that the image of Figure 10 is generated using square polygons. Square polygons are not plainer, and therefore, typically are not used for generating images. In contrast, triangular polygons are plainer and are typically used for displaying three-dimensional projected images.

2. Lyons Does Not Teach or Make Obvious the Claimed Inventions

In contrast to the teachings of Lyons, claim 1 requires the use of a digital database stored in the control center, and a computer that transforms the database "to provide three-dimensional projected" images based on the position and orientation data received from the RPV. Thus, the digital database of claim 1 is used to generate a three-dimensional projected image for the pilot, whereas: 1) the moving map of Lyons is a two-dimensional image generated using film; and 2) the digital database of Lyons is used for updating the two-dimensional moving map to correct for error associated with the dead reckoned positions, not for display.

Similarly, independent claim 14 requires a database comprising terrain data and a computer "configured to access said terrain data according to "information identifying the remotely piloted craft's position and orientation in three-dimensional space" and configured to transform said terrain data to provide three-dimensional projected image data representing said remotely piloted aircraft's environment." Furthermore, claim 14 requires a display to display the three-dimensional image data.

Independent claim 24 covers a remotely piloted aircraft having a communication system for transmitting the remotely piloted aircraft's position and orientation to a pilot station "for transformation into a three-dimensional projected image of said remotely piloted aircraft's environment according to a database representing real terrestrial terrain using polygons."

Finally, independent method claim 32 requires: 1) "communicating said current position and orientation from said remotely piloted craft to a pilot station;" 2) "accessing a database comprising terrain data that represents real terrestrial terrain as a set of polygons;" 3) "transforming said terrain data into image data representing a simulated three-dimensional view according to the current position and orientation of said remotely piloted aircraft;" and 4) "displaying said three-dimensional view using said image data."

The remaining pending claims are each dependent on one of the allowable base claims 1, 14, 24, and 32. For at least these reasons, Applicant respectfully submits that this rejection has been overcome.

35 U.S.C. §103 rejection, over Lyons, et al. in view of Kanaly (US Patent 4,405,943)

The Examiner has rejected Claims 10, 11, 19, 20, 33, 46-47 under 35 U.S.C. §103 as being obvious over Lyons, et al. ("Lyons") in view of Kanaly (US Patent 4,405,943). Claims 10, 11, 19, 20 and 33 are each dependent on one of the allowable base claims 1, 14, 24, and 32. Claims 46 and 47 have been canceled (without prejudice). For at least this reason, Applicant respectfully submits that this rejection has been overcome with respect to claims 10, 11, 19, 20 and 33.

35 U.S.C. §103 rejection, over Lyons, et al. in view of Thornberg, et al. (US Patent 5,552,983)

The Examiner has rejected Claims 12-13, 21-22, and 48-49 under 35 U.S.C. §103 as being obvious over Lyons, et al. ("Lyons") in view of Thornberg, et al. (US Patent 5,552,983) Claims 12, 13, 21-22 are each dependent on one of the allowable base claims 1 and 14. Claims 48 and 49 have been canceled (without prejudice). For at least this

reason, Applicant respectfully submits that this rejection has been overcome with respect to claims 12, 13, 21, and 22.

Conclusion

Applicant respectfully submits that the rejections have been overcome by the amendments and remarks, and that the Claims are now in condition for allowance. Accordingly, Applicant respectfully requests the rejections be withdrawn and the Claims as amended be allowed.

Drawing Corrections

The drawings have been objected to by the draftsman. The Applicant will file amended drawings at the time of allowance of the present application.

Invitation for a telephone interview

The Examiner is invited to call the undersigned at 408-720-8598 if there remains any issue with allowance of this case.

Charge our Deposit Account

Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 10/21, 1997

Daniel M. De Vos
Reg. No. 37,813

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025-1026
(408) 720-8598

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
A Limited Liability Partnership Including Law Corporations

1279 Oakmead Pa y
Sunnyvale, California 94086
(408) 720-8598 Telephone
(408) 720-9397 Facsimile

Facsimile Transmittal Sheet

RECEIVED
OCT 21 1997
GROUP 2300

Date: 10/21/97

URGENT

Deliver to: Tan Nguyen

Fax No. (703) 308-5358

FROM BSTZ:

From: Daniel De Vos
Operator: Dawn Roberts
Page 1 of 14

To Firm: U.S. PATENT AND TRADEMARK OFFICE
Phone:
Your Ref: Applic. No.: 08/587,731
Our Ref: 002055.P004
Title: A METHOD AND APPARATUS FOR REMOTELY PILOTING AN AIRCRAFT

Message:

As agreed, Applicant is resubmitting the response previously faxed on September 11, 1997. To complete the record, following is a brief summary of the reasons (as understood by the Applicant) for resubmitting the response:

On September 11, 1997 applicant faxed 14 pages to the Patent and Trademark Office. These 14 pages included a fax cover page, two copies of a two page Transmittal letter, and a nine page response. In response, Applicant received a paper mailed on September 12, 1997 indicating that applicant's response was non-responsive. In a telephone discussion, it was determined that only one page of applicant's nine page response was actually received.

Sincerely,

Daniel M. De Vos

RECEIVED
OCT 21 1997
GROUP 2300

Attorney's Docket No.: 002055.P004 Patent

In re the Application of: Jed Margolin
(Inventor(s))

Application No.: 08/587,731

Filed: January 19, 1996

For: A Method and Apparatus for Remotely Piloting an Aircraft
(title)

ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

SIR: Transmitted herewith is an Amendment for the above application.

_____ Small entity status of this application under 37 C.F.R. §§ 1.9 and 1.27 has been established by a verified statement previously submitted.

_____ A verified statement to establish small entity status under 37 C.F.R. §§ 1.9 and 1.27 is enclosed.

__X__ No additional fee is required.

The fee has been calculated as shown below:

	(Col. 1) Claims Remaining After Amd.		(Col. 2) Highest No. Previously Paid For	(Col. 3) Present Extra	SMALL ENTITY Rate	SMALL ENTITY Additional Fee	OTHER THAN A SMALL ENTITY Rate	OTHER THAN A SMALL ENTITY Additional Fee
Total Claims	* 38	Minus	** 49	0	x11	$	x22	$ 0
Indep. Claims	* 4	Minus	*** 5	0	x40	$	x80	$ 0
____ First Presentation of Multiple Dependent Claim(s)					+130	$	+260	$
					Total Add. Fee	$	Total Add. Fee	$ 0

* If the entry in Col. 1 is less than the entry in Col. 2, write "0" in Col. 3.

** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 20, write "20" in this space.

*** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 3, write "3" in this space. The "Highest No. Previously Paid For" (Total or Independent) is the highest number found from the equivalent box in Col. 1 of a prior amendment or the number of claims originally filed.

I hereby certify that this correspondence is being transmitted by facsimile to the United States Patent and Trademark Office in accordance with 37 CFR § 1.6(d), on the date shown below.

Name: Dawn Roberts

Signature: Dawn Roberts

Date: 10/21/97

(LJV/cak 10/25/96)

_____ A check in the amount of $_____ is attached for presentation of additional claim(s).
_____ Applicant(s) hereby Petition(s) for an Extension of Time of _____ month(s) pursuant to 37 C.F.R. § 1.136(a).
_____ A check for $_____ is attached for processing fees under 37 C.F.R. § 1.17.
_____ Please charge my Deposit Account No. 02-2666 the amount of $_____.
A duplicate copy of this sheet is enclosed.
__X__ The Commissioner of Patents and Trademarks is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 02-2666 **(a duplicate copy of this sheet is enclosed)**:
__X__ Any additional filing fees required under 37 C.F.R. § 1.16 for presentation of extra claims.
__X__ Any extension or petition fees under 37 C.F.R. § 1.17.

BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP

Date: 10/21, 1997

Daniel M. De Vos

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12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025
(408) 720-8598

(LJV/cak 10/25/96)

01002

Attorney's Docket No.: 002055.P004 Patent

In re the Application of: Jed Margolin
(Inventor(s))

Application No.: 08/587,731

Filed: January 19, 1996

For: A Method and Apparatus for Remotely Piloting an Aircraft
(title)

ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

SIR: Transmitted herewith is an Amendment for the above application.

_____ Small entity status of this application under 37 C.F.R. §§ 1.9 and 1.27 has been established by a verified statement previously submitted.

