor and statistically characterize the airborne target activity within a surveillance volume for aviation safety and security, comprising:*
>
> *at least one volume-scanning radar device that tracks airborne targets and generates radar track data;*
>
> *a track database operatively connected to said volume-scanning radar device for receiving from said volume-scanning radar device in real-time said radar track data, said track database further configured to (i) organize and store on the fly in said track database in time ordered form said track data generated by said volume-scanning radar device and (ii) organize and store on the fly in said track database in spatial-ordered form said track data,*

wherein said time-ordered form includes the structuring of radar data in said track database in accordance with the times of the collection of the radar data and said spatial-ordered form includes structuring of radar data in said track database in accordance with the trajectories of target objects represented by said track data; and

an airborne-target activity illustrator operatively connected to said track database that converts subsets of said organized and stored track data into airborne-target activity reports which statistically characterize target activity in the airspace for users, <u>allowing them at a glance to understand and appreciate a new hazardous situation so they can issue warnings as well as notify personnel to help mitigate the risk.</u>

and

Claim 16

A method of sampling the abundance and behavior of airborne targets for aviation safety and security, comprising:

operating a radar system to illuminate sub-volumes of a 3D volume and detect and track airborne targets within, the operating of the radar system including varying a pointing angle of a radar antenna so as to illuminate different sub-volumes of the 3D volume;

collecting and organizing radar data from said radar system to generate on the fly temporally ordered track information and further organizing said radar data to generate on the fly spatially ordered track information about the airborne targets tracked within the 3D volume over time, wherein said temporally ordered track information includes radar data structured in accordance with the times of collection thereof and said spatially ordered track information includes radar data structured in accordance with the trajectories of target objects;

storing on the fly the temporally ordered track information;

storing on the fly the spatially ordered track information; and

generating reports that convey to users statistical information about bird abundance and behavior during selected time intervals and at selected locations within the 3D volume <u>so they can understand and appreciate a new hazardous situation and issue warnings as well as notify personnel to help mitigate the risk</u>, the generating of said reports including accessing the stored temporally ordered track information and the stored spatially ordered track information.

The underlined text in each claim is that discussed below in relation to the clarity objection raised by the examiner in his latest official examination report.

The Issues to be decided

11 There are a number of issues to be decided in relation to this application.

(i) Firstly, does the application in suit, as currently claimed, meet the requirements under Section 1(1)(a) of the Act for novelty over the disclosure in WEBER and NOHARA? I will also deal with the issue of the clarity of the amended claims raised by the examiner as part of my consideration of this issue.

(ii) Secondly, does the application in suit, as currently claimed, relate to subject matter that falls within the exclusions listed in Section 1(2) of the Act. In particular, does this application relate to a computer program or to presentation of information?

12 I will deal with each of these in turn setting out the relevant law and case law and my analysis and conclusions.

Novelty – Section 1(1)

The Relevant Law

13 Section 1(1) of the Act sets out what is required of a patentable invention as follows:

> *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) the invention is new;*
> *…*
> *and references in this Act to a patentable invention shall be construed accordingly.*

14 Section 2 of the Act sets out what 'new' means as follows:

> *2(1) An invention shall be taken to be new if it does not form part of the state of the art.*
>
> *2(2) The state of the art in the case of an invention shall be taken to comprise all matter (whether a product, a process, information about either, or anything else) which has at any time before the priority date of that invention been made available to the public (whether in the United Kingdom or elsewhere) by written or oral description, by use or in any other way.*
> …….

15 It is well established that there are two requirements for lack of novelty, (i) prior disclosure and (ii) enablement. Disclosure is determined based on whether the directions in the prior publication will inevitably lead the skilled person to the same disclosure as that described in the latter application. Enablement deals with whether the skilled person would be able to work the disclosed invention. In effect, does the prior publication provide enough information for the skilled person to be able to arrive at the same place as that described in later patent application.

Analysis

16 Before making a comparison between the present application and the identified prior art documents, it is first necessary for me to construe the claims of the patent application interpreting them in the light of the description and drawings as instructed

by Section 125(1) of the Act and taking account of the Protocol to Article 69 of the EPC.

Claim Construction

17 Much of the correspondence between the examiner and the applicant has focussed on how certain features of the claimed invention should be construed. In the following analysis, I have reviewed the features of the latest independent claims on file, claim 1 and claim 16, and set down how I think these features should be construed. I have taken note of the views of the applicant and examiner in this regard also.

