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Paper 18
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PARROT S.A., PARROT DRONES, S.A.S. and PARROT INC.,
Petitioners,

v.

QFO LABS, INC.,
Patent Owner.

Case IPR2016-01550
Patent 7,931,239 B2

Before MEREDITH C. PETRAVICK, HYUN J. JUNG, and SCOTT C. MOORE, *Administrative Patent Judges.*

JUNG, *Administrative Patent Judge.*

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Parrot S.A., Parrot Drones S.A.S., and Parrot Inc. ("Petitioners") filed a Petition (Paper 2, "Pet."), requesting institution of an *inter partes* review of claims 1–10 of U.S. Patent No. 7,931,239 B2 (Ex. 1001, "the '239 patent"). QFO Labs, Inc. ("Patent Owner") timely filed a Preliminary Response (Paper 10, "Prelim. Resp."). Under 35 U.S.C. § 314, an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

Upon consideration of the Petition and Preliminary Response and for the reasons explained below, we determine that Petitioners have shown that there is a reasonable likelihood that they would prevail with respect to at least one of the challenged claims, and we institute an *inter partes* review of claim 10 of the '239 patent.

A. Related Proceedings

Petitioners indicate that the patent at issue in Case IPR2016-01559 is a continuation of the '239 patent. Pet. 75. Patent Owner indicates that the '239 patent is involved in case 1:16-cv-00682-GM in the U.S. District Court for the District of Delaware. Paper 8, 1–2; *see also* Pet. 75 (indicating intent to file an action in the District of Delaware).

B. The '239 Patent (Ex. 1001)

The '239 patent relates to a "homeostatic flying hovercraft and to a radio controlled flying saucer toy employing the principals of a homeostatic flying hovercraft." Ex. 1001, 1:19–21. Figure 21 of the '239 patent is reproduced below:

Fig.21

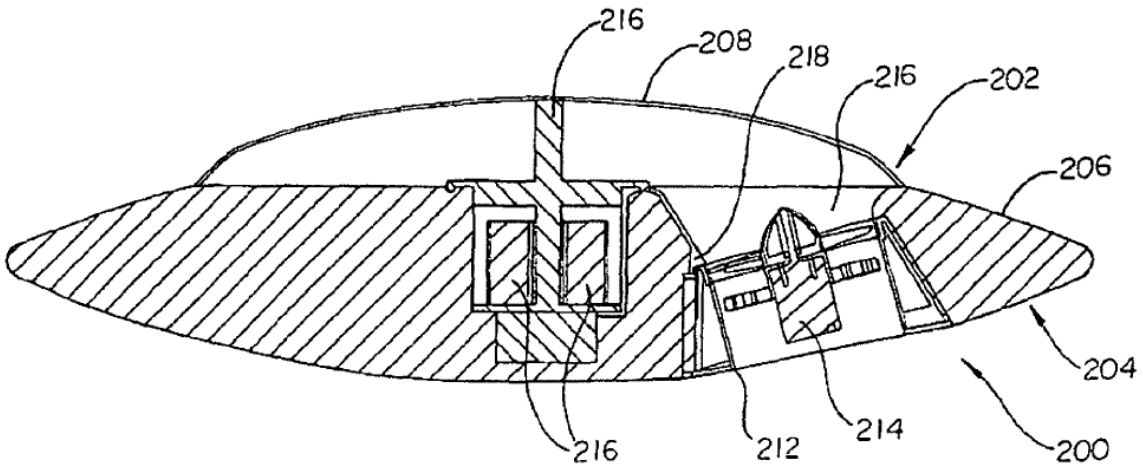


Figure 21 illustrates a "side cutaway view" of a "preferred embodiment of a homeostatic flying hovercraft." Ex. 1001, 8:44–46, 8:54–55, 9:14–16. Homeostatic flying craft 200 has upper surface 202, bottom surface 204, four duct openings 212 on bottom surface 204, and battery-powered ducted fan 214 mounted inboard from each duct opening 212. *Id.* at 9:14–29. Each fan 214 is powered from an internal pair of batteries 216. *Id.* at 9:41–42; *see also id*. at 12:27–13:8, 13:34–60 (describing embodiment of Figs. 1–3).

Homeostatic control system 300 is "operably connected to thrusters . . . in order to maintain a desired orientation" and includes "XYZ sensor arrangement 302 and associated control circuitry 304 that dynamically determines an inertial gravitational reference." *Id.* at 10:64–11:5; *see also id.* at 10:30–37 (also describing a homeostatic control system and XYZ sensor arrangement before stating "[f]inally, the RC aircraft has . . . "). XYZ sensor arrangement 302 "comprises an X-axis sensor system, a Y-[axis] sensor system[,] and a Z-axis sensor system." *Id.* at 11:14–16. "The X-axis sensor system is positioned in an X plane of the body and includes at least

three first sensors that sense acceleration and gravity in the X plane and at least three second sensors that sense acceleration only in the X plane." Ex. 1001, 11:16–20. The Y-axis and Z-axis sensor systems are similarly configured. *Id.* at 11:20–26. "Preferably, the X-axis sensor system comprises two sets of active accelerometers and two sets of passive accelerometers oriented in the X plane," and the Y-axis sensor system similarly comprises active and passive accelerometers. *Id.* at 11:27–31. Each set of active accelerometers has a pair of active accelerometers "oriented at 90 degrees with respect to each other in the respective plane," and each set of passive accelerometers has a pair of passive accelerometers also "oriented at 90 degrees with respect to each other in the respective plane." *Id.* at 11:32–37. The pairs of active and passive accelerometers are "positioned at 45 degrees offset relative to a horizontal plane through a center of the body." *Id.* at 11:37–40.

Figure 22a of the '239 patent is reproduced below:

Fig.22a

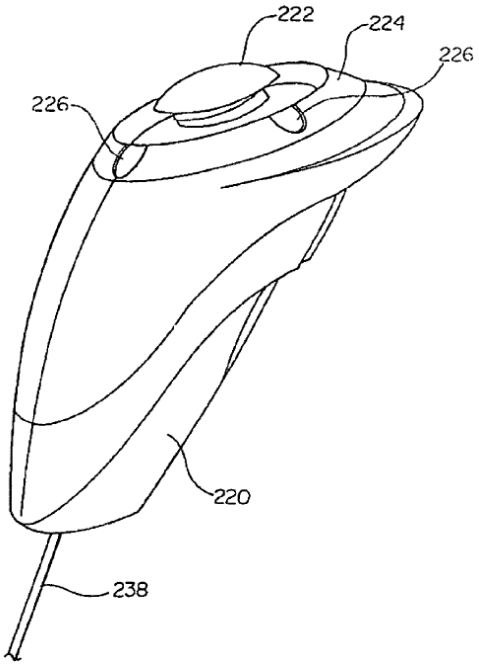


Figure 22a is an isometric view of a hand-held bee controller. Ex. 1001, 8:56–57, 9:49–50. A radio-controlled ("RC") controller 220 "includes a body adapted to be held in one hand" and a "homeostatic control system IS positioned within the body." *Id.* at 10:13–17. A user selectively positioning an orientation of RC controller 220 provides a "desired orientation." *Id.* The homeostatic control system "includes an XYZ sensor arrangement and associated control circuitry" to sense the "desired orientation of the RC controller" and "dynamically determines an inertial gravitational reference for use in sensing the desired orientation." *Id.* at 10:14–21. RC controller 220 also includes a "bidirectional radio frequency (RF) transceiver providing two-way RF communications between the RC aircraft and the hand-held RC controller that communicates the desired orientation to the RC aircraft." *Id.* at 10:22–25; *see also id.* at 13:18–33, 13:61–14:8 (describing embodiment of Figs. 1–3).

C. Illustrative Claim

The '239 patent has 10 claims, all of which Petitioners challenge. Claims 1, 6, and 10 are independent, and claim 1 is reproduced below:

> 1. A radio controlled (RC) homeostatic flying hovercraft comprising:
>
> a flying structure having lift generated by at least four electrically, powered generally downwardly directed thrusters, said flying structure including:
>
> a homeostatic control system operably connected to said thrusters that automatically controls a thrust produced by each thruster in order to automatically maintain a desired orientation of said flying structure, said homeostatic control system including at least a three dimensional, three-axis sensor system and associated control circuitry that dynamically determines a gravitational reference other than by dead reckoning for use by said homeostatic control system in automatic control of said thrusters to maintain homeostatic stabilization in said desired orientation;

a radio frequency (RF) receiver; and

a battery system electrically coupled to said thrusters, said RF receiver and said homeostatic control system; and

an RC controller separate and remote from said flying structure and adapted to control said desired orientation of said flying structure, said RC controller including:

a handheld structure housing a sensor system that senses at least a two dimensional, two-axis sensed orientation of said handheld structure as a result of a user remote from said flying structure selectively orienting said handheld structure; and

an RF transmitter that communicates information based on said sensed orientation to said receiver of said flying structure as said desired orientation used by said homeostatic control system to automatically control said thrusters to maintain said desired orientation.