_____ A verified statement to establish small entity status under 37 C.F.R. §§ 1.9 and 1.27 is enclosed.

__X__ No additional fee is required.

The fee has been calculated as shown below:

	(Col. 1) Claims Remaining After Amd.		(Col. 2) Highest No. Previously Paid For	(Col. 3) Present Extra	SMALL ENTITY Rate	SMALL ENTITY Additional Fee	OTHER THAN A SMALL ENTITY Rate	OTHER THAN A SMALL ENTITY Additional Fee
Total Claims	* 38	Minus	** 49	0	x11	$	x22	$ 0
Indep. Claims	* 4	Minus	*** 5	0	x40	$	x80	$ 0
[ ]	First Presentation of Multiple Dependent Claim(s)				+130	$	+260	$
					Total Add. Fee	$	Total Add. Fee	$ 0

* If the entry in Col. 1 is less than the entry in Col. 2, write "0" in Col. 3.

** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 20, write "20" in this space.

*** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 3, write "3" in this space. The "Highest No. Previously Paid For" (Total or Independent) is the highest number found from the equivalent box in Col. 1 of a prior amendment or the number of claims originally filed.

I hereby certify that this correspondence is being transmitted by facsimile to the United States Patent and Trademark Office in accordance with 37 CFR § 1.6(d), on the date shown below.

Name: [signature]

Signature: [signature]

Date: 10/21/97

(LJV/cak 10/25/96)

01003

_____ A check in the amount of $_____ is attached for presentation of additional claim(s).
_____ Applicant(s) hereby Petition(s) for an Extension of Time of _____ month(s) pursuant to 37 C.F.R. § 1.136(a).
_____ A check for $_____ is attached for processing fees under 37 C.F.R. § 1.17.
_____ Please charge my Deposit Account No. 02-2666 the amount of $_____.
A duplicate copy of this sheet is enclosed.
__X__ The Commissioner of Patents and Trademarks is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 02-2666 **(a duplicate copy of this sheet is enclosed)**:
__X__ Any additional filing fees required under 37 C.F.R. § 1.16 for presentation of extra claims.
__X__ Any extension or petition fees under 37 C.F.R. § 1.17.

Date: 10/21, 1997

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

ORIGINAL SIGNED BY

10/21/97

Daniel M. De Vos

Reg. No. 37,813

12400 Wilshire Boulevard
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Los Angeles, California 90025
(408) 720-8598

(LJV/cak 10/25/96)

08/587,731

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
08/587,731	01/19/96	MARGOLIN	J 002055.P004

LM21/1128

BLAKELY SOKOLOFF TAYLOR AND ZAFMAN
12400 WILSHIRE BOULEVARD
7TH FLOOR
LOS ANGELES CA 90025

EXAMINER	
NGUYEN, T	
ART UNIT	**PAPER NUMBER**
2763	8

DATE MAILED: 11/28/97

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

OFFICE ACTION SUMMARY

☒ Responsive to communication(s) filed on 10/21/1997.

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 D.C. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-38 ☒ are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-38 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of Reference Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

– SEE OFFICE ACTION ON THE FOLLOWING PAGES –

01005

PTOL-326 (Rev. 10/95)

* U.S. GPO: 1996-409-290/40007

DETAILED ACTION

Notice to Applicant(s)

1. This office action is responsive to the amendment filed on October 21, 1997. As per request, claims 39-49 have been canceled. Thus, claims 1-38 are pending.

Drawings

2. The drawings are objected to under 37 CFR § 1.84 for the reasons set forth by the draftsman. See attached PTO-948 form for details. Correction is required. However, correction of the noted defect can be deferred until the application is allowed by the examiner.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made

to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-9, 14-18, 23-32, and 34-38 rejected under 35 U.S.C. § 103(a) as being unpatentable over Lyons et al. (an article entitled "Some Navigation Concepts For Remotely Piloted Vehicles", AGUARD Conference Proceedings No. 176 on Medium Accuracy Low Cost Navigation, September 1975, pages 5-1 to 5-15) in view of Wysocki et al. (5,381,338) or Fant (4,835,532) or Beckwith et al. (4,660,157).

a. With respect to claims 1, 2, and 14, Lyons et al. disclose the invention as claimed (see at least the abstract) including a remotely piloted aircraft (see figure 8, RPV), a communications system for communicating flight data between a computer and said remotely piloted aircraft, said flight data including said remotely piloted aircraft's position and orientation, said flight data also including flight control information for controlling said remotely piloted aircraft (see page 5-2, section Radio Navigation Using a Data Link, and figure 6 and the related text), a digital database comprising terrain data (see pages 5-3 and 5-4, section Terrain Map Correlation; and figure 8). Lyons et al. further disclose that the computer accesses said terrain data according to said remotely piloted aircraft's position and to transform said terrain data to provide a projected image data according to said remotely piloted aircraft's orientation; a display

for displaying said projected image data (see page 5-4, third paragraph, and figure 8), and a remote flight control coupled to said computer for inputting said flight control information (see figure 6).

Lyon et al. do not explicitly disclose that the computer produce a three dimensional image data from the digital database and the navigation information. However such feature is well known at the time the invention was made (for examples, see figure 1 and the related text in Wysocki et al.; see figures 1, 3 and the related text in Fant; or see figures 1, 4 and the related text in Beckwith et al.). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of either Wysocki et al., Fant, or Beckwith et al. into the system of Lyon et al. in order to improve the system with the enhanced capability of displaying three-dimensional image of the remoted aircraft over the terrain data.

b. With respect to claim 3, Lyons et al. disclose that the flight data communicated between said remotely piloted aircraft and said computer is secured (see page 5-2, first paragraph of the Radio Navigation Using Data Link section).

c. With respect to claims 4, 5, 7, and 15, Lyons et al. disclose that said remotely piloted aircraft further comprises a infra red sensor image (video camera) and means for communicating and displaying video data representing images captured by the sensor image (see page 5-3, section Map Matching, and figure 8).

24-31. Therefore, claims 32 and 34-38 are rejected for the same rationales set forth for claims 24-31.

5. Claims 10, 11, 19, 20, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyons et al., Wysocki et al. or Fant or Beckwith et al. as applied to claims 1-9, 14-18, 23-32, and 34-38, and further in view of Kanaly (4,405,943).

Lyons et al. disclose the claimed invention as discussed above except for the determination of a delay time for communicating said flight data between said computer and said remotely piloted aircraft, and adjusting the sensitivity of said set of one or more remote flight controls based on said delay time. However, Kanaly does suggest delay time for communicating between the ground station and the remote airborne into account of controlling the remote airborne (see at least column 3, lines 15-24, and column 8, line 54 to column 9, line 6). It would have been obvious to incorporate the teaching of Kanaly into the system of Lyons et al. in order to improve the system with the enhanced capability of providing more accurate the remote flight controls to the remoted vehicle and receiving the accurate position and heading data of the vehicle from the remoted vehicle.

6. Claims 12-13, and 21-22 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Lyons et al., Wysocki et al. or Fant or Beckwith et al. as applied to claims 1-9, 14-18, 23-32, and 34-38 above, and further in view of Thornberg et al. (5,552,983).

Lyons et al. disclose the claimed invention as discussed above except that the remote flight controls allows for inputting absolute pitch and roll angles. However, such feature is well known in the art at the time the invention was made. For example, Thornberg et al. suggest a variable referenced control system for remotely operated vehicles which includes means for inputting absolute pitch and roll angles for remotely control the unmanned aerial vehicle (see at least figures 5 and 6). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Thornberg et al. into the system of Lyons et al. in order to input the pitch and roll control signals as the flight control signals for remotely control the vehicle.

7. All claims are rejected.

Remarks

8. Applicant's arguments filed on October 27, 1997 have been fully considered and they are deemed to be persuasive. However, upon the updated search, the new ground of rejections has been set forth as above.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Tan Nguyen, whose telephone number is (703) 305-9755. The examiner can normally be reached on Monday-Thursday from 7:30 AM-5:00 PM. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin J. Teska, can be reached on (703) 305-9704.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-3900.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 308-9051, (for formal communications intended for entry)

Or:

(703) 308-5357 (for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

/tqn
November 20, 1997

Tan Nguyen
TAN Q. NGUYEN
PATENT EXAMINER

Attorney's Docket No. 2055.P004

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#9/IDS 4/1/98

In re Application of:
Jed Margolin

Application No. 08/587,731

Filed: January 19, 1996

For: A Method and Apparatus for Remotely Piloting an Aircraft

Examiner: T. Nguyen

Art Unit: 3614

Assistant Commissioner for Patents
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT

Sir:

Enclosed is a copy of Information Disclosure Citation Form PTO-1449 together with copies of the documents cited on that form. It is respectfully requested that the cited documents be considered and that the enclosed copy of Information Disclosure Citation Form PTO-1449 be initialed by the Examiner to indicate such consideration and a copy thereof returned to applicant(s).