18 Claims 1 and 16 both refer to the 3D nature of the required radar system. The description repeatedly stresses that 3D target localisation capabilities distinguish the current invention from the prior art and the meaning of this feature of the claims has been a significant point of disagreement throughout prosecution of the application. Starting with the description, it expressly defines volume/3D scanning radar devices/systems as ones which produce a "*periodic sampling of a large volume such as a cylindrical area of 20 km in diameter and 10,000 feet in altitude*"; and additionally defines the term "*3D volume*" as meaning "*on the order of kilometres or more in diameter or width and thousands of feet or more in height*"[1]. Moreover, it contemplates several ways of achieving effective 3D radar scanning of a surveillance volume. It contemplates using a radar system with "*a pencil beam that slowly scans up and down in elevation, while rotating rapidly in azimuth*" (or vice versa); multiple "*2D azimuth-rotating pencil-beam radar systems operating side-by-side at different fixed elevation angles*" (or vice versa); multiple 2D azimuth-rotating pencil-bean radar systems operating side-by-side with multiple 2D elevation-rotating pencil-bean radar systems[2]; etc. Thus it contemplates systems which cover a 3D volume over an extended period of time as well as systems which do so in a single scan. Conversely it also acknowledges that "*conventional avian radars have a … three-dimensional (3D) localization capability*" – albeit one characterised as "*very limited*"[3].

19 The examiner has stated that NOHARA discloses "*limited 3D volume scanning*", which I take to mean that he has construed this term sufficiently broadly as to encompass this limited-coverage system. The applicant has argued repeatedly that the citations fail to disclose the claimed 3D volume-scanning radar system but I am unable to ascertain whether their contention is that they fail to disclose 3D volume-scanning radar *per se* or that they fail to disclose the claimed combination of such radar with the required track database and report generation means. Several letters[4] suggest the former, stating that "*NOHARA does not disclose a volume-scanning radar or 3D volume sampling in accordance with the present invention … illustrated in Figure 1 and 2, and taught on pages 14-17 and 25-28*". The inference appears to be that the applicant construes these features narrowly as per these embodiments.

20 I deem that the skilled reader of the current claims would have understood the patentee to have chosen the phrases "*3D radar sampling system*", "*surveillance volume*"; "*volume-scanning radar device*" and "*3D volume*" advisedly. Had they

[1] See pages 21-25 and Figure 2 of the applicant's description
[2] See p.13 and Figure 1 of the applicant's description
[3] See p.9, line 4
[4] See applicant's letters dated 28/12/2016, 02/03/2017 and 15/06/2017 (latest correspondence)

intended to define their invention more narrowly, they might have limited the claims to the relevant features of the exemplary radar systems or to the shape (e.g. cylindrical) or size of the 3D volume, for example. Absent any such limitation, I am of the view that these terms should be interpreted at face value. Thus the claims extend to radar systems and devices which scan across a volume of any shape and size that is suitable for aviation safety and security; and which locates and tracks targets in three dimensions.

21 Claim 1 also requires the radar device to "[track] *airborne targets and* [generate] *radar track data*". I understand "*radar track data*" to be a term of art which would be understood by the skilled reader in line with how radar trackers commonly work. Specifically, in order to generate "*radar track data*" the radar device must perform multiple scans and must include a processor which "*declares the presence and location of target plots ... on each radar scan*", "*sorts the scan-to-scan time-series of plots into either target tracks or false alarms*" and associates plots to tracks[5]. Thus "*radar track data*" means data generated by a radar device as a result of multiple scans which identifies, for each airborne target, its multiple locations over time. Claim 1 further requires a "*track database*" which receives, orders and stores the radar track data "*on the fly*". I take this to mean that it is the radar track data which are received by the track database, rather than the 'raw' (individual and un-associated) radar scans.

22 Similarly, claim 16 requires the radar system to "*detect and track*" airborne targets within the 3D volume, thus generating "*radar data*" which is collected and organised "*on the fly*". I consider this (in light of the later requirement for accessing said data) to imply use of a database; and the term "*radar data*" to encompass any data generated by the radar system, whether processed to identify target tracks over time or not. Moreover claim 16 also requires the "*radar data*" to be collected and organised "*to generate … track information*". Thus the implied database must be a track database but claim 16 is broader than claim 1 insofar as it encompasses a method wherein the track database receives radar track data as well as one wherein it receives radar data and generates radar track data therefrom.