D. Asserted Grounds

Petitioners challenge, under 35 U.S.C. § 103, the claims as follows:

References	Claim(s) Challenged
Louvel[1], Thomas[2], and Jimenez[3]	1–3, 5–7, 9, and 10
Louvel, Thomas, Jimenez, and Yavnai[4]	3
Louvel, Thomas, Jimenez, and Carroll[5]	4 and 8
Gordon[6] and Thomas	1, 2, 5–7, 9, and 10
Gordon, Thomas, and Yavnai	3
Gordon, Thomas, and Carroll	4 and 8

Pet. 18–19.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Only

[1] US 2002/0104921 A1, published Aug. 8, 2002 (Ex. 1004).
[2] US 5,128,671, iss. July 7, 1992 (Ex. 1006).
[3] US 2002/0106966 A1, published Aug. 8, 2002 (Ex. 1007).
[4] US 6,588,701 B2, iss. July 8, 2003 (Ex. 1009).
[5] US 6,847,865 B2, iss. Jan. 25, 2005 (Ex. 1008).
[6] M. Gordon et al., "Rotorcraft Aerial Robot—Challenges and Solutions," Georgia Institute of Technology, School of Aerospace Engineering (October 25–28, 1993) (Ex. 1005).

those terms in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Petitioners state that "no construction of any non-means plus function claim term is required." Pet. 15. The parties agree that independent claim 6 recites limitations that are written in means-plus-function form. Pet. 15; Prelim. Resp. 6. Petitioners propose interpretations in a chart for "sensing means," "control means," "radio means" of the flying structure, "battery means," "handheld structure housing means," and "radio means" of the RC controller, all of which appear in independent claim 6. Pet. 15–16 (citing Exs. 1001, 1003). Petitioners' chart includes the asserted functions for each term and where the corresponding structure can be found in the specification of the '239 patent. *See id*. Patent Owner disputes the functions of the "radio means" of both the flying structure and RC controller. Prelim. Resp. 6–7. Patent Owner also provides additional citations to the specification of where corresponding structure can be found. *See id.* at 7.

After reviewing the evidence presented, we interpret the following means-plus-function terms for the purposes of determining whether Petitioners have demonstrated a reasonable likelihood of prevailing in its asserted challenges of claims 6–9.

Term	Function	Corresponding Structure
"sensing means"	"dynamically determining an actual orientation of said flying structure, including at least a	"an XYZ sensor arrangement and associated control circuitry" (Ex. 1001 at 10:33–38, 11:1–5, 11:14–44)

	three-dimensional, three-axis sensor"[7]	
"control means"	"automatically controlling a thrust produced by each of said thrusters to maintain a desired orientation of said flying structure in response to said actual orientation"	"Referring now to FIGS. 28–31, a preferred embodiment of the homeostatic control system 300. . . operably connected to the thrusters" and "include[ing] an XYZ sensor arrangement 302 and associated control circuitry 304" (Ex. 1001 at 10:63–11:13, Figs. 28–31) and the "detailed circuit schematic set forth in FIGS. 30a–30g detail to a person skilled in the art the implementation of one embodiment of the homeostatic control system" (*id.* at 12:24–26, Figs. 30a–30g)
"radio means" of flying structure	"radio frequency (RF) communication of said desired orientation"	"bidirectional radio frequency (RF) transceiver providing two-way RF communications" (Ex. 1001 at 10:21–25, 10:37–40), "a 2 digital channel bi-directional

[7] Because the parties agree that this is the recited function of the "sensing means" (*see* Pet. 15, Prelim. Resp. 7), we do not address the issue of whether this limitation recites sufficient structure to remove it from the ambit of § 112 ¶ 6.

		controller 12 is preferably used with a transceiver in . . . the craft" (*id.* at 13:18–20), "radio control (R/C) receiver 68" that is "a digital unit" (*id.* at 14:11–17)
"battery means"	"providing electrical power to said thrusters, said control means, and said radio means"	"pair of batteries 216," "lithium polymer rechargeable batteries," "battery 216" (Ex. 1001 at 9:41–48), "battery pack 32 in the form of rechargeable nickel metal hydride cells" (*id.* at 12:43–47, 13:58–60) "power . . . via a tether cable" (*id.* at 12:47–49)
"handheld structure housing means"	"sensing at least a two dimensional, two-axis sensed orientation of said handheld structure in response to a user remote from said flying structure selectively orienting said hand-held structure"	"one-handed bee controller" (Ex. 1001 at 7:17–21, 8:56–59, Figs. 22a, 22b), "hand-held bee controller 220" (*id.* at 9:49–63), "hand-held RC controller" (*id.* at 10:13–25), "remote controller 12" (*id.* at 12:27–29, 13:9–33, Figs. 1–3)
"radio means" of RC controller	"RF communication of information based on said sensed orientation with said radio means	"radio frequency communications" (Ex. 1001 at 7:31–43, 7:48–52), "a transceiver in . .

	of said flying structure as said desired orientation for said control means automatically controlling said thrusters"	. the controller" (*id*. at 13:18–32)

Patent Owner also proposes interpretations for "homeostatic" and "orientation." Prelim. Resp. 14–16. For the purposes of this Decision, we determine that express interpretations of these terms or any other terms are not necessary. *See also* Pet. 15 (stating that "no construction of any non-means plus function claim term is required").

B. Grounds Based on Louvel

Petitioners contend that (1) claims 1–3, 5–7, 9, and 10 are obvious in view of Louvel, Thomas, and Jimenez; (2) claim 3 is obvious in view of Louvel, Thomas, Jimenez, and Yavnai; and (3) claims 4 and 8 are obvious in view of Louvel, Thomas, Jimenez, and Carroll. Pet. 18–19, 32–54. In support of these contentions, Petitioners cite to Louvel, Thomas, Jimenez, Yavnai, and Carroll and a Declaration of Girish Chowdhary, Ph.D. (Ex. 1003, "Chowdhary Declaration" or "Chowdhary Decl."). *See id.* at 32–54.

1. Ground 1 – Louvel, Thomas, and Jimenez

a. Louvel (Ex. 1004)

Louvel "relates to a light aircraft, like a flying saucer, remotely controlled and remotely powered." Ex. 1004 ¶ 1. Figures 1 and 2 of Louvel are reproduced below.