Pursuant to 37 C.F.R. § 1.97, the submission of this Information Disclosure Statement is not to be construed as a representation that a search has been made and is not to be construed as an admission that the information cited in this statement is material to patentability.

Pursuant to 37 C.F.R. § 1.97, this Information Disclosure Statement is being submitted under one of the following (as indicated by an "X" to the left of

FIRST CLASS CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 on February 27, 1998
(Date of Deposit)

Conny Van Dalen
Name of Person Mailing Correspondence

Conny VanDalen
Signature

2-27-98
Date

01012

the appropriate paragraph):

_____ 37 C.F.R. §1.97(b).

__X__ 37 C.F.R. §1.97(c). If so, then enclosed with this Information Disclosure Statement is one of the following:

____ A certification pursuant to 37 C.F.R. §1.97(e) or

__X__ A check for $240.00 for the fee under 37 C.F.R. § 1.17(p).

_____ 37 C.F.R. §1.97(d). If so, then enclosed with this Information Disclosure Statement are the following:

(1) A certification pursuant to 37 C.F.R. §1.97(e);

(2) A petition requesting consideration of the Information Disclosure Statement; and

(3) A check for $_____ for the fee under 37 C.F.R. §1.17(i) for submission of the Information Disclosure Statement.

If there are any additional charges, please charge Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 2/27, 1998

ORIGINAL SIGNED BY
DMD
Daniel M. De Vos
Reg. No. 37,813

12400 Wilshire Blvd.
Seventh Floor
Los Angeles, CA 90025-1026
(408) 720-8598

#9

Sheet 1 of 1

Form PTO-1449
(REV. 8-83)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

ATTY. DOCKET NO.	SERIAL NO.
02055.P004	08/587,731
APPLICANT: Jed Margolin	
FILING DATE: 1-19-96	GROUP: 3614

INFORMATION DISCLOSURE CITATION

(Use several sheets if necessary)

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
TN		4,964,598	10/23/90	Berejik, et al.	244	190	12/19/88

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

TN		Shifrin, Carole A., "Gripen Likely to Fly Again Soon," Aviation Week & Space Technology, August 23, 1993, p.72-73.

EXAMINER	DATE CONSIDERED
Jan Mayer	04/30/98

*EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

GRIPEN LIKELY TO FLY AGAIN SOON

CAROLE A. SHIFRIN/LONDON

A preliminary report on the crash of the Swedish JAS 39 Gripen fighter earlier this month has put blame on the flight control system's high amplification of stick commands combined with the pilot's "large, rapid stick movements."

"This led to the stability margin being exceeded and the aircraft entering a stall," Sweden's accident investigation board said. The panel said a contributing factor was the late display of the aircraft's "STYRSAK" flight attitude warning, which gave the pilot too little time to react.

The board said action should be taken to eliminate the risk of pilot-induced oscillation in the aircraft's envelope. After this has been implemented and verified, the board said it saw no safety reason why flights should not be resumed.

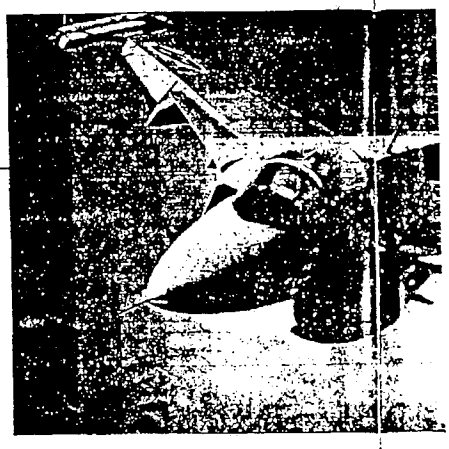
The preliminary report of the Aug. 8 accident ruled out a system or design deficiency in the Gripen's advanced flight control system, which had caused the crash of the first prototype in February, 1989. A finding of a serious design fault would have caused a major reevaluation of the multirole Gripen (*AW&ST* Aug. 16, p. 78).

The problem will be relatively easy to correct and the aircraft should be flying again within the next three to five weeks, Swedish air force officials said.

The preliminary report on the crash, which occurred during an air display over central Stockholm, said that Saab Military Aircraft test pilot Lars Rodestrom had entered a low-speed turn at a 280-meters (919-ft.) altitude with lit afterburner and a speed of 285 km./hr. (154 kt.). During the left turn, the aircraft's angle of bank was about 65 deg., loading about 2g and angle of attack about 21 deg.

When leaving the turn, the pilot applied an almost maximum movement of the control stick to the right as he was pushing it forward to assume level flight. The large stick movement caused the aircraft to roll over to the right while the angle of attack decreased. Attempting to level quickly, Radestrom then applied a large movement of the stick to the left while continuing to push forward to lower the nose.

The elevons moved with maximum speed, changing the aircraft's flying characteristics and reducing its stability margin. This is when the control system sent a signal to the aircraft's STYRSAK warning system that the maximum rate of elevon deflection had been reached. The aircraft responded to the pilot's command with a roll to the left combined with a nose-up movement.



To correct these movements, Radestrom moved the stick almost all the way to the right and somewhat forward. The aircraft then rolled to the right with an angle of bank of about 35 deg. in combination with a nose-down movement to –7 deg. angle of pitch. Radestrom then moved the stick rapidly backwards and to the left to lift the nose at the same time that the aircraft's stabilizing functions attempted to lift the nose.

"This caused the nose-up movement to be amplified so much that the stabilizing effect of the elevons was insufficient, whereupon the aircraft went into a superstall and became uncontrollable," the preliminary report said.

The STYRSAK warning to the pilot that

TAIWAN INDUSTRY SEEKS MAJOR GROWTH

MICHAEL MECHAM, TAIPEI, TAIWAN

Taiwan aerospace companies, which now have annual military and civil aerospace programs valued at some $1 billion, want to grow six times as large by the end of the decade through joint-venture work with foreign partners.

That theme was stressed last week at the Taipei Aerospace Technology Exhibition, which attracted 230 exhibitors from 15 nations—60% more than in its first outing two years ago. The exhibition is proving such a draw that organizers are considering the inclusion of flying displays for 1995.

THE REPUBLIC OF CHINA'S IDF fighter was shown only in a full-scale mockup version inside the exhibition hall. But two of the first production models—single- and twin-seat versions—were publicly displayed for the first time at the nearby Shun-Shan air base. They appeared alongside the AT-3 advanced jet trainer, shown in a single-seat light fighter configuration and as a twin-seat trainer. Taiwan Aerospace hopes to compete the AT-3 in the U. S. Joint Primary Aircraft Training System competition.

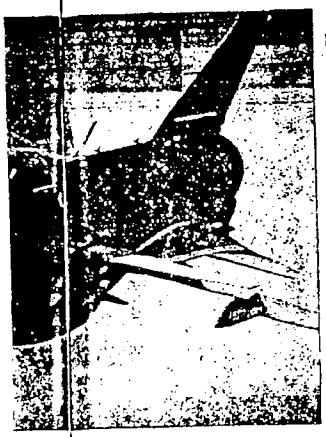
By government estimate, Taiwan's annual aerospace growth rate will be 20% through 1996. Achieving $6 billion in annual maintenance and production work by 2000 would be even more spectacular. But David R. C. Chu, director of the Committee for Aviation and Space Industry Development (CASID), said it should be possible, using the pending British Aerospace/Taiwan Aerospace agreement to jointly produce the RJ regional commuter jet and the pending F-16 and Mirage 2000-5 fighter acquisitions as springboards.

CASID, the government agency charged with promoting Taiwan aerospace development, has strong backing from President Lee Teng-hui. In an address prepared for the exhibition, Lee emphasized that of the eight key industrial technologies identified in his national economic stimulus package, seven are applicable to aerospace.

CHU DESCRIBED TAIWAN'S goal as being an Asian aerospace "hub" in league with foreign partners rather than any grander scheme of acquiring technology now in hopes of setting off later on an independent course.