23 Claims 1 and 16 thus both (implicitly or explicitly) require a track database storing radar track data. Again, the meaning of this requirement has been the subject of disagreement during prosecution of the application. I agree with the applicant that the current claims clearly require the data to be organised and stored on-the-fly in "*temporally ordered form*" and (in another distinct step) in "*spatially ordered form*" in the track database. This must mean that, for each target object track, the track database stores two sets of track data respectively "*structured in accordance with the times of collection … and trajectories of target objects*" - and indeed this is supported by the statement on page 30 of the description that "*The RDS 21 and GDS 22 combination achieve this [computationally efficient avian activity reporting] at the cost of essentially doubling the storage requirements of the Track Database 14 and increasing its computational capabilities*". Moreover, I consider the terms "*structured*" and "*ordered*" in this context to mean that each radar track data entry in the database must be stored in a structure that identifies its time of collection; and additionally in another structure identifies a trajectory to which it belongs; and that the database must be <u>ordered in two ways</u> according to these respective structures. This is consistent

[5] See pages 37-38 of the applicant's description, for example.

with the descriptions of the radar data server (RDS) and geographical data server (GDS) set out on pages 22-23 of the applicant's specification.

24 Claims 1 and 16 further require the generation of reports. Claim 1 requires an "*airborne-target activity illustrator operatively connected to said track database that converts subsets of said organised and stored track data into airborne-target activity reports which statistically characterise target activity in the airspace*". The examiner has read this broadly whilst the applicant has argued that it must be distinguished from reporting of real-time target data and instead requires reports based on statistical analysis of the historical track data in the database. I concur with the applicant that the currently claimed illustrator is distinguished from a real-time radar display in the sense that it displays reports generated from data resulting from a query on the track database, rather than displaying the output of a radar processor directly. The data which are reported may thus relate to the latest scan alone but are nonetheless '*historical'* in the sense that they have been written to the database in the required structures and then retrieved therefrom. I take the requirement for the reports to statistically characterise the activity to mean that they must include some numerical fact derived from a sample (subset) of the track data in the database – be that data relating to a single event or multiple events.

25 Claim 16 is narrower in this respect than claim 1, requiring "*generating reports that convey to users statistical information about bird abundance and behavior [sic] during selected time intervals and at selected locations within the 3D volume … the generating of said reports including accessing the stored temporally ordered track information and the stored spatially ordered track information*". The same points of construction apply here as apply to claim 1 (see above).

26 Furthermore the applicant has repeatedly argued that their invention is able to generate avian activity reports for intervals including hourly, daily, weekly, monthly and yearly. Whilst this may indeed be true, I note that neither independent claim requires this. Claim 1 merely requires that the illustrator "*converts subsets of said organised and stored track data into … reports*" with no implication that the subsets relate to any specified time interval. Claim 16 requires generating reports relating to "*selected time intervals*" but falls short of specifying these intervals.

27 For completeness, I agree with the applicant's contention that a subset of a set may include the set itself – i.e. it is not limited to a proper subset. Finally, for reasons set out below (under the heading 'Clarity), I do not consider the phrase "*allowing them* [i.e. users] *at a glance to understand and appreciate a new hazardous situation so they can issue warnings as well as notify personnel to help mitigate the risk*" in claim 1 – and the similar phrase in claim 16 - to limit the scope of the claims in any way.

Clarity

28 Under Sections 14(5)(b) of the Act, a claim (or claims) must be "*be clear and concise*". In his latest examination report dated 18 May 2017, the examiner has objected that underlined text in claim 1 above is unclear because the features it specifies are indeterminate.

29 It is my view that this phrase specifies features delimiting the scope of the claim in terms of results to be achieved by said features. These results are subjective because

they are defined by what users are able to understand and appreciate from glancing at the airborne target activity reports; and by what the users are able to do as a consequence. These results cannot be directly and positively verified by non-inventive tests or procedures due to their subjective nature; nor are any such tests adequately specified in the description. The applicant's response dated 15 June 2017 does not contradict this. Instead he argues that the wording of the claim given its natural meaning is clear, particularly in light of a quoted section of the description which provides context. Whilst I agree that the reader would understand the phrase in a general sense, I do not believe that he would be able to determine what – if any – limitation it places on the scope of the claim; nor does the quoted section of the description provide an appropriate test. Consequently I consider that the phrase implies a limitation on the claim but that any such limit is indeterminate – i.e., it obscures the scope of the claim.

30 Although the examiner has not objected to lack of clarity of claim 16, I note that this claim also includes a feature defined by a strikingly similar phrase to that which renders claim 1 unclear – see underlined text in claim 16 above.

31 Having noted the response dated 15 June 2017 from the applicant, I do not consider that the possible alternative wording referred to would be a useful way to address this issue.

The Prior Art

32 The examiner maintains that the invention specified in claim 1 and 16 lacks novelty over NOHARA and WEBER. I will consider these prior art documents in turn.

NOHARA

33 NOHARA has a *prima facie* publication date of 2005 so, absent any arguments to the contrary from the applicant, I am content that it forms part of the state of the art under section 2(2) of the Act. The introduction to NOHARA explains that it describes an experimental "*avian radar surveillance system*" used to generate "*bird detection and tracking information*" at a naval air station – i.e. for bird air strike hazard (BASH) applications.