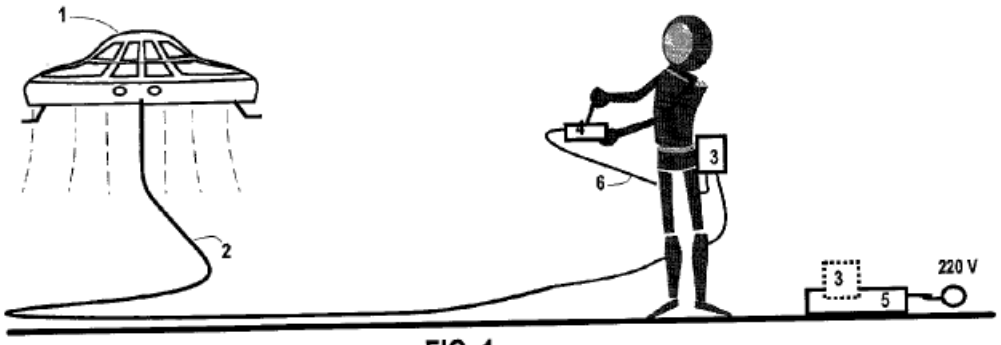


FIG. 1

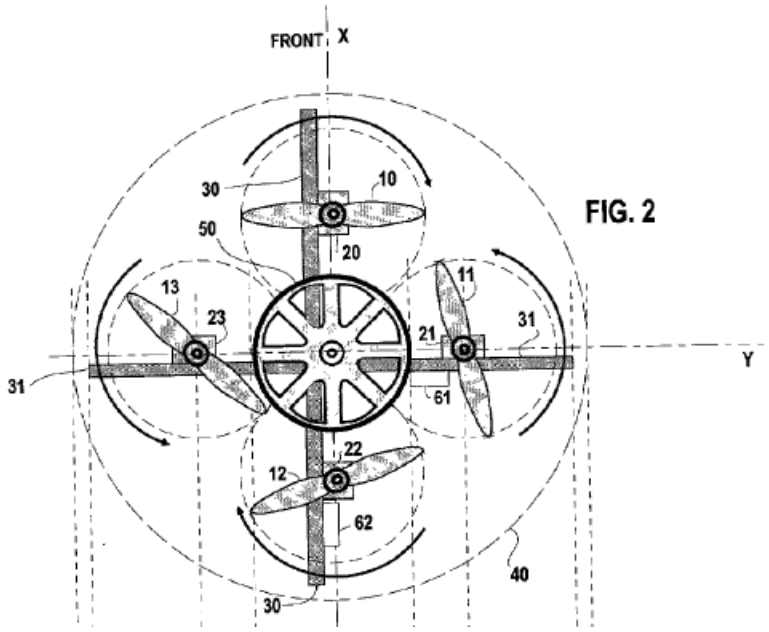


FIG. 2

Figure 1 shows the invention of Louvel, including the exterior of aircraft 1; and Figure 2 shows a top view of an interior of aircraft 1. Ex. 1004 ¶¶ 12, 13. Aircraft 1 "has a general shape looking like a flying saucer." *Id.* ¶ 25. Aircraft 1 has four propellers 10, 11, 12, 13 with vertical axis to provide lift thrust, and each propeller 10–13 is driven independently by electric motor 20, 21, 22, 23. *Id.* ¶¶ 29, 30. Aircraft 1 is "fitted with three attitude sensors whose purpose is to provide information for the closed loop control," and the sensors include roll tilt angle sensor 61, pitch tilt angle sensor 62, and yaw sensor 63. *Id.* ¶¶ 42–44, 46.

Aircraft 1 is linked to control unit 3, which is also linked to handling unit 4. *Id.* ¶¶ 25, 26. Control unit 3 includes a rechargeable battery 80 that supplies enough current to the electric motors of aircraft 1 for several minutes. Ex. 1004 ¶ 60.

Figure 5 of Louvel is reproduced below.

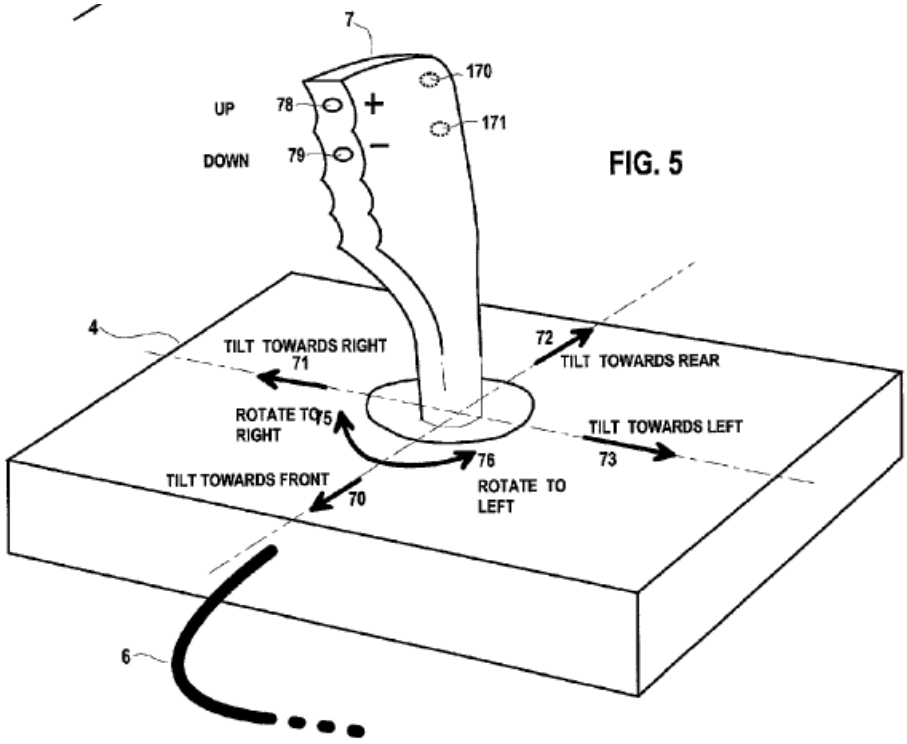


Figure 5 shows handling unit 4. *Id.* ¶¶ 16, 50. Handling unit 4 includes handle 7 and is linked to the control unit. *Id.* ¶ 49. Pushing handle 7 towards direction 70 causes aircraft 1 to tilt towards the front side; pushing handle 7 towards direction 72 causes aircraft 1 to tilt towards the rear side; pushing handle 7 towards direction 71 causes aircraft 1 to tilt towards the right side; pushing handle 7 towards direction 73 causes aircraft 1 to tilt towards the left side; and turning handle 7 in direction 76 causes aircraft 1 to rotate towards the left. *Id.* ¶¶ 51–53.

When there is no action on handle 7, a closed control loop uses data from sensors 60–63 "to converge towards the horizontal normal attitude of the aircraft and to cancel the yaw movement." Ex. 1004 ¶ 91. When there is action on handle 7, a "microcontroller corrects the present required values driven in each electric current to generate an imbalance in the direction required by the handle position," and the imbalance is limited in order "to limit the displacement speed of the aircraft" and "to allow a quick stabilization as soon as the action on the handle stops." *Id*. ¶ 93. For example, if sensor 62 indicates that aircraft 1 is tilting towards the rear, then speed of propeller 12 is increased, speed of propeller 10 is decreased, and speeds of propellers 11, 13 are unchanged. *Id*. ¶ 98.

b. Thomas (Ex. 1006)

Thomas relates to a "hand-held control device detecting multiple degrees of freedom of movement." Ex. 1006, 1:7–9. Figure 1 of Thomas is reproduced below.

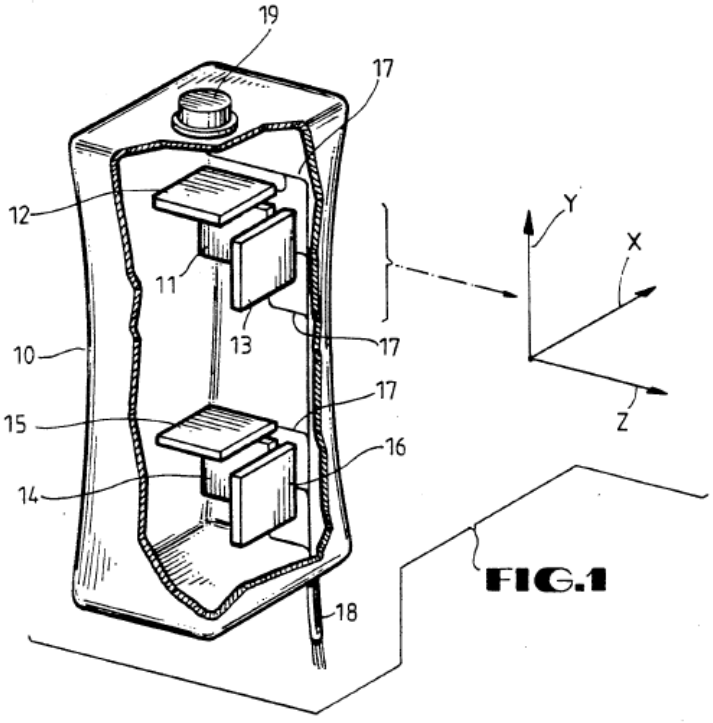


Figure 1 illustrates a "partly broken away" view of a "hand-held joystick using six accelerometers." Ex. 1006 at 1:59–61. Hand-held enclosure 10 is "not mounted to swivel about some fixed anchor point" and "is held by the user as a pistol-grip type of hand-held device, free from any mechanical connection to a supporting structure." *Id.* at 2:15–19. It supports two sets of three mutually-perpendicular accelerometers 11, 12, 13, 14, 15, 16. *Id*. at 2:12–14. The geometric configuration of the accelerometers uniquely identifies any combination of translations or linear motions along X, Y, and Z axes and rotations about X, Y, and Z axes. *Id.* at 2:60–3:3.

For example, if housing 10 is moved linearly along the X axis, accelerometers 11, 14 "produce equal signals of the same sign, and all the other accelerometers produce no signal." *Id.* at 3:3–6. Linear motion along the Y axis causes accelerometers 12, 15 to generate signals, and linear motion along the Z axis causes accelerometers 13, 16 to generate signals. *Id*. at 3:6–10. The signals from accelerometers 11–16 are sent to conditioning circuitry 26 via cable 18. *Id*. at 2:24–29, 3:43–50.