"Our goal is to be the best partner of the best companies," he said.

Neither Dassault nor ROC Defense Ministry officials will discuss details of the pending sale of Mirage 2000-5s. Of particular interest is what type of offset agreement might be achieved for the fighter.



First JAS 39 delivered to the Swedish air force crashed during a flight display in Stockholm.

he was beginning to saturate the control system was displayed 1 sec. after the rapid stick movement. Just 6.2 sec. elapsed from the time the pilot gave the command to leave the turn until he ejected.

The delay in display of the STYRSAK warning meant the pilot did not have a chance to react, the report said. The low altitude did not give him the opportunity to take action to regain control of the aircraft, and his decision to eject was correct, it concluded.

Officials said the problem that caused the accident had been identified during the development program. But the risk of the situation occurring in flight was considered "negligible." ■

The model is most likely to be the agreement now being implemented with Lockheed for the F-16. It calls for offsets worth 10% of the $6-billion contract for 150 aircraft.

LOCKHEED OFFICIALS are expected to begin canvassing 19 Taiwan factories this week to select candidates for offset work.

Chu said Taiwan does not have priorities for the offsets. Maintenance and resupply are expected to be the major elements, although original parts supply could be an element in later block deliveries, he said.

Most important is to hear Lockheed's analysis of the local industry, he said. "We have little experience, so we have to rely on Lockheed's expertise," he said.

Taiwan's metallurgy industries are expected to provide the core for the offsets, which means air frame and perhaps some engine parts will be produced. That is because Taiwan should be able to achieve certification in airframe parts faster than in military electronics, Chu said. ■

002055.P004

Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#10/B 4/1/98

In re Application of:
Jed Margolin

Serial No. 08/587,731

Filed: January 19, 1996

For: A Method and Apparatus for Remotely Piloting an Aircraft

Examiner: T. Nguyen

Art Unit: 2304

Assistant Commissioner for Patents
Washington, D.C. 20231

AMENDMENT AND REMARK

Sir:

Responsive to the Office Action mailed on November 28, 1997, the Applicant respectfully requests the Examiner to enter the following amendment and to consider the following remark:

AMENDMENT

In the Specification:

On page 3, line 22, please replace "many" with --may--.

On page 3, line 23, please replace "cameras" with --camera--.

In the Claims:

Please cancel claims 10, 11, 19 and 20, without prejudice.

Please amend the claims as follows:

FIRST CLASS CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 on February 27, 1998
(Date of Deposit)

Conny Van Dalen
Name of Person Mailing Correspondence

Conny Van Dalen 2-27-98
Signature Date

01018

1. (Once Amended) A system comprising:

a remotely piloted aircraft <u>including,</u>

<u>a position determining system to locate said remotely piloted aircraft's position in three dimensions; and</u>

<u>an orientation determining system for determining said remotely piloted aircraft's orientation in three dimensional space;</u>

a communications system for communicating flight data between a computer and said remotely piloted aircraft, said flight data including said remotely piloted aircraft's position and orientation, said flight data also including flight control information for controlling said remotely piloted aircraft;

a digital database comprising terrain data;

said computer to access said terrain data according to said remotely piloted aircraft's position and to transform said terrain data to provide three dimensional projected image data according to said remotely piloted aircraft's orientation;

a display for displaying said three dimensional projected image data; and

a set of one or more remote flight controls coupled to said computer for inputting said flight control information, <u>wherein said computer is also for determining a delay time for communicating said flight data between said computer and said remotely piloted aircraft, and wherein said computer adjusts the sensitivity of said set of one or more remote flight controls based on said delay time</u>.

2. (Once Amended) The system of claim 1, <u>wherein:</u>

said remotely piloted aircraft [including:] <u>includes a device for capturing image data; and</u>

<u>said system operates in at least a first mode in which said image data is not transmitted from said remotely piloted aircraft to said computer at a sufficient data rate to allow for real time piloting of the remotely piloted aircraft</u>

[a position determining system for locating said remotely piloted aircraft's position in three dimensions; and

an orientation determining system for determining said remotely piloted aircraft's orientation in three dimensional space].

~~14.~~ (Once Amended) A station for flying a remotely piloted aircraft that is real or simulated comprising:

a database comprising terrain data;

a set of remote flight controls for inputting flight control information;

a computer having a communications unit configured to receive status information identifying said remotely piloted aircraft's position and orientation in three dimensional space, said computer configured to access said terrain data according to said status information and configured to transform said terrain data to provide three dimensional projected image data representing said remotely piloted aircraft's environment, said computer coupled to said set of remote flight controls and said communications unit for transmitting said flight control information to control said remotely piloted aircraft, said computer also to determine a delay time for communicating said flight control information between said computer and said remotely piloted aircraft, and said computer to adjust the sensitivity of said set of remote flight controls based on said delay time; and

a display configured to display said three dimensional projected image data.

~~24. (Once Amended) A remotely piloted aircraft comprising:~~

a position determining system to locate said remotely piloted aircraft's position in three dimensions;

an orientation determining system to determine said remotely piloted aircraft's orientation in three dimensional space;

53. (New) The method of claim 34, wherein said step of generating said flight control information in response to manual manipulations of the set of manual flight controls on said pilot station includes the step of:

receiving input representing a current position of a directional control; and

interpreting said current position relative to the horizon, rather than a rate of rotation.

REMARK

Applicant respectfully requests reconsideration of this application as amended.

35 U.S.C. §103 rejection, over Lyons in view of Wysoki or Fant or Beckwith

The Examiner has rejected Claims 1-9, 14-18, 23-32, and 34-38 under 35 U.S.C. §103 as being obvious over Lyons in view of Wysoki or Fant or Beckwith.

According to M.P.E.P. § 2142, "[t]o establish a primary facia case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claim combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." (emphasis added).

CLAIMS 1 and 14

Claim 1 has been amended to include the limitations of claims 2, 10 and 11. Similarly Claim 14 has been amended to include the limitations of claims 19 and 20. Thus, Claims 1 and 14 are discussed under the next rejection directed to claims 10, 11, 19, and 20.

CLAIMS 24 AND 32

1. The Office Action Misdescribes Lyons

The office action agrees that Lyons does not teach the generation of "three dimensional image data from the digital database and the navigation information." However, Lyons fails to teach more than just the generation of the 3D image.

Lyons teaches a pilot station that uses dead reckoning to estimate the location of the RPV. As is well known in the art, dead reckoned positions have accumulating error. To correct for this error, the RPV transmits some information to the pilot station. The information transmitted depends on the approach of which Lyons describes two:

1) The transmission of video or radar image data from the RPV to the pilot station. For the video and radar image data (Section 3, including Figure 8), the pilot station provides a two dimensional moving map on which the pilot station indicates the dead reckoned position. At various intervals, the pilot must use the video or radar image to correct the dead reckoned position (This is what Figure 8 shows).

2) The transmission of laser measurements from the RPV to the pilot station. For the laser measurements (Section 4, Figure 10-12), the pilot station includes a database. The pilot station identifies a search area in the database based on the dead reckoned position - where the current dead reckoned position is the center of the search area ("expected RPV position" in Figure 12) and the search area represents the locations the RPV could be due to the accumulating error in the current dead reckoned position. The pilot station then compares the laser measurement for various position in the search area in an effort to locate the correct position of the RPV. Once the database has been used to locate the correct position of the RPV, the pilot station indicates the RPVs actual position on the 2D moving map (this map is not generated based on the database).

One advantage of the laser system being that the error in the dead reckoned position is automatically corrected using the laser and database, whereas the video and radar image data system requires user intervention to update. Another advantage of the laser system is that the laser data requires less bandwidth than the video or radar image data. For a further description of Lyons, see footnote [1].

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[1] In summary, the Lyons reference teaches various techniques for updating the dead reckoned position of remotely piloted aircraft on a two dimensional moving map display available to the pilot. In particular, Lyons contemplates a RPV transmitting information to a control center (Figure 1). The control center is used by the pilot to fly the RPV. To display the position of the RPV to the pilot, the control center provides a "moving map display." As contemplated by Lyons, "the most convenient display mode for the present application is the rolling map or 'passing scene' technique where a new line is added to the top of the display and the scene is shifted slowly downwards" (page 5-3, end of first full paragraph). In particular, Lyons contemplates using film to generate the moving map (Figure 5). The moving map is moved based on the dead reckoned positions of the RPV.