34 Sections 3.1 and 3.2 of NOHARA set out the system requirements and design of the experimental radar system. These requirements include radar coverage of 0-6 nmi, 360° azimuth and "*useful height information … from bird targets*". Section 3.2 acknowledges that to meet these requirements, a "*trade-off*" was made in terms of reduced volume coverage. Thus the resulting radar system uses a "*parabolic antenna with 4° pencil beam*" (as illustrated in Figure 2), typically set at an elevation angle "*between 0° and 30° above the horizon, depending on the intended use*". The applicant has argued that this does not amount to a volume-scanning radar or 3D radar sampling as specified in the claims. Whilst I agree that the disclosed radar does not scan or sample a cylindrical or hemispherical 3D volume of the size and shape contemplated in the application under consideration (as discussed in paragraphs 18-20 above), the volume swept by its 4° pencil beam does nonetheless constitute a 3D volume. I am therefore convinced that the disclosed radar scans a volume that is suitable for aviation safety and security (c.f. claim 1) by rotating its antenna at constant elevation so as to successively illuminate different sub-volumes of the 3D volume (c.f.

claim 16) so as to locate targets therein in three dimensions. I believe that this is what the examiner meant by his statement that the disclosed radar "*provides limited 3D volume scanning*" and his reference to the applicant's acknowledgement in the description that "*conventional avian radars have a very limited three-dimensional (3D) localization capability*".

35 The requirements for the system described in section 3.1 of NOHARA also include "*real-time automatic tracking of bird targets, providing current location … and dynamic (speed and heading) estimates*". Section 3.2 explains that the experimental radar system includes a radar processor which meets this requirement by processing the radar signals to detect and track targets and "*[storing] processed … tracking data*". I consider that this meets the requirements of claims 1 and 16 for the system to generate radar track data; and indeed this appears to be uncontentious to both the examiner and the applicant.

36 The main area of disagreement between the examiner and applicant in relation to NOHARA regards the storage of the radar data, with particular reference to the following passages.

> *"3.1 System Requirements …*
> *Ability to store raw radar signal data and processed detection and tracking data for off-line reprocessing*
>
> *3.2 System Design …*
> *The eBirdRad processor stores raw data and processed detection and tracking data in accordance with operator selections. The raw data recordings support off-line playback, reprocessing and analysis. The processor supports continuous writing of both detection and track reports directly to a database for post processing, interaction with geographical information systems (GIS), and for Web Services. … Since the track reports contain all of the important target data (date, time position, dynamics, size), remote situational awareness for BASH and NRM applications is easily realised."*

It seems that NOHARA uses the terms "*processed detection and tracking data*" and "*detection and tracking reports*" interchangeably so I will use the former term.

37 The examiner and applicant agree that these passages of NOHARA disclose a track database (and I concur). The examiner contends that the disclosed storage of "*detection reports*" meets the requirement of claim 1 for on-the-fly organisation and storage of the radar track data in time ordered form (i.e. in accordance with the radar data collection times) and that the disclosed storage of "*track reports*" meets the similar requirement for its organisation and storage in spatial-ordered form (i.e. in accordance with the trajectories of the tracked target objects). In particular, he argues that track reports are implicitly spatially ordered. The applicant maintains that the cited passages merely indicate real-time storage; that they make clear that the disclosed date storage is for archival purposes only (which I take to mean that there is no motivation to structure the data for any purpose other than straightforward scan-by-scan retrieval) and that NOHARA provides no teaching or implication as to how the data is organised and structured in the database, let alone spatial ordering in accordance with trajectories.

38 To understand these arguments, it is useful to look more closely at the citation. NOHARA sets out that the detection and tracking data are generated from the raw radar data by the "*radar processor which carries out all radar signal processing … automatic detection, tracking*". The detection data is clearly distinct from the tracking data[6]. In particular, paragraph 3 of section 4 explains that:

> *"If automatic detection and tracking algorithms … are now applied* [to the unprocessed plan position data]*, Figure 9 results. Detections are indicated by small circles at the location where the clutter-map threshold was exceeded. … Tracks are indicated by a square symbol (drawn at the target's current position) with a line emanating from the square (pointed to the direction the target is heading)."*

I take this to mean that the processed detection data are the output of a first stage of radar data processing in which targets (and their locations) are identified as such in data from single scan. A second stage of radar data processing operates on the processed detection data to associate multiple detections of an individual target in multiple scans so as to generate the processed tracking data. Since the processed detection data are stored in the database, it is implicit that they are structured such as to include a capture time attribute (to allow later retrieval) and that they will be stored in a time-ordered form. Conversely I do not consider the processed detection data to be radar <u>track</u> data (as required by claim 1) or track information (as per claim 16) because they are output by the radar processor (and stored) at an intermediate stage <u>before</u> the tracking process – i.e. they represent locations of individual detected targets that are not yet associated to any track.