"Alternatively, the cable 18 may be omitted altogether and a wireless RF transmitter may be employed, transmitting the signals generated by the accelerometers 11–16 to a receiver in the computer 28." *Id.* at 3:62–65. The hand-held joystick can replace "the joystick, pedals, throttle assembly, trim controls and other input devices on an aircraft such as a helicopter" or "may be used to control robots." *Id.* at 4:9–13, 26–27.

c. Jimenez (Ex. 1007)

Jimenez relates to a "radio controlled toy blimp." Ex. 1007 ¶ 2. "The blimp includes conventional radio frequency remote control means known to

the art for controlling vertical and horizontal flight patterns." Ex. 1007 ¶ 14. A gondola is attached to an underside of the blimp, and the gondola includes printed wired circuit board 4. *Id*. ¶¶ 14, 23, 24, 31. Figure 3 of Jimenez is reproduced below.

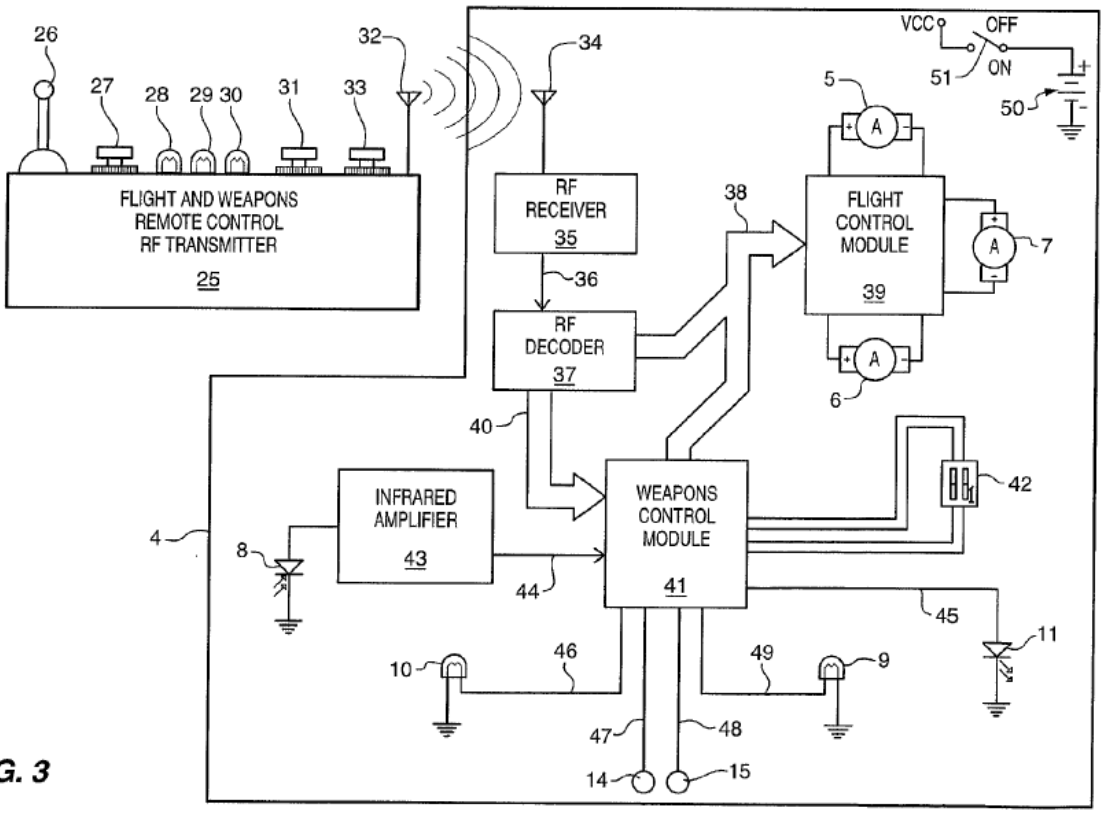


FIG. 3

Figure 3 is an electrical block diagram of printed circuit board 4. *Id.* ¶ 25. It shows "remote control RF transmitter 25 which the pilot employs to transmit flight . . . commands to blimp 1." *Id.* "The pilot uses joy stick 26 to change the direction and/or elevation of the blimp 1" and "remote control RF transmitter 25 . . . is used . . . to transmit flight . . . commands to the blimp 1." *Id*. ¶ 35. "The flight . . . commands are transmitted from antenna 32 to antenna 34 where they are transformed into a series of binary ones and zeros by RF Receiver 35 and supplied via wire 36 to RF decoder 37 where

they are assembled into distinctive binary codes representing flight . . . commands." *Id*.

d. Claims 1–3 and 5

Petitioners contend that Louvel teaches or suggests the limitations of independent claim 1. Pet. 33–35, 37 (citing Ex. 1004, Abstract, ¶¶ 1, 25, 26, 29, 30, 38, 42–44, 49, 51–53, 60, 90, 91, 98, Figs. 1, 5). Petitioners rely on Jimenez to teach or suggest the RF receiver, RC controller, and RF transmitter of claim 1. Pet. 35–39, 42–43 (citing Ex. 1007 ¶¶ 24, 25, 31, 35, Fig. 3). Petitioners also rely on Thomas to teach or suggest the "handheld structure housing a sensor system" of claim 1. Pet. 39–41 (citing Ex. 1006 at Abstract, 1:7–9, 1:29–31, 1:43–45, 2:11–23, 3:3–14, 3:62–65, 4:9–13).

In particular, claim 1 recites a "radio-controlled (RC) homeostatic flying hovercraft comprising: a flying structure . . . including . . . a battery system electrically coupled to said thrusters, said RF receiver and said homeostatic control system." For this limitation, Petitioners argue that "Louvel discloses that the on-board components are powered by an electric battery system" (Pet. 37 (citing Ex. 1004 ¶ 60)) and cite a portion of Louvel that teaches "electric rechargeable battery (80) . . . allows to supply enough current to the five electric motors of the aircraft for several minutes" (Ex. 1004 ¶ 60). Petitioners do not point to any other evidence for this limitation. *See* Pet. 37.

Petitioners present insufficient evidence and argument that Louvel teaches or suggests "a flying structure . . . including . . . a battery system" as required by claim 1. Louvel, instead, teaches that aircraft 1 is "remotely supplied" and "remotely powered." Ex. 1004, Abstract, ¶¶ 1, 7. Louvel's aircraft 1 is linked to control unit 3 (Ex. 1004 ¶ 25, Fig. 1) and control unit 3

includes battery 80 (*id*. ¶¶ 58–60, Fig. 7). Petitioners do not argue that control unit 3 is included within a flying structure. *See* Pet. 33 (arguing Louvel discloses a "flying hovercraft . . . remotely supplied'"). Moreover, Petitioners' arguments are based on "claim terms tak[ing] on their ordinary and customary meaning [as] they would have to one of ordinary skill in the art at the time of the invention." Pet. 15 (citing Chowdhary Decl. ¶ 43). Petitioners present no interpretations for "flying hovercraft" or "flying structure" such that those claim terms would encompass control unit 3 of Louvel, which is remote from aircraft 1. *See id*. (stating "Petitioners submit that, for purposes of this IPR, no construction of any non-means plus function claim term is required").

Further, Petitioners' rationales for combining Louvel, Thomas, and Jimenez concern the required RF communication and RC controller that provides desired orientation. *See* Pet. 36 (arguing it would have been obvious to "modify Louvel to use RF communication" as taught by Jimenez), 41–43 (arguing it would have been obvious to "modify Louvel to allow for controlling the aircraft based on the 'sensed orientation' of the remote controller, as taught by Thomas"). The asserted rationales do not address the issue of whether a skilled artisan would have had reason to modify Louvel's flying structure to include a battery system, as required by claim 1.

Petitioners' arguments for claims 2, 3, and 5, which depend from claim 1, contend that Louvel teaches or suggests its flying structure has a "body housing said thrusters within a perimeter of said body" (Pet. 44–45), "electrically ducted fans" (*id*. at 45–46), and a closed-loop control (*id*. at 48–

49). The arguments for dependent claims 2, 3, and 5 do not address the deficiency identified above for claim 1.