As is well known in the art, dead reckoned positions have accumulating error. To adjust for this error, Lyons describes two basic concepts: 1) map matching (Section 3); and 2) terrain map correlation (Section 4). The map matching concept requires that the RPV transmit some kind of image data to the control center. In Figure 6, the control center is shown having the moving map display and the sensor display (i.e., a display generated from the image data transmitted by the RPV). Lyons contemplates the transmission of two kinds of image data: 1) side looking radar (SLR); and 2) real time forward-looking sensors. When using the SLR system, the SLR generated image data received by the control center allows it to make a downward-looking image. The pilot watches the sensor display (i.e., the display generated based on the transmitted image data) for "likely update features"—landmarks. When the pilot sees a landmark in the sensor display, the pilot presses a transfer button which causes the control center to superimpose the sensor display over the moving map (Figure 5). The pilot then adjusts the moving map so that it matches the overlaid sensor display image and presses an accept button. By adjusting the moving map in this manner, the dead reckoned position of the RPV is updated in an attempt to remove the error associated with the calculation of dead reckoned positions (Page 5-3, second, third, and fourth full paragraphs). The simulated SLR/map update system is illustrated in Figures 7A and 7B.

Having described the SLR-based map matching technique, the real time forward-looking sensor technique will now be described. Lyons describes basically two techniques of updating dead reckoned RPV positions on a moving map using only real time forward-looking sensors: 1) an anamorphic projection technique (page 5-3, fifth full paragraph; figure 8); and 2) a HUD based technique (page 5-3, sixth full paragraph; figure 9). Similar to the SLR based technique, the anamorphic projection technique requires the pilot to watch the sensor display (i.e., the image generated from the transmitted data) for landmarks, press a button which superimposes the transmitted image on the moving map, adjust the moving map, and press an accept button. As described in Lyons, in order to superimpose the forward-looking transmitted image on the moving map, the forward-looking image is transformed using anamorphic projection. Lyons goes on to describe various problems with the anamorphic projection technique, and then describes the HUD based technique.

In the HUD based technique, the pilot is presented with two images: 1) the moving map display (see left-hand image of Figure 9); and 2) the sensor display generated from the image data transmitted from the real time forward-looking sensor on the RPV. The HUD technology is used to allow the pilot to mark landmarks on the forward-looking sensor based image. These HUD markings are then superimposed on the moving map, and the pilot makes the necessary adjustments to the moving map (page 5-3, sixth full paragraph).

In summary, the map matching techniques use the following: 1) the transmission of image data from the RPV to the control center; 2) a display at the control center which shows an image based on the real time image data received from the RPV; 3) a moving map display that is moved based on the dead reckoned position of the RPV; and 4) some manner of superimposing the sensor image onto the moving map to allow the pilot to update the moving map in an effort to correct the error associated with the dead reckoned positions. Neither the sensor display's image nor the moving map can be equated to the generation of "a three-dimensional projected image" generated based upon "a digital database" stored in the control center. The sensor display's image is based on image data transmitted from the RPV, while the moving map contemplated by Lyons is a two-dimensional, top down view displayed using film (see Figures 5 and 7).

Having described the map matching techniques from Lyons, Applicant will now describe the terrain map correlation technique of Lyons. The terrain map correlation technique described in Lyons is also used for correcting the error in dead reckoned positions shown to the pilot by a two-dimensional moving map. In particular, Lyons states at page 5-3, last paragraph:

The office action states that Lyons teaches a remotely piloted aircraft that transmits its position and orientation. However, Lyons actually teaches the remotely piloted aircraft transmitting either: 1) video or radar image data; or 2) laser measurements (see above and footnote). Neither the video/radar image or the laser measurements are the RPVs position, but are data used to either manually or automatically update the dead reckoned position of the Lyons system. Thus, Lyons does not teach the claimed transmission of the remotely piloted aircraft's position and orientation in three dimensional space (see claims 24 and 32).

In addition, the office action cites pages 5-4, third paragraph, and Figure 8 as disclosing a single system that accesses a database based on the remotely piloted aircraft's transmitted position and orientation and transforms the terrain data into a projected image. However, Figure 8 is for a first system in which the RPV uses a "forward looking sensor" to transmit a video image and the pilot station uses anamorphic projection to overlay that image on a 2D moving map, which is not generated by transforming a database of polygons (see page 5-3, paragraph 6), while pages 5-4, third

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> Reconnaissance or forward-looking sensors provide a convenient method of updating the navigation system. However, these sensors required large datalink bandwidth to transmit the video picture to the control center and hence are vulnerable to ECM... Hence, an alternative method of updating the navigation system is desirable. (emphasis added)

The phrase "updating the navigation system" is used throughout Lyons to refer to the adjustment of a two-dimensional moving map in an effort to correct for error due to dead reckoning.

Rather than requiring the user to actively update the moving map display (i.e., push a button which causes the images to be superimposed, adjusting the moving map, and pushing an accept button), the terrain map correlation technique attempts to adjust the moving map (i.e., correct for the dead reckoned error) without pilot intervention using a laser range measurements and a digital elevation database. In operation, the RPV transmits to the control center a set of laser range measurements (including an altimeter reading). The control center uses dead reckoned positions to both adjust the two-dimensional moving map and to estimate the location of the RPV over a digital database map of elevation points stored in the control center (Figure 10). Based on a calculation of the possible error associated with the dead reckoned positions, a search area is identified in the digital database (Figure 12). A search is then performed within this search area to identify the position that most closely matches the transmitted laser range data. The RPV's position is then updated to the location that best matches the transmitted laser ranges in an attempt to correct the error associated with the dead reckoned positions. The moving map is then automatically adjusted (without pilot intervention) to reflect the updated RPV position.

Thus, the digital database of Lyons (conceptually illustrated in Figure 10) is not used to generate a three-dimensional projected image, but is used to update the two-dimensional moving map in an effort to correct for the error in the dead reckoned positions. In addition to the description in Lyons, further support for the fact that the digital database of Lyons is not used to generate a three-dimensional projected image is that the image of Figure 10 is generated using square polygons. Square polygons are not guaranteed to be planar, and therefore, typically are not used for generating images. In contrast, triangular polygons are guaranteed to be planar and are typically used for displaying images.

paragraph describe a second system in which the RPV transmits laser measurements in lieu of a video stream - Lyons describes the advantages of using one over the other.

With reference to the laser system, the database is simply used to correct for the accumulating error in the dead reckoned position. Once the actual location of the RPV is corrected using the database and laser measurements, the database is no longer used or transformed. In contrast, the image generated by Lyon's pilot station is the 2D moving map with an indication of the corrected RPV location (see footnote 1 for support). Thus, Lyons does not teach the claimed transformation of the terrain data in the database to generate a projected image based on the position and orientation transmitted by the RPV.

2. The Combination of Lyons and Wysoki or Fant or Beckwith

The office action cites Wysoki or Fant or Beckwith as teaching the generation of three dimensional image data from a digital database. However, the claimed invention requires that the database represent the terrain using polygons (see Applicant's claim 24, lines 9 - 10 and claim 32, lines 10-11). None of Lyons, Wysoki, Fant or Beckwith generate a projected image using polygons[2]. Furthermore, none of Wysoki, Fant or Beckwith teach the limitations of the claims discussed above with reference to Lyons. Therefore, the combination does not teach the transmission by the RPV of its position and orientation in three dimensional space, and the pilot station using the received position and orientation to transform a database representing real terrestrial terrain using polygons into a three dimensional projected image of the remotely piloted aircraft's environment.

[2] As described above, the data in the database of Lyons is not used to generate an image, but simply to update the dead reckoned position.

With respect to Beckwith, the digital elevation data in the database is points with a constant north up position, not polygons (see col. 6, lines 52-61; col. 7, lines 30-36).

Fant describes the use of two databases: 1) the object library database which contains real-world images; and 2) the gaming area database which provides the information necessary for the placement of the contents of the object library, surfaces, and special effect on a grid or gaming area (see col. 6, line 38 - col. 7, line 10). In particular, the Fant patent is for a high performance computer graphics system that combines Computer Generated Imagery (CGI) with Computer Synthesized Imagers (CSI) to form Computer Generated Synthesized Imagery (CGSI) (see col. 2, line 53 - col. 3, line 12).