39 Since the processed track data discussed in NOHARA are stored in a database, I consider it implicit that they are stored in a structure which includes an attribute identifying a trajectory to which each 'detection' of the target belongs. Conversely I can see no necessary implication that they are spatially ordered. Indeed in light of this I agree with the applicant that the phrase "*the processor supports continuous writing of … track reports*" suggests that the processed track data is written to the database in time-ordered form. The fact that track reports indicate the locations of the tracked target over time does not, in my view, imply that they are <u>ordered</u> spatially in the database.

40 Referring again to my interpretation of the claims above, I am also persuaded by the applicant's arguments that NOHARA fails to disclose the required report generation features. Section 4 of NOHARA discusses the results obtained using the disclosed eBirdRad system. Referring again to the text I quoted in paragraph 38 above, it is clear that the displays shown in Figures 5-9 display <u>in real-time</u> the outputs of the processor at each processing stage (first unprocessed plan positions, then processed plan positions, bird detections and finally bird tracks). Although the processor writes at least some of this data to a database, there is no explicit or implicit disclosure that the data is first written to the database and then retrieved for display. Even if the examiner is right that the statement that the data is "*available for post processing*" means that the display of Figure 9 may also access stored (rather than real-time) radar track data, it is still not operatively connected to a database supporting the required

[6] see paragraphs 4 & 6 of section 3.2 and section 4 of NOHARA

‘dual storage’ (claim 1) or result from access to appropriately structured data (claim 16) – for the reasons set out above.

41 I therefore conclude that NOHARA does not explicitly or implicitly disclose or suggest the track data storage and organisation features or the reporting features of the invention under consideration.

42 As a consequence, the arguments on file concerning whether or not NOHARA discloses <u>statistical</u> characterisation of the target activity are moot and have not been considered.

WEBER

43 Turning now to the second novelty citation, WEBER has a publication date of 30 October 2008 and consequently forms part of the state of the art under section 2(2) of the Act. WEBER is assigned to the applicant requesting the current hearing and lists as inventors two of the co-authors of NOHARA (upon which it relies).

44 WEBER discloses a system which is strikingly similar to that described in NOHARA. The main difference between the two is that the radar system disclosed in WEBER achieves the height estimation accuracy required for avian radar <u>without</u> any trade-off in coverage by using radar systems similar to those used in the current application[7]. The radar data processing, storage and reporting of the WEBER system are similar to those of NOHARA[8]. Like NOHARA, WEBER discloses continuously writing detection and track data (which I take to mean plots 36 and tracks 37 of Figure 7) to a database which “*can continuously store complete target detection and track data over extended periods of time in order to support such R&D activities*”. I consider that essentially the same differences exists between the detection and track data storage disclosed by WEBER and the current inventive concept as have been identified above between the latter and NOHARA – i.e. that detection data do not constitute radar <u>track</u> data (as required by claim 1) or <u>track</u> information (as per claim 16); and that there is no suggestion or implication that the track data are spatially ordered.

45 Additionally, paragraphs [0074] and [0080] of WEBER make clear that “*target data*” are generated by post-processing (i.e. analysing) the track data such that “*target data 38 consists of tracks data 37 refined into user-specific products such as alerts, statistical summaries, reduced subsets, etc.*”. The target data may be written to the database and “*real-time target data*” may be sent to a local monitor for real-time display which may thus display “*scan-converted video, target data including detection data (with time history) and track data, maps, user data (e.g. text, push pins) etc.*” Even if these target data are generated on the fly from the data received from the sampling system 8 (Figure 7), then I can see no necessary implication that they are spatially ordered and structured in accordance with target object trajectories; and moreover it is difficult to see how alerts or statistical summaries could be so.

46 The examiner maintains that organising and storing track data in spatial ordered form is evident by the database “*storing sorted data into tracks using tracking algorithms*”. If this is a reference to the tracks 37 illustrated in Figure 7 of WEBER, then I disagree

[7] see paragraphs [0047]-[0048] of WEBER
[8] See Figure 7 and paragraphs [0071]-[0074] and [0086]-[0087] of WEBER

for the reasons set out in paragraph 44 above; and if a reference to the target data 38, then the arguments in paragraph 45 above apply.