Therefore, for the reasons above, we are not persuaded that there is a reasonable likelihood that Petitioners would prevail with respect to their challenge of claims 1–3 and 5 as unpatentable over Louvel, Thomas, and Jimenez.

e. Claims 6, 7, and 9

Independent claim 6 recites a "radio controlled (RC) homeostatic flying hovercraft comprising: a flying structure including: . . . battery means for providing electrical power to said thrusters, said control means and said radio means." Petitioners provide a chart that correlates the limitations of claim 1 to the limitations of claim 6. Pet. 44; *see also id.* at 10–14 (assigning numbers to the limitations of the challenged claims). Petitioners assert that the "limitations of claim 6 are expressly disclosed by the prior art for the same reasons discussed above in connection with claim 1." Pet. 44.

Petitioners relate the battery means of claim 6 to the battery system of claim 1. *See* Pet. 10 (labeling "and a battery system . . . " as limitation "1e"), 12 (labeling "and battery means . . . " as limitation "6e"), 44 (relating limitation "1e" to "6e"). Louvel does not adequately support Petitioners' arguments regarding the "flying structure including: . . . battery means" limitation of claim 6 for the same reasons discussed above with respect to the "flying structure . . . including . . . a battery system" limitation of claim 1.

Petitioners' arguments for claims 7 and 9, which depend from claim 6, contend that Louvel teaches or suggests its flying structure having a "body housing said thrusters within a perimeter of said body" (Pet. 44–45) and

having a closed-loop control (Pet. 48–49). The arguments for claims 7 and 9 do not address the deficiency in Petitioners' showings with respect to claims 1 and 6.

Accordingly, we are not persuaded on this record that there is a reasonable likelihood that Petitioners would prevail with respect to their challenge of claims 6, 7, and 9 as unpatentable over Louvel, Thomas, and Jimenez.

f. Claim 10

Petitioners provide a chart that asserts certain limitations of claim 1 correspond to the limitations of independent claim 10. Pet. 44; *see also id.* at 10–14 (assigning labels to limitations of the challenged claims). Petitioners contend that the "limitations of claim 10 are expressly disclosed by the prior art for the same reasons discussed above in connection with claim 1." Pet. 44.

Claim 10 recites a "method for operating a radio controlled (RC) homeostatic flying hovercraft having at least four battery powered generally downwardly directed thrusters . . . ," and based on charts in the Petition, we understand Petitioners as arguing that Louvel discloses a remote controlled flying hovercraft and therefore, a method of operating an RC flying hovercraft with four battery powered, downwardly directed thrusters. *See* Pet. 10–11 (chart assigning labels to limitations of claim 1), 13–14 (chart assigning limitations to claim 10), 33–34 (citing Ex. 1004 at Abstract, ¶ 1, 29, 30, 38), 44 (chart correlating labels for limitations of claims 1 and 10). We also understand Petitioners as contending that, because Louvel has handling unit 7, Louvel teaches or suggests a "method . . . using an RC

controller separate and remote from said flying hovercraft." *See* Pet. 10–11, 13–14, 38–39 (citing Ex. 1004 ¶¶ 25, 26, 49, 51–53), 44.

For the recitations of "providing as part of said RC controller a handheld structure housing a sensor system" and "using said sensor system in said RC control to sense at least a two dimensional, two-axis sensed orientation of said handheld structure in response to a user remote from said flying structure selectively orienting said handheld structure," we understand Petitioners as arguing Louvel, Thomas, and Jimenez would have included such steps because the proposed combination has an "RC controller including: a handheld structure housing a sensor system that senses at least two dimensional, two-axis sensed orientation of said handheld structure as a result of a user remote from said flying structure selectively orienting said handheld structure." *See* Pet. 10–11, 13–14, 39–42 (citing Ex. 1004 at Abstract, ¶¶ 1, 7, Fig. 5B; Ex. 1006 at Abstract, 1:7–9, 1:29–31, 1:43–45, 2:11–23, 3:3–14, 3:62–65, 4:9–14; Chowdhary Decl. ¶¶ 50–53, 117, 119, 120), 44.

We also understand Petitioners as asserting that Louvel and Jimenez would have included "communicating a desired orientation by radio frequency (RF) communication information to said flying hovercraft, said desired orientation including information based on said sensed orientation of said handheld structure" because the proposed combination of Louvel and Jimenez has an RF receiver and an RF transmitter. *See* Pet. 10–11, 13–14, 35–37 (citing Ex. 1004 Abstract, ¶ 1, 25, 92; Ex. 1007 Abstract, ¶¶ 2, 24, 25, 31, 35, Fig. 3; Chowdhary Decl. ¶¶ 103, 117, 118), 42–44 (citing Ex. 1007 ¶¶ 24, 25, 31, 35, Fig. 3).

For "using a sensor system in said flying hovercraft to dynamically determine an actual orientation of said flying hovercraft, said sensor system including at least a three-dimensional, three-axis sensor," Petitioners contend that, because Louvel teaches or suggests a homeostatic control system with a three-dimensional, three-axis sensor system, it also teaches or suggests using such a system. *See* Pet. 10–11, 13–14, 34–35 (citing Ex. 1004 ¶¶ 42–44, 91), 44. Petitioners also argue that, because Louvel teaches or suggests a flying structure including a homeostatic control system connected to thrusters to maintain automatically a desired orientation, Louvel also teaches or suggests:

> using control circuitry in said flying hovercraft to automatically and dynamically control a thrust produced by each of said thrusters to achieve and homeostatically maintain said actual orientation of said flying hovercraft in response to said desired orientation communicated to said flying hovercraft and said actual orientation determined by said sensor system in said flying hovercraft without additional control information communicated to said flying hovercraft.

See Pet. 10–11, 13–14, 34 (citing Ex. 1004 ¶¶ 90, 98), 44.

Petitioners assert that a person of ordinary skill in the art would have had reason to incorporate Jimenez's RF communication feature into Louvel's system. Pet. 36 (citing Chowdhary Decl. ¶¶ 103, 117, 118; Ex. 1004 Abstract, ¶ 1; Ex. 1007 Abstract, ¶ 2). Petitioners contend that, because Louvel teaches an RC controller that is connected to the aircraft by flexible cable and Jimenez teaches "an alternative design choice that does not require a physical connection – radio transmission," the wireless configuration of Jimenez would alleviate Louvel's increasing cable weight as its aircraft lifts. Pet. 36 (citing Ex. 1004 ¶¶ 25, 92; Ex. 1007 ¶ 35).

Petitioners also argue that "remote control model aircraft were already popular in the 1990s even before Jimenez." *Id*. (citing Chowdhary Decl. ¶ 118). Petitioners, thus, assert that it would have been obvious to "modify Louvel to use RF communication because doing so would be using a known technique to a known device ready for improvement to yield predictable results" and that the "interchangeability of wired and wireless communications was well known." *Id*. at 37 (citing Chowdhary Decl. ¶ 118); *see also id*. at 43 (arguing similarly for the claimed RF transmitter).

Petitioners further assert that a person of ordinary skill in the art also would have had reason to modify the allegedly obvious Louvel and Jimenez system to further include the wireless controller of Thomas. Pet. 41 (citing Chowdhary Decl. ¶¶ 117, 119, 120; Ex. 1004 Abstract, ¶ 1; Ex. 1006 at 4:11–14). Petitioners argue that a person of ordinary skill in the art would have been motivated to "modify Louvel to allow for controlling the aircraft based on the 'sensed orientation' of the remote controller, as taught by Thomas" because Louvel teaches sending multi-dimensional orientation information to a flying structure and Thomas allows "specify[ing] such information in a different manner – based on the joystick's orientation in the user's hand, rather than a handle." *Id*. at 41–42 (citing Chowdhary Decl. ¶ 119; Ex. 1004 ¶¶ 50–53, Fig. 5B; Ex. 1006 at 2:11–23). Petitioners assert that "[a]s a matter of common sense," a person of ordinary skill "would have employed the user-friendly input system disclosed in Thomas . . . in place of the generic handle-based controller disclosed in Louvel" and the proposed combination "would have been a routine design choice." *Id*. at 42 (citing Chowdhary Decl. ¶ 120). Petitioners also assert that Thomas improves on joysticks like the one of Louvel and there are no unexpected results from its

proposed combination because the Louvel controller is used to control an aircraft in the same manner described in Thomas. *Id*. (citing Chowdhary Decl. ¶ 120; Ex. 1004 ¶ 7; Ex. 1006 at 1:11–13).