Wysoki describes a database of digital orthophotographs (see col. 4, lines 43-51). Digital orthophotographs are computerized images generated by making geometric corrections to scanned aerial photographs. In particular, an aerial photograph contains some degree of distortion. In contrast, maps maintain a constant scale, but lack the detail of an aerial photograph. Orthophotography combines the features of maps and aerial photographs. The aerial photographs are unwrapped (to remove the distortion) and fitted to a particular map projection to create an image map that has uniform scale and known accuracy.

As a result, in certain embodiments of the invention, the remote pilot can fly the RPV without any image data being transmitted by the RPV, but based on the 3D projected image generated by transforming the database, with respect to the RPV position and orientation received by the pilot station from the RPV, into a 3D image. In other words, the pilot in the claimed system need not rely on image data transmitted from the RPV to fly the RPV. For at least this reason, it is respectfully submitted that these claims are allowable over the cited prior art.

35 U.S.C. §103 rejection, over Lyons in view of Wysoki or Fant or Beckwith, and further in view of Kanaly

The Examiner has rejected Claims 10, 11, 19, 20, and 33 under 35 U.S.C. §103 as being obvious over Lyons in view of Wysoki or Fant or Beckwith, and further in view of Kanaly.

As stated above, claim 1 has been amended to include the limitations of claims 2, 10 and 11. Similarly Claim 14 has been amended to include the limitations of claims 19 and 20. Thus, Claims 1 and 14 are discussed under this rejection.

Similar to the limitations of Claims 24 and 32, Claims 1 and 14 require that the RPV transmit its position and orientation in three dimensional space to the pilot station and that the pilot station transform the terrain data with respect to the position and orientation to generate a three dimensional projected image. As previously stated, the combination of reference does not teach these limitations.

In addition, Claims 1, 14 (as amended) and claim 33 include the limitations of determining the delay time for communication between the pilot station and RPV, as well as adjusting the sensitivity of the flight controls based on the determined delay time.

Kanaly does not teach or suggest these limitations. In contrast, Kanaly deals with a system in which a remote operator wears a helmet (on which an oculometer is mounted) that determines where the remote operator is looking. Signals indicating where

the remote operator is looking are sent to the RPV. The RPV includes a camera. The prior art system over which Kanaly distinguishes is one in which the camera on the RPV provides high resolution data in the center and low resolution data on the periphery. As a result, the prior art system must move the camera in response to the remote operators movements. This camera movement introduces a delay in the image provided to the remote operator.

To reduce or remove this delay (not measure it or adjust flight controls) due to movement of the camera, Kanaly teaches having the camera store high resolution data over the whole scene in a memory on board the RPV. The RPV transmits the high resolution imagery corresponding to the center of where the remote operator is looking and low resolution imagery (based on the stored high resolution data) corresponding to the remote operator's peripheral vision. As a result, movement of the remote operator's head merely requires the RPV adjust from where in the memory the high and low resolution data is accessed - the camera need not be moved. "Because the high resolution data is obtained from memory and not from the camera equipment directly, as in the prior art, the scheme in accordance with the present invention permits the camera to be effectively decoupled from the data link." (see col. 2, line 56 - col. 3, line 24; col. 8, line 54 - col. 9, line 6).

Thus, Kanaly does not teach the measurement of a communication delay in order to adjust the sensitively of flight controls based on that delay (see claims 1, 14, and 33). For at least this reason, it is respectfully submitted that these claims are allowable.

35 U.S.C. §103 rejection, over Lyons in view of Wysoki or Fant or Beckwith, and further in view of Thornberg

The Examiner has rejected Claims 12-13 and 21-22 under 35 U.S.C. §103 as being obvious over Lyons in view of Wysoki or Fant or Beckwith, and further in view of Thornberg.

Claims 12-13 and 21-22 are each dependent on one of the allowable base claims 1 and 14. For at least this reason, Applicant respectfully submits that claims 12-13 and 21-22 are allowable.

New claims 50 -53

Claims 50 - 52 each require that the remotely piloted aircraft include some device for capturing image data but that the system operate in at least a first mode in which that image data is not transmitted and/or not used to pilot the aircraft. In other words, the pilot in the claimed system cannot rely on image data transmitted from the RPV (as in certain systems of Lyons - radar and video data) to fly the RPV. In certain embodiments of the invention, the remote pilot can fly the RPV based on the 3D projected image generated by transforming the database with respect to the RPV position and orientation received by the pilot station from the RPV. Of course, additional information that is not image data could also be transmitted.

Claim 53 specifies the manner in which the flight controls used to pilot the aircraft are operated. In particular, certain joystick controls on aircraft operate to indicate a rate of rotation (e.g., pushing a joystick to the right means the aircraft should start turning right at the speed indicated by the orientation of the joystick - if the position is held, the plane will roll). However, the claimed manner of operation requires the joystick position indicate the orientation of the aircraft with respect to the horizon (e.g., joystick centered causes the aircraft to fly straight; joystick pushed to the right causes the aircraft to bank to the right at the angle indicated by the joystick - not roll; etc.).

Conclusion

Applicant respectfully submits that the rejections have been overcome by the amendments and remarks, and that the Claims are now in condition for allowance.

01029

Accordingly, Applicant respectfully requests the rejections be withdrawn and the Claims as amended be allowed.

Drawing Corrections

The drawings have been objected to by the draftsman. The Applicant will file amended drawings at the time of allowance of the present application.

Invitation for a telephone interview

The Examiner is invited to call the undersigned at 408-720-8598 if there remains any issue with allowance of this case.

Charge our Deposit Account

Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 2/27, 1998

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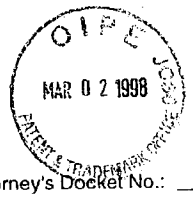


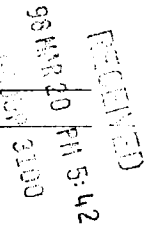
Attorney's Docket No.: 002055.P004 Patent

In re the Application of: Jed Margolin
(inventor(s))

Application No.: 08/587,731

Filed: January 19, 1996

For: A Method and Apparatus for Remotely Piloting an Aircraft
(title)



ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

SIR: Transmitted herewith is an Amendment for the above application.

_____ Small entity status of this application under 37 C.F.R. §§ 1.9 and 1.27 has been established by a verified statement previously submitted.

_____ A verified statement to establish small entity status under 37 C.F.R. §§ 1.9 and 1.27 is enclosed.

__X__ No additional fee is required.

The fee has been calculated as shown below:

	(Col. 1) Claims Remaining After Amd.		(Col. 2) Highest No. Previously Paid For	(Col. 3) Present Extra	SMALL ENTITY Rate	SMALL ENTITY Additional Fee	OTHER THAN A SMALL ENTITY Rate	OTHER THAN A SMALL ENTITY Additional Fee
Total Claims	* 38	Minus	** 49	0	x11	$ 0	x22	$
Indep. Claims	* 3	Minus	*** 5	0	x41	$ 0	x82	$
☐ First Presentation of Multiple Dependent Claim(s)					+135	$ 0	+270	$
					Total Add. Fee	$ 0	Total Add. Fee	$ 0

* If the entry in Col. 1 is less than the entry in Col. 2, write "0" in Col. 3.

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Name of Person Mailing Correspondence

Conny VanDalen
Signature

2-27-98
Date

01031

(LJV/cak 10/25/96)

_____ A check in the amount of $_____ is attached for presentation of additional claim(s).

_____ Applicant(s) hereby Petition(s) for an Extension of Time of _____ month(s) pursuant to 37 C.F.R. § 1.136(a).

_____ A check for $_____ is attached for processing fees under 37 C.F.R. § 1.17.

_____ Please charge my Deposit Account No. 02-2666 the amount of $_____.

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__X__ Any additional filing fees required under 37 C.F.R. § 1.16 for presentation of extra claims.

__X__ Any extension or petition fees under 37 C.F.R. § 1.17.

BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP

Date: 2/27, 1998

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08/587,731

UNITED STATES DEPARTMENT OF COMMERCE
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Washington, DC 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/587,731	01/19/96	MARGOLIN J	002055.P004

PM21/0504

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EXAMINER	
NGUYEN, T	
ART UNIT	PAPER NUMBER
3614	11

DATE MAILED: 05/04/98

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Tan Nguyen

TAN Q. NGUYEN
PATENT EXAMINER

01033

PTO-90C (REV. 2/95)

1-File Copy

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Office Action Summary

Application No.	Applicant(s)
08/587,731	MARGOLIN
Examiner	**Group Art Unit**
TAN Q. NGUYEN	3614

☒ Responsive to communication(s) filed on *3/2/98*.