47 The examiner also refers to paragraph [0050] of WEBER as disclosing the conversion of subsets of the track data into airborne-target activity reports including histograms of bird numbers. Whilst I agree that "*histograms which characterize height distribution for several or all targets*" clearly constitute "*reports that convey statistical information about bird behaviour*" (claim 16) and "*airborne-target activity reports which statistically characterise target activity in the airspace*" (claim 1), I agree with the applicant that they appear to be generated on-the-fly and that there is no suggestion or implication that they are generated from appropriately structured and ordered data previously written to the database.

48 I therefore conclude that WEBER does not explicitly or implicitly disclose or suggest the track data storage and organisation features or the reporting features of the invention under consideration.

Excluded matter – Section 1(2)

The Relevant law

49 Section 1(2) of the Act sets out certain categories of invention that are not patentable as follows (my emphasis added in bold):

> *It is hereby declared that* ***the following*** *(among other things)* ***are not inventions for the purposes of this Act****, that is to say, anything which consists of -*
>
> *(a) …..;*
> *(b) …..;*
> *(c) a scheme, rule or method for performing a mental act, playing a game or doing business, or* ***a program for a computer****;*
> *(d)* ***the presentation of information****;*
>
> *but the foregoing provision shall prevent anything from being treated as an invention for the purposes of this Act* ***only to the extent that a patent or application for a patent relates to that thing as such****.*

The categories of subject-matter (a)-(d) are conventionally referred to as excluded subject matter or excluded matter.

50 The assessment of patentability under section 1(2) of the Act is governed by the judgment of the Court of Appeal in *Aerotel Ltd v Telco Holdings Ltd and Macrossan's Application* [2006] EWCA Civ 1371 (hereafter *Aerotel*). In this judgment, the court reviewed the case law on the interpretation of section 1(2) and approved a four-step test for deciding whether an invention is patentable. The test comprises four steps:

(1) Properly construe the claim;
(2) Identify the actual contribution;

(3) Ask whether it falls solely within the excluded matter;
(4) Check whether the contribution is actually technical in nature.

Operation of this test is explained in paragraphs 40-48 of the *Aerotel* judgment. Paragraph 43 confirms that identification of the contribution is essentially a matter of determining what it is that the inventor has really added to human knowledge and involves looking at the substance of the invention claimed, rather than the form of the claim. Paragraph 46 explains that the fourth step of checking whether the contribution is technical may not be necessary because the third step – asking whether the contribution is solely of excluded matter - should have covered that point already.

51 More recently, the Court of Appeal in the case of *Symbian* [2009] RPC 1 (hereafter *Symbian*) confirmed that this structured approach is one means of answering the question whether or not the invention reveals a technical contribution to the state of the art. In other words, *Symbian* confirmed that the four-step test is equivalent to the prior case law test of 'technical contribution', as discussed in *Merrill Lynch*[9], *Gale*[10] and *Fujitsu*[11]. The key question is what the 'technical contribution' amounts to, not whether it happens to be implemented by a computer.

52 Lewison J (as he then was) in *AT&T/CVON Innovations* [2009] EWHC 343 (hereafter *AT&T*) set out five factors or signposts that he considered to be helpful when considering whether a computer program makes a technical contribution. These signposts were modified slightly in *HTC Europe Co Ltd v Apple Inc* [2012] EWHC 1789 (hereafter *HTC*). The five signposts are:

> *(i) Whether the claimed technical effect has a technical effect on a process which is carried on outside the computer.*
>
> *(ii) Whether the claimed technical effect operates at the level of the architecture of the computer; that is to say whether the effect is produced irrespective of the data being processed or the applications being run.*
>
> *(iii) Whether the claimed technical effect results in the computer being made to operate in a new way.*
>
> *(iv) Whether the program makes the computer a better computer in the sense of running more efficiently and effectively as a computer.*
>
> *(v) Whether the perceived problem is overcome by the claimed invention as opposed to merely being circumvented.*

Analysis

53 I will apply the four step test approved by the Court of Appeal in *Aerotel*.

Step (1): Properly construe the claim(s)

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[9] *Merrill Lynch's application* [1989] RPC 561.
[10] *Gale's application* [1991] RPC 305.
[11] *Fujitsu Limited's application* [1997] RPC 608.

54 The first step is to construe independent claim 1 and independent claim 16. I have already indicated how I have construed these claims in the discussion above under Novelty (see section headed '*Claim Construction*' above).

Step (2): Identify the actual contribution

55 This step of the test is explained in paragraph 43-44 of *Aerotel* as:

> *"… an exercise in judgment probably involving the problem said to be solved, how the invention works, what its advantages are. What has the inventor really added to human knowledge perhaps best sums up the exercise."*

Thus the invention must be set in context of the state of the art at the priority date of the invention which, for the current purposes, is exemplified by NOHARA, WEBER and the applicant's specification – bearing in mind that "*the test must be what contribution has actually been made, not what the inventor says he has made*".