We determine that the present record reasonably supports Petitioners' arguments regarding claim 10. Patent Owner responds that the Petition fails to analyze the claims as a whole and Petitioners' use of "claim number/letter shorthand reference approach" is improper, unclear, and inaccurate. Prelim. Resp. 18–19 (citing *Neochord, Inc. v. University of Maryland, Baltimore*, IPR2016-00208, slip op. 24 (PTAB May 24, 2016) (Paper 6)). Patent Owner also argues that Petitioners' approach circumvents word count limits. *Id*. at 21–22. In particular for claim 10, Patent Owner contends that the correlation of limitations of claims 1 and 10 do not correspond directly. *Id*. at 20–21 (citing Pet. 20).

As summarized above, we provide our understanding of Petitioners' position with respect to claim 10. The arguments and the relied-upon evidence for claim 10 are sufficiently clear to permit us to analyze Petitioners' position, and our analysis based on our understanding persuades us that there is a reasonable likelihood that Petitioners would prevail with respect to their challenge of claim 10. We are, therefore, not persuaded that Petitioners' presentation of arguments for claim 10 is improper, unclear, or inaccurate. Also, Patent Owner's cited case states that "[t]o the extent that Petitioner attempts to incorporate other parts of the Petition by reference, it is unclear upon what aspects of Bachman Petitioner relies." *See Neochord*, slip op. at 24. We are not persuaded that Petitioners' position with respect to claim 10 is unclear as to what aspects of the cited references Petitioners rely, and thus, are not persuaded to deny institution on that basis.

Patent Owner also responds that Louvel, Thomas, and Jimenez fail to teach or suggest the use of "orientation" as required by claim 10. Prelim. Resp. 33. In particular, Patent Owner argues that (1) Louvel and Thomas do not teach or suggest the concept of using orientation, (2) Louvel uses "position" of its joystick relative to its base, and (3) Thomas relies on motion of its handheld enclosure to provide control signals. *Id*. at 34–38 (citing Ex. 2005 ¶¶ 18–22, 39–40).

At this stage of the proceeding, we are not persuaded that Petitioners' combination of Louvel, Thomas, and Jimenez fails to teach or suggest "orientation" as required by claim 10. Even under Patent Owner's proposed interpretation of "orientation" as the "angular displacement of a body with respect to an inertial gravitational frame of reference," Thomas teaches or suggests that motion of its handheld enclosure would result in an angular displacement with respect to an inertial gravitational frame of reference, and that further motion would result in another angular displacement that is different in distance with respect to that same frame of reference. Furthermore, Thomas teaches or suggests that rotational motion of its handheld enclosure can provide control signals. *See* Ex. 1006 at 3:10–23.

Patent Owner also argues that Louvel and Thomas do not teach or suggest dynamically determining a gravitational reference and the Petition does not explain how its proposed combination teaches or suggests dynamically determining a gravitational reference. Prelim. Resp. 38–40 (citing Pet. 33–34; Ex. 1004 ¶ 90; Ex. 2005 ¶¶ 23, 24). These arguments are not persuasive because claim 10 does not require in express terms dynamically determining a gravitational reference.

Patent Owner also contends that Thomas is not analogous art. Prelim. Resp. 33, 40. Specifically, Patent Owner contends that Thomas is primarily directed to computer controls, not the field of remote control aircraft. *Id*. at 41. Patent Owner further contends that Thomas having been cited almost 500 times in computer control systems is strong evidence that Thomas is not considered to be reasonably pertinent to the particular problem of remote control aircraft. *Id*. (citing Ex. 2005 ¶ 48). At this stage of the proceeding, Patent Owner's argument does not persuade us because the present record indicates that Thomas deals with a "hand-held joystick" (Ex. 1006 Abstract) and logically would have commended itself to one of ordinary skill in the art in considering any need or problem known in the field of remote control aircraft, especially one with a joystick such as Louvel (*see* Ex. 1004, Fig. 5).

Patent Owner further responds that Thomas is "merely cumulative of art . . . that was overcome during the prosecution of the '239 patent." Prelim. Resp. 33, 41–43. This argument does not address whether Petitioners have shown a reasonable likelihood of prevailing on their challenge of claim 10, and to the extent that Patent Owner is arguing that the "same or substantially the same prior art or arguments previously were presented to the Office" (35 U.S.C. § 325(d)), we are not persuaded to exercise our discretion to deny institution because Petitioners present different arguments based on Thomas, which Patent Owner indicates was not cited during prosecution of the '239 patent (*see* Prelim. Resp. 27).

Patent Owner also responds that the rationale for combining Louvel and Thomas is insufficient. Prelim. Resp. 33, 43–44. As summarized above, Petitioners provide several rationales for combining Louvel and Thomas. *See* Pet. 41–42. For example, the present record indicates that the

joystick of Thomas would perform the same function as Louvel, and at this stage of the proceeding, we are persuaded that Petitioners' asserted routine design choice rationale is sufficient. The present record does not persuade us that all the asserted rationales for combining Louvel and Thomas are insufficient.

Patent Owner further responds that the combination of Louvel, Thomas, and Jimenez does not provide transmitting sensed orientation and a desired orientation based on the sensed orientation of an RC controller. Prelim. Resp. 44–45. In particular, Patent Owner contends that the Petition cites a portion of Thomas regarding a computer controller embodiment and not an aircraft embodiment. *Id.* at 45. Patent Owner also argues that Petitioners do not "present any arguments for how or why the cables and physically separate computer or the joystick *inside* the aircraft being controlled as described in *Thomas* would be worked into the proposed combination." *Id.* at 45–46. These arguments are not persuasive because one of ordinary skill in the art is not compelled to follow blindly the teachings of one prior art reference over another without exercise of independent judgment and not all features of a secondary reference need to be bodily incorporated into a primary reference.

For the reasons above and on the present record, we determine that the information presented in the Petition shows a reasonable likelihood that Petitioners would prevail in proving the claim 10 is unpatentable over Louvel, Thomas, and Jimenez.

2. Ground 2 – Louvel, Thomas, Jimenez, and Yavnai

Petitioners contend that dependent claim 3 is obvious in view of Louvel, Thomas, Jimenez, and Yavnai. Pet. 19, 49–51.

a. Yavnai (Ex. 1009)

Yavnai relates to "remotely-controlled unmanned mobile devices adapted to function as a robot scout." Ex. 1009, 1:6–10. The unmanned mobile device ("UMD") includes a "ducted rotor having a plurality of propellers." *Id.* at 1:50–52. Figure 1(a) of Yavnai is reproduced below.

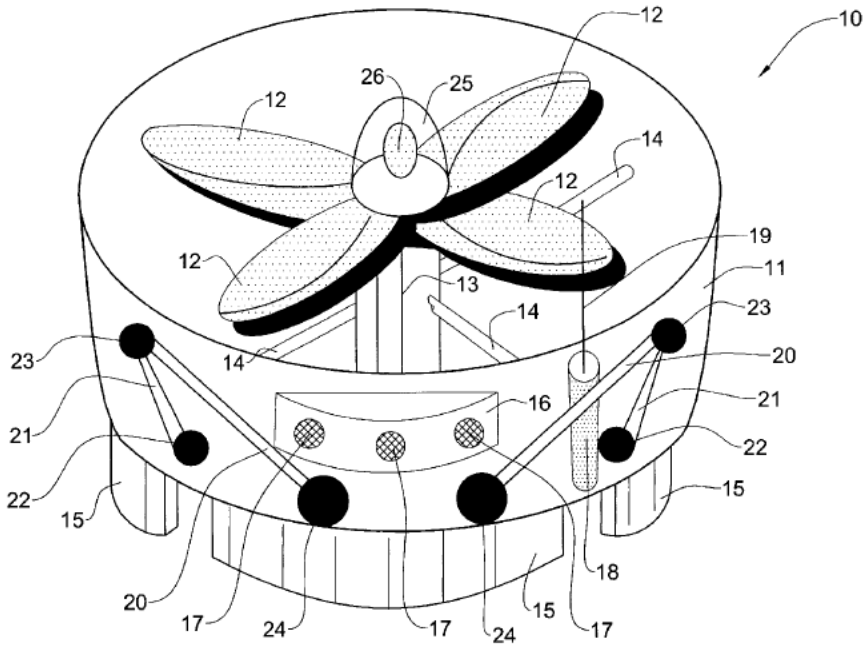


FIG. 1A

Figure 1(a) is a perspective view of an unmanned mobile device. *Id.* at 4:19–21. UMD 10 has toroidal duct 11 surrounding rotor and propeller assembly 12. *Id.* at 4:56–58. The structure "creates a ducted aerodynamic fan blowing an air stream through the duct which acts to propel the UMD." *Id.* at 4:60–62.

b. Claim 3

Claim 3 depends from claim 1 and recites "wherein each of said thrusters comprises an electrically powered ducted fan." Petitioners argue that Louvel, Thomas, and Jimenez teach or suggest the limitations of claim

1, and that a person of ordinary skill in the art "would understand that the propeller arrangement disclosed by Louvel functions as a ducted fan." Pet. 49. Petitioners also argue that, to the extent Louvel does not teach or suggest a ducted fan, Yavnai teaches or suggests the "electrically powered ducted fan" of claim 3. Pet. 49–50 (citing Ex. 1009).