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *THREE* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) *1-9, 12-18, 21-38, and 50-53* is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1-9, 12-18, 21-38, and 50-53* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐approved ☐disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____.

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). *9*

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

Notice to Applicant(s)

1. This office action is responsive to the amendment filed on March 02, 1998. As per request, claims 10, 11, 19 and 20 have been canceled. Thus, claims 1, 2, 14, and 24 are amended. Claims 50-53 have been added. Thus claims 1-9, 12-18, 21-38 and 50-53 are pending.

2. The prior art submitted on March 02 has been considered.

Drawings

3. The drawings are objected to under 37 CFR § 1.84 for the reasons set forth by the draftsman. See attached PTO-948 form for details. Correction is required. However, correction of the noted defect can be deferred until the application is allowed by the examiner.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-9, 14-18, 23-38, and 50-53 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lyons et al. (an article entitled "Some Navigation Concepts For Remotely Piloted Vehicles", AGUARD Conference Proceedings No. 176 on Medium Accuracy Low Cost Navigation, September 1975, pages 5-1 to 5-15) in view of Wysocki et al. (5,381,338) or Fant (4,835,532) or Beckwith et al. (4,660,157), and further in view of Kanaly (4,405,843).

a. With respect to claims 1 and 14, Lyons et al. disclose the invention as claimed (see at least the abstract) including a remotely piloted aircraft (see figure 8, RPV), a communications system for communicating flight data between a computer and said remotely piloted aircraft, said flight data including said remotely piloted aircraft's position and orientation, said flight data also including flight control information for controlling said remotely piloted aircraft (see page 5-2, section Radio Navigation Using

a Data Link, and figure 6 and the related text), a digital database comprising terrain data (see pages 5-3 and 5-4, section Terrain Map Correlation; and figure 8). Lyons et al. further disclose that the computer accesses said terrain data according to said remotely piloted aircraft's position and to transform said terrain data to provide a projected image data according to said remotely piloted aircraft's orientation; a display for displaying said projected image data (see page 5-4, third paragraph, and figure 8), and a remote flight control coupled to said computer for inputting said flight control information (see figure 6).

Lyon et al. do not explicitly disclose that the computer produce a three dimensional image data from the digital database and the navigation information. However such feature is well known at the time the invention was made (for examples, see columns 6, 8; figure 1 and the related text in Wysocki et al.; see figures 1, 3 and the related text in Fant; or see figures 1, 4 and the related text in Beckwith et al.). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of either Wysocki et al., Fant, or Beckwith et al. into the system of Lyon et al. in order to improve the system with the enhanced capability of displaying three-dimensional image of the remoted aircraft over the terrain data.

Lyons et al. disclose the claimed invention as discussed above except for the determination of a delay time for communicating said flight data between said

computer and said remotely piloted aircraft, and adjusting the sensitivity of said set of one or more remote flight controls based on said delay time. However, Kanaly does suggest delay time for communicating between the ground station and the remote airborne into account of controlling the remote airborne (see at least column 3, lines 15-24, and column 8, line 54 to column 9, line 6). It would have been obvious to incorporate the teaching of Kanaly into the system of Lyons et al. in order to improve the system with the enhanced capability of providing more accurate the remote flight controls to the remoted vehicle and receiving the accurate position and heading data of the vehicle from the remoted vehicle.

Thus, because of the motivation set forth above, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Lyon, Kanaly, with either Wysocki et al., Fant, or Beckwith et al.

b. With respect to claims 2, 50, and 51, Kanaly discloses that the remotely piloted aircraft includes a device for capture image data (see figure 3, item 74) and the image data is stored in the memory (see figure 3, item 21 and the related text).

c. With respect to claim 3, Lyons et al. disclose that the flight data communicated between said remotely piloted aircraft and said computer is secured (see page 5-2, first paragraph of the Radio Navigation Using Data Link section).

d. With respect to claims 4, 5, 7, and 15, Lyons et al. disclose that said

remotely piloted aircraft further comprises a infra red sensor image (video camera) and means for communicating and displaying video data representing images captured by the sensor image (see page 5-3, section Map Matching, and figure 8).

e. With respect to claims 6 and 16, Lyons et al. disclose that the video data is transmitted on a different communication link (wideband transmission of video signals) than said flight data (see page 5-2, first paragraph of section Radio Navigation Using a Data Link).

f. With respect to claims 8 and 17, Lyons et al. disclose that the display is a head mounted display (see figures 5 and 6).

g. With respect to claims 9 and 18, Lyons et al. also disclose that the remote flight control is responsive to manual manipulations (see figure 6).

h. With respect to claim 23, Lyons et al. disclose that the communications unit includes at least one of a communications transceiver and a simulation port (see page 5-4 and figure 6).

i. With respect to claim 24, Lyons et al. further disclose that the database representing terrain using polygons (see figure 10).

j. With respect to claims 25-28 and 30-31, the limitations of these claims have been noted in the rejection above. They are therefore considered rejected as set forth above.

k. With respect to claim 29, wherein said video data is transmitted real-time (see page 5-3, first paragraph of the section Map Matching).

l. Claims 32-38 and 52 are method claims corresponding to apparatus claims 24-31. Therefore, claims 32-38 and 52 are rejected for the same rationales set forth for claims 24-31.

m. With respect to claim 53, Kanaly disclose the step of receiving the input representing a current position of a directional control. The step of interpreting the current position relative to the horizon is not mentioned. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to interpret the current position relative to the horizon since it is well known for the control instrument as shown in the figure 1 can be performed such function.

6. Claims 12-13, and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyons et al., Wysocki et al. or Fant or Beckwith et al., and Kanaly as applied to claims 1-9, 14-18, 23-38, and 50-53 above, and further in view of Thornberg et al. (5,552,983).

Lyons et al. disclose the claimed invention as discussed above except that the remote flight controls allows for inputting absolute pitch and roll angles. However, such feature is well known in the art at the time the invention was made. For example,

Thornberg et al. suggest a variable referenced control system for remotely operated vehicles which includes means for inputting absolute pitch and roll angles for remotely control the unmanned aerial vehicle (see at least figures 5 and 6). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Thornberg et al. into the system of Lyons et al. in order to input the pitch and roll control signals as the flight control signals for remotely control the vehicle.

7. All claims are rejected.

Remarks

8. Applicant's arguments filed on October 27, 1997 have been fully considered but they are not deemed to be persuasive. Upon amended claims, the newly added claims, and the updated search, the new ground of rejections has been set forth as above.

9. In the amendment, applicants essentially argue that the Lyon reference "fails to teach more than just the generation of the 3D image". However, upon examination of the claims, the references cited clearly cover the subject matter AS CLAIMED by the applicants. Therefore, the rejection under 35 U.S.C. § 103 is considered to be proper.

10. Applicants also argue that none of Lyons, Wysocki, Fant or Beckwith generate a projected image using polygons. Applicant's attention is directed to figure 10 of the Lyon reference in which it discloses that the terrain model includes a plurality of polygons and in figure 1, 3, 5, and column 5, lines 42-49 of the Fant reference do suggest such feature.

11. Applicants further argue that the references cited do not disclose the determining of the delay time for communication. Applicant's attention is directed to column 8, line 54 to column 9 line 35 in which it disclose such feature. Therefore, the new rejection made is considered to be proper.

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Tan Nguyen, whose telephone number is (703) 305-9755. The examiner can normally be reached on Monday-Thursday from 7:30 AM-5:00 PM. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Cuchlinski, can be reached on (703) 308-3873.

Any response to this action should be mailed to:

Box AF

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to:

(703) 305-7687, (for formal communications, please mark "EXPEDITED PROCEDURE"; for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

Tan Nguyen

TAN Q. NGUYEN
PATENT EXAMINER

/tqn
May 01, 1998

Art Unit 3614

002055.P004 Patent

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE #12 Req for Recon 7/13/98

In re Application of:
Jed Margolin

Serial No. 08/587,731

Filed: January 19, 1996

For: A Method and Apparatus for Remotely Piloting an Aircraft

Examiner: T. Nguyen

Art Unit: 3614

RESPONSE UNDER 37 C.F.R. § 1.116
-- EXPEDITED PROCEDURE --
EXAMINING GROUP 3614

Assistant Commissioner for Patents
Washington, D.C. 20231

RESPONSE UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE -- EXAMINING GROUP 3614

Sir:

Responsive to the Office Action mailed on May 4, 1998, the Applicant respectfully requests reconsideration of this application in view of the following remark:

35 U.S.C. §103 rejection, over Lyons in view of Wysoki or Fant or Beckwith, and further in view of Kanaly

The Examiner has rejected Claims 1-9, 14-18, 23-38, and 50-53 under 35 U.S.C. §103 as being obvious over Lyons in view of Wysoki or Fant or Beckwith, and further in view of Kanaly.

FIRST CLASS CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 on July 6, 1998
(Date of Deposit)

Conny Van Dalen
Name of Person Mailing Correspondence

Conny VanDalen 7-6-98
Signature Date

As described in more detail below, the Office Action: 1) either clearly misdescribes Kanaly or clearly asserts an improper rejection regarding Kanaly; and 2) clearly misdescribes Lyons in stating that Lyons describes an RPV that communicates "flight data ... including said remotely piloted aircraft's position" (see Office Action page 3). In addition, Applicant submits that Lyons in view of Wysoki or Fant or Beckwith, and further in view of Kanaly does not teach the claimed invention

In order to address the numerous references used to support this rejection, Applicant discusses Kanaly; then Lyons; then the combination of Lyons and Kanaly and Wysoki or Fant or Beckwith; and finally why Applicant's claimed invention is not obvious over the asserted combination.

1) The Office Action either Misdescribes Kanaly or Asserts an Improper Rejection Regarding Kanaly

The Office Action states that Lyons does not disclose "the determination of a delay time for communicating said flight data between said remotely piloted aircraft, and adjusting the sensitivity of said set of one or more one or more flight controls based on said delay time." (see Office Action page 5) Then, the Office Action states that Kanaly "does suggest delay time for communicating between the ground station and the remote airborne into account of controlling the remote airborne." Id. Either, the Office Action is: 1) incorrectly asserting that Kanaly teaches that the computer monitors the time delay and adjusts the sensitivity of the controls; or 2) asserting an improper rejection because "the prior art reference (or references when combined)" do not "teach or suggest all the claim limitations," but rather teach away.

a) Assuming the Office Action is Asserting that Kanaly Describes Monitoring the Time Delay for Communication and Adjusting the Sensitivity of the Controls Based on the Measured Time Delay

Kanaly basically teaches the inclusion of a buffer in a remotely piloted vehicle to store high resolution image data to mask the time delay for slewing a camera.[1] However, Kanaly does **not** describe that the pilot station computer determine the time delay for communication and adjust the sensitivity of the controls accordingly. In particular, the Office Action cites the following two sections of Kanaly to support the rejection:

> It also substantially increases the speed of operation of the system. Namely, a considerably shorter period of time is required to simply fetch data from memory, as compared to having to slew the camera, as in the prior art system described above. The savings in time in fetching the data from the memory permits the use of more time for digitizing , formatting, processing, etc. without delaying the image so much as to be noticeable by the console operator. (col. 3, lines 15 - 24). (emphasis added)

The above quote deals with the delay resulting from having to slew the camera, not from the communications delay.

> At the ground station the incoming signals are down converted and demodulated from transceiver 54 and modem 51 equipment to obtain display control signals. The display control signals are used to control the scanning of the image pixels of the display 31, so as to generate high resolution data only at the portion corresponding to point of observation of the operator 10 and equated with that particular portion of the overall scene data stored in memory 21 aboard the remotely piloted vehicle. It has been found that the time delay from a step change in look angle by the

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[1] Kanaly deals with a system in which a remote operator wears a helmet (on which an oculometer is mounted) that determines where the remote operator is looking. Signals indicating where the remote operator is looking are sent to the RPV. The RPV includes a camera. The prior art system over which Kanaly distinguishes is one in which the camera on the RPV provides high resolution data in the center and low resolution data on the periphery. As a result, the prior art system must move the camera in response to the remote operator's movements. This camera movement introduces a delay in the image provided to the remote operator.

To reduce or remove this delay (not measure it or adjust flight controls) due to movement of the camera, Kanaly teaches having the camera store high resolution data over the whole scene in a memory on board the RPV. The RPV transmits the high resolution imagery corresponding to the center of where the remote operator is looking and low resolution imagery (based on the stored high resolution data) corresponding to the remote operator's peripheral vision. As a result, movement of the remote operator's head merely requires the RPV adjust from where in the memory the high and low resolution data is accessed - the camera need not be moved. "Because the high resolution data is obtained from memory and not from the camera equipment directly, as in the prior art, the scheme in accordance with the present invention permits the camera to be effectively decoupled from the data link." (see col. 2, line 56 - col. 3, line 24; col. 8, line 54 - col. 9, line 6).

> operator 10 to a look angle correction by the oculometer 33 and changes to a new location in memory 21 from which new high resolution data is to be read out and its subsequent transmission and appearance on the display device 31 as high resolution imagery data may be less than 0.2 seconds using present day modulation and transmission rates. This minimum time delay is substantially less than the approximate 0.5 seconds required normally by the human eye before the operator becomes aware of the high resolution data that he is viewing. (col. 8, line 54 to col. 9, line 6).

The above quote merely indicates that it takes 0.2 seconds to perform the following: "a look angle correction by the oculometer 33," "changes to a new location in memory 21 from which new high resolution data is to be read out," "its subsequent transmission," and "its appearance on the display." Thus, Kanaly is discussing the delay of the overall system and how it has been improved, not the specific time delay required for communication from the RPV to the pilot station. In addition, Kanaly just recognizes that there is delay and that the delay is not perceptible to the human eye (In fact, Kanaly states that the required "0.2 seconds" is "substantially less" "than the approximate 0.5 seconds required normally by the human eye"). Since Kanaly's delay is not perceptible to the human eye, it is not at all surprising that no where in Kanaly is the idea of having the computer in the pilot station measure the delay and adjust the sensitivity of the controls. As such, Kanaly teaches away from the claimed invention by teaching that the delay is not perceptible to the human eye.

b) Assuming the Office Action is Improperly basing the Rejection on the Mere Fact that Kanaly indicates that there Exist Delay in His System, and that Part of that Delay is Due to Transmission of Data

The second quote from Kanaly reproduced above clearly indicates that Kanaly has determined that the delay associated with "a look angle correction by the oculometer 33," "changes to a new location in memory 21 from which new high resolution data is to be read out," "its subsequent transmission," and "its appearance on the display" is less than 0.2 seconds. This provides no support for the rejection.

According to M.P.E.P. § 2142:

> [t]o establish a primary facia case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claim combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." (emphasis added).

The determination by Kanaly that the delay time for his overall system is imperceptible by the human eye does not even come close to teaching or suggesting the claimed limitation of having the computer in the pilot station measure the time delay, much less doing anything about that time delay (e.g., adjusting the sensitivity of the controls). In fact, Kanaly indicates that the delay is imperceptible (0.2 is "substantially less" than 0.5 seconds), and thereby indicates no need to do anything about the delay. Thus, if the Office Action is asserting that the mere fact that Kanaly has determined a static time of 0.2 seconds for his system and that this time is imperceptible to the human eye as teaching or suggesting the claimed limitations, the rejection is improper because claim limitations that are not taught or suggested by Kanaly are being ignored. In fact, Kanaly teaches away from the claimed invention by teaching that the delay is not perceptible to the human eye.

2) The Office Action Misdescribes Lyons

Although Lyons has been extensively described in Applicant's prior responses and discussed at length in an interview, the Office Action continues to assert that Lyons describes the transmission of flight data from the aircraft, where that flight data includes the aircraft's position. This is clearly not the case.

Lyons teaches the use of dead reckoning.[2] Dead reckoning is the determination of an **estimated** or dead reckoned position that is based on various elements (including

[2] In summary, the Lyons reference teaches various techniques for updating the dead reckoned position of remotely piloted aircraft on a two dimensional moving map display available to the pilot. In particular, Lyons contemplates a RPV transmitting information to a control center (Figure 1). The control center is used by the pilot to fly the RPV. To display the position of the RPV to the pilot, the control center provides a "moving map display." As contemplated by Lyons, "the most convenient display mode for the present application is the rolling map or 'passing

scene' technique where a new line is added to the top of the display and the scene is shifted slowly downwards" (page 5-3, end of first full paragraph). In particular, Lyons contemplates using film to generate the moving map