56 The problem addressed by the invention is considered by the applicant to be "*the critical gap in bird awareness which … is associated with sparse (in space and time) visual bird count data relied upon by airports in order to identify hazardous birds and assess the risk of bird strikes on an ongoing basis. The present invention addresses this … gap while mitigating the cost of data acquisition, the computational complexity of big data processing, and complexity of human interpretation associated with the proposed 3D radar sampling solution*"[12]. This may be understood by reference to the specification, which presents the invention in light of an assertion that known BASH radar systems do not (directly and on-the-fly) provide answers to some useful queries about avian activity detected at a specified time and place. Instead they provide real-time display and analysis of current and near-current activity as well as storage of the detected and processed data for later post-processing. This is purportedly because the databases of such known systems are not structured so as to support <u>efficient</u> spatio-temporal queries on "*track information which grows* [in volume] *very quickly*". For example, pages 18, 30 and 34 set out the problem as follows (my emphasis added):

> *"A geographic information system (GIS) database-friendly organisation of the data is required in order to be able to … make <u>efficient</u> queries on a track, rather than purely a time, basis".*
>
> *"The GIS-based architecture of the Avian Track Interpreter 44 is key to being able to <u>compute efficiently and deliver in a timely manner</u> the avian activity reports. … The RDS 21 stores this data efficiently but the storage and organisation is essentially time-ordered… Unless the data is re-organised to account for both spatial and temporal aspects of the problem … the avian activity reports … will not be <u>practical</u>. The RDS 21 and GDS 22 combination achieve this at the cost of essentially doubling the storage requirements of the Track Database 14 and increasing its computational capabilities."*

[12] See applicant's letter dated 2 March 2017

> *"Let's examine the calculations needed to compute these activity reports. … [In an example] 1200 unique birds will be tracked in each hour on average, with 28,800 track updates. … In generating the grid-based spatial activity report, the computational requirements get completely out of hand if the RDS 21 is used. … On the other hand, if the GDS 22 is used for these activity reports, the total abundance versus time line graph is easily generated."*

57 The implication of this appears to be that although a known BASH radar system storing track data in a time-ordered structure (e.g. in a typical Relational Data Server (RDS)) would be able to support the generation of the required reports from small volumes of stored data, it would be unable to deal efficiently with the large data volumes that are typical in such systems; nor would it support the radar data being written and analysed at the same time. I believe that this is what the applicant means by the invention "*mitigating … the computational complexity of big data processing*".

58 The invention addresses this problem by combining a known radar device with software which – thanks to its 'dual' data storage model – supports real-time organisation and storage of radar track data as it is received from a radar device; and on-demand generation of statistically-based avian activity reports that are derived from (optionally time- or space-delimited) subsets of the stored data.

59 The applicant has argued that the statistically-based airborne activity reports produced by their invention cannot be produced by prior systems – i.e. because the reports are based on "*analysis of historical track data … not solely real-time data*" it produces new information about the airborne activity and consequently cannot merely be a computer program or the presentation of information *per se*. I take this to mean that, by continuously storing the radar track data in the claimed dual forms and generating the reports there-from, the invention allows the user at any time to generate the statistically-based reports for any selected times and locations – and moreover that this is not possible using prior systems. It is not clear to me that this is the case. The examiner has highlighted paragraph [0074] of WEBER, which discloses generating "*target data 38* [which] *consists of tracks data 37 refined into user-specific products such as alerts, statistical summaries, reduced subsets, etc.*" and which is presented to a user; and paragraph [0086] which discloses obtaining the same information by post-processing. Although this target data is not derived from data organised and stored as per the current claims, it nonetheless constitutes "*reports that convey statistical information about bird behaviour*" (c.f. claim 16) and "*airborne-target activity reports which statistically characterise target activity in the airspace*" (c.f. claim 1). Furthermore, as noted above, the applicant's own specification implies that known BASH radar systems relying on a RDS for storage of track data would be able to support the generation of the reports envisaged by the applicant provided that the analysis only small volumes of data were processed. Therefore, returning to the problem addressed by the invention, it still appears that the problem is not that prior systems are <u>unable</u> to provide the required statistically-based reports (at least insofar as those reports are specified by the independent claims) but rather that they cannot do so <u>efficiently and rapidly</u> due to their computational limitations.

60 From this analysis I am of the view that the problem addressed by the invention lies – at least in part - in the computational limitations of the data storage and querying tools of the prior systems and that the solution provided by the invention improves those

software tools by the use of more appropriate data models. I believe that this is what the examiner meant by his formulation of the contribution.