Petitioners provide reasons why a person of ordinary skill would consider the asserted references. Pet. 51 (citing Exs. 1004, 1009). Petitioners also contend that a person of ordinary skill "would have recognized that the directed propellers of Louvel would benefit from ducts," such as reducing losses in thrust and shielding propellers from human contact. Pet. 51 (citing Ex. 1009; Chowdhary Decl. ¶ 168).

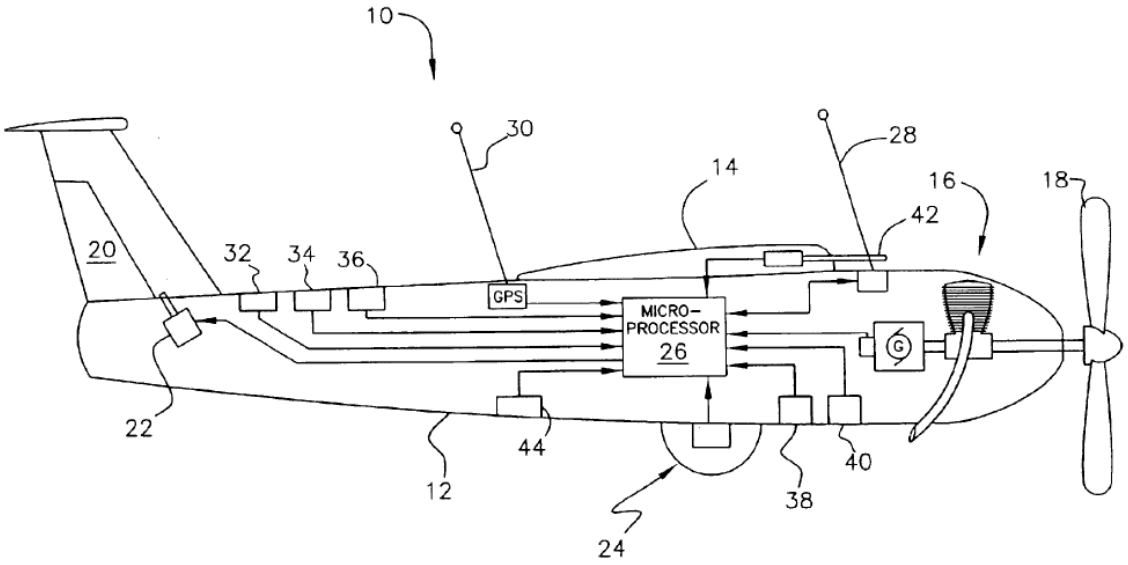
Petitioners' arguments for claim 3 do not remedy the deficiency discussed above in relation to claim 1, from which claim 3 depends. Petitioners, therefore, do not demonstrate a reasonable likelihood that they would prevail with respect to their challenge of claim 3 as unpatentable over Louvel, Thomas, Jimenez, and Yavnai.

3. Ground 3 – Louvel, Thomas, Jimenez, and Carroll

Petitioners contend that dependent claims 4 and 8 are obvious in view of Louvel, Thomas, Jimenez, and Carroll. Pet. 19, 52–54.

a. Carroll (Ex. 1008)

Carroll relates to "control of miniature unmanned aircraft, wherein directional control is remotely controlled, and other aspects of flight . . . are automatically controlled from within the aircraft." Ex. 1008, 1:28–32. The only figure of Carroll is reproduced below.



The figure shows miniature, unmanned aircraft 10. Ex. 1008 at 2:64–65. Aircraft 10 has a remotely controlled guidance system with microprocessor 26 and radio frequency transceiver 28 "to receive remotely generated flight direction commands and to communicate flight direction commands to microprocessor 26." *Id*. at 3:20–27.

b. Claims 4 and 8

Claims 4 and 8 depend from claims 1 and 6, respectively, and require "RF transceivers providing two-way RF communications." Petitioners argue that Carroll teaches or suggests the limitations of claims 4 and 8. Pet. 52–53 (citing Ex. 1008 at 3:20–27, 3:51–55, 4:1–4, Fig.). Petitioners also argue that one of ordinary skill in the art would have looked to both Louvel and Carroll. *Id*. at 53–54 (citing Ex. 1004 ¶¶ 1, 8; Ex. 1008 at 1:28–32, 2:1–7). Petitioners assert that it would have been obvious to replace the wired communication of Louvel or the one-way RF system of Jimenez with the transceiver of Carroll because the "advantages of the Carroll communication system . . . allows the controller device to incorporate information derived from sensors on the aircraft" and would eliminate complications from the

weight of an attached cable. Pet. 54 (citing Chowdhary Decl. ¶ 173; Ex. 1004 ¶ 92).

Petitioners' arguments for claims 4 and 8 do not address the deficiency discussed above in relation to claims 1 and 6, from which they depend. Therefore, the Petition fails to demonstrate a reasonable likelihood of prevailing in the challenge of claims 4 and 8 as unpatentable over Louvel, Thomas, Jimenez, and Carroll.

C. Grounds Based on Gordon

Petitioners contend that (1) claims 1, 2, 5–7, 9, and 10 are obvious in view of Gordon and Thomas; (2) claim 3 is obvious in view of Gordon, Thomas, and Yavnai; and (3) claims 4 and 8 are obvious in view of Gordon, Thomas, and Carroll. Pet. 19, 55–74. Petitioners cite to these references and the Chowdhary Declaration. *See id.* at 55–74.

1. Ground 4 – Gordon and Thomas

a. Gordon (Ex. 1005)

Gordon states that the "Georgia Tech Aerial Robotics Team has been working on autonomous control of an unmanned aerial vehicle for three years as both a research project and a competition entry." Ex. 1005, 298. It also states that "[e]xamining the requirements of the competition it is clear that the chosen vehicle must possess the ability to vertical take-off and land (VTOL), hover and control with respect to a ground point," and "[o]f the currently proven aircraft configurations at hand, the helicopter best satisfied these needs – possessing both the VTOL and hover capabilities, as well as the highest efficiency." *Id*. at 300. Gordon also points to the "well documented" ability to control helicopter movement, availability as an "off the shelf item" in various sizes, "widely available" parts, and "extensive

knowledge base of experienced builders and pilots" at local hobby clubs. Ex. 1005 at 300. Gordon concludes that "[t]hese advantages, combined with the extensive theoretical and computational knowledge base in rotorcraft found at Georgia Tech, made the conventional helicopter configuration the most suitable platform." *Id.* Figure 2 of Gordon is reproduced below.