61 The applicant also argues that the reports generated by the invention supply "*technical data*" (in the form of the statistical characterisations of airborne activity) to users in an aviation safety environment and thus "*effectively forms an aspect of an alarm*". Be that as it may, it is not decisive in determining the contribution of the invention. The question remains whether the contribution lies in the 'alarm' as a whole (i.e. a 'better alarm' or a 'better radar sampling system for aviation safety') or whether it lies in a computing solution to a problem of a computer program *per se* within that context; or indeed to the presentation of that 'alarm' *per se*.

62 The applicant further argues that their invention makes a technical contribution to the art because it relates to "*improving the operation and performance of a safety system for use in an aviation setting*" in a way that is analogous to the system considered in Office decision BL O/312/15 (BOEING)[13]. Again, the question is not whether the claimed system as a whole relates to such a safety system (which it clearly does) but rather whether or not the contribution is confined to a solution to a problem of a computer program or the presentation of information *per se* – albeit within such a system.

63 This brings me to the heart of the applicant's argument; namely that the contribution made by the invention extends to the 3D radar sampling and reporting system and method as a whole. This system integrates the radar device and the "*specialised track database*" which receives and stores radar data in real-time in the specified 'dual form'. Consequently the contribution lies in this integrated system that is able to generate the historical statistical reports on-the-fly in the context of continuous monitoring and storage of data. Such an integrated system is something more than a computer so the contribution goes beyond a computer program; i.e. "*a better radar system*" (thus meeting the first *AT&T/CVON* 'signpost').

64 Having carefully considered these arguments, I am of the view that the central problem addressed by the invention lies in the inability of prior systems to provide continuous real-time monitoring, storage and analysis of airborne target data that meets the needs of BASH applications to understand the complex long-and short-term spatial and temporal behaviour of those targets in a 'live' operational environment. Although the solution involves overcoming the computational limitations of the data storage and querying tools of the prior systems, the result is a system which allows queries which in previous systems were usually carried out off-line to instead be carried out on-line at the same time as the tracking and data storage processes. In other words, the invention is not only concerned with organising and storing the data in the specified 'dual form' for its own sake (e.g., for computational simplicity or improved use of computer memory) but also in order to make possible BASH applications which are not practically possible in prior systems. Consequently, I find merit in the argument from the applicant that the contribution lies in a 3D radar system for monitoring airborne target activity which is able concurrently to generate historical statistical characterisations of airborne target activity on-demand due to its organisation and storage of 3D radar track data relating to airborne target activity in time-ordered form

[13] For text of decision see IPO Hearing decision database here

(structured in accordance with time of collection) and additionally in spatial-ordered form (structured in accordance with respective trajectories).

Step (3): Ask whether the contribution falls solely within the excluded matter

65 On this basis, I consider that the contribution lies in a 3D radar system which – as a matter of practical reality – provides information not available from prior systems in the operational timeframes of 'live' BASH applications. Although clearly the system involves the presentation of this information to its users, the contribution is not limited to this presentation *per se* but instead extends to the capture and generation of this information as a whole. Similarly, although the invention relies on a computer program for its realisation, the contribution made by the invention goes beyond this.

Step (4) Check whether the contribution is actually technical in nature

66 Given my answer under Step 3 above, I do not need to go on to consider this fourth step of the *Aerotel* test.

Dependent claims and auxiliary requests

67 Having determined that the claims currently on file are novel and do not relate to matter excluded from patentability under Section 1(2) of the Act, the question of the patentability of the claims specified in auxiliary request 1 or auxiliary request 2 is moot and I have not considered them.

Conclusion

68 Taking all of the above into account, I find that the application meets the requirement for novelty under Section 1(1)(a) of the Act.

69 I find also that the invention does not fall solely in the field of excluded subject matter under Section 1(2) of the Act.

70 As noted above, I consider that claim 1 and claim 16 as currently on file both lack clarity under section 14(5)(b). The applicant will need to amend these claims.

71 I note that the period under Section 20 of the Act for placing this application in order has been extended under Rule 108(3) of the Rules to 9 July 2017. Under Rule 108(7), the applicant may file a further request, with the relevant form and fee, under rule 108(3) to extend the compliance period for an additional period of two months anytime up to 9 September 2017. Should the applicant wish to proceed with this application, it will be necessary for them to file such a request to extend the compliance date. Should they do so, I would be content to exercise discretion to grant such a request.

72 The application will be remitted for completion of the examination process. As part of the latter, the applicant will need to address the issue of the clarity of claims 1 and 16 through appropriate amendment. In the absence of an appropriate request under rule 108(3) or amendments to address the outstanding issue, the application will be refused under Section 18(3) of the Act.

Appeal

73 Any appeal must be lodged within 28 days after the date of this decision.

Dr LCULLEN

Deputy Director, acting for the Comptroller