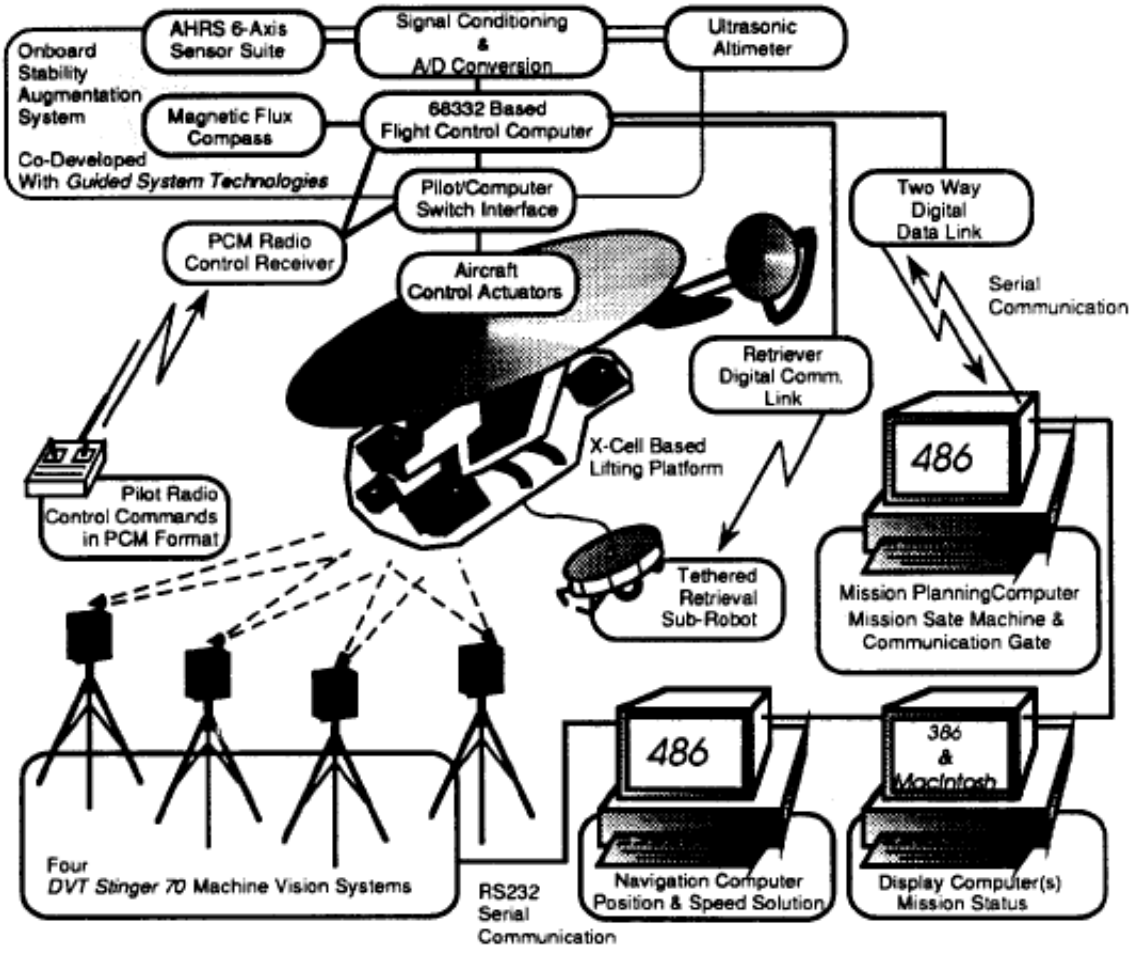


Figure 2- Georgia Tech Aerial Robitics System Block Diagram

Figure 2 shows a block diagram of the "Georgia Tech Aerial Robotics System." *Id.* at 305.

b. Claims 1, 2, 5–7, 9, and 10

Claim 1 recites a "radio-controlled (RC) homeostatic flying hovercraft comprising: a flying structure having lift generated by at least four electrically, powered generally downwardly directed thrusters." Petitioners argue that "Gordon discloses a remote-controlled aerial vehicle . . . such as a 'model helicopter.'" Pet. 55 (citing Ex. 1005 at 298).

Petitioners assert that it would have been obvious "to modify Gordon to be a four-thruster hovercraft" because the "decision to use a particular number of thrusters was a routine design choice." *Id*. (citing Chowdhary Decl. ¶ 179). Petitioners point to the decision to use two main rotor blades instead of four main rotor blades and cite the "low disk loading and low rotor speed with minimum downloading" as indications that the number of thrusters is a routine design choice. *Id.* at 55–56 (citing Ex. 1005 at 300, 301). Petitioners further assert that a person of ordinary skill in the art "would have known that the bi-rotor configuration detailed in Gordon could easily be replaced with four rotors." *Id*. at 56 (citing Chowdhary Decl. ¶ 179; Ex. 1013).

Petitioners provide insufficient argument and evidence that one of ordinary skill in the art, upon reading Gordon, would have modified or replaced the helicopter of Gordon with a four-thruster flying structure, as required by claim 1. Gordon describes many advantages of using a model helicopter over the "many types of VTOL aircraft," such as the well-documented ability to control helicopter movement, off-the-shelf availability, widely available parts, and extensive user knowledge base. *See* Ex. 1005 at 300. Gordon states that "[t]hese advantages . . . made the conventional helicopter configuration the *most suitable platform*" for the

purposes of Gordon. *See id.* (emphasis added). Petitioners' position does not explain persuasively why, in view of all the advantages described by Gordon for using a model helicopter, a person of ordinary skill in the art would have modified Gordon's system to include a four-thruster flying structure, rather than a model helicopter. Petitioners cite to paragraph 179 of the Chowdhary Declaration (Pet. 55–56), but the cited paragraph substantially repeats the arguments found in the Petition that we find insufficient. Moreover, Petitioners inadequately explain how the modification of Gordon to be a four-thruster hovercraft would be a "routine design choice." *See* Pet. 55–56.

Petitioners contend that the limitations of independent claims 6 and 10 "are expressly disclosed by the prior art for the same reasons discussed above in connection with claim 1." Pet. 64–65. For the reasons discussed above, we are not persuaded that Gordon and Thomas teach or suggest a "radio-controlled (RC) homeostatic flying hovercraft comprising: a flying structure including: at least four electrically, powered generally downwardly directed thrusters," as required by claim 6, or a "method for operating a radio controlled (RC) homeostatic flying hovercraft having at least four battery powered generally downwardly directed thrusters," as required by claim 10.

Claims 2 and 5 depend from claim 1, and claims 7 and 9 depend from claim 6. Petitioners contend that Gordon teaches or suggests a flying body with a body housing thrusters (Pet. 65–66), that Gordon and Thomas teach or suggest tilted thrusters (*id.* at 66–67), and that Gordon teaches or suggests automatically controlling moment-to-moment balance and stabilization (*id.*

at 68–69). These arguments do not address the deficiency discussed above for claims 1 and 6.

Accordingly, Petitioners fail to demonstrate a reasonable likelihood of prevailing in the challenge of claims 1, 2, 5–7, 9, and 10 as unpatentable over Gordon and Thomas.

2. Ground 5 – Gordon, Thomas, and Yavnai

Claim 3 depends from claim 1. Petitioners argue that claim 3 is obvious in view of Gordon, Thomas, and Yavnai. Pet. 19, 69–71. In particular, Petitioners contend that Yavnai teaches or suggests an "electrically powered ducted fan," as required by claim 3, and that one of ordinary skill in the art would have combined Gordon, Thomas, and Yavnai. Pet. 69–71 (citing Ex. 1005 at 298, 300; Ex. 1009 at 1:6–7, 1:43–45, 1:47–48, 1:50–54, 2:15–19, 4:56–65, 5:12–17, 5:19–22, Fig. 1B; Chowdhary Decl. ¶¶ 240–242). Petitioners' arguments for claim 3 do not remedy the deficiency discussed above in relation to claim 1, from which claim 3 depends.

Petitioners, therefore, do not demonstrate a reasonable likelihood that they would prevail with respect to their challenge of claim 3 as unpatentable over Gordon, Thomas, and Yavnai.

3. Ground 6 – Gordon, Thomas, and Carroll

Petitioners assert that claims 4 and 8, which depend from claims 1 and 6, respectively, are obvious in view of Gordon, Thomas, and Carroll. Pet. 19, 71–74. Specifically, Petitioners contend that Carroll teaches or suggests bidirectional RF communication and that one of ordinary skill in the art would have combined Gordon, Thomas, and Carroll. Pet. 72–74 (citing Ex. 1005 at 298, 299, 302; Ex. 1008 at 1:28–32, 2:1–4, 3:20–27, 3:51–55, 4:1–4,

Fig.; Chowdhary Decl. ¶¶ 247–248). Petitioners' arguments for claims 4 and 8 do not address the deficiency discussed above in relation to claims 1 and 6, from which they depend.

Petitioners, thus, fail to demonstrate a reasonable likelihood that they would prevail with respect to their challenge of claims 4 and 8 as unpatentable over Gordon, Thomas, and Carroll.

III. CONCLUSION

For the foregoing reasons, we determine that the information presented in the Petition in view of the Preliminary Response shows a reasonable likelihood that Petitioners would prevail in proving that claim 10 of the '239 patent is unpatentable over Louvel, Thomas, and Jimenez.

At this stage of the proceeding, the Board has not made a final determination as to the patentability of any challenged claim or any underlying factual and legal issues.

IV. ORDER

Accordingly, it is:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review is hereby instituted as to claim 10 of U.S. Patent No. 7,931,239 B2 on the ground that, under 35 U.S.C. § 103, claim 10 is unpatentable over Louvel, Thomas, and Jimenez;

FURTHER ORDERED that *inter partes* review commences on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial;

FURTHER ORDERED that the trial is limited to the ground of unpatentability listed above, and no other grounds of unpatentability are authorized for *inter partes* review.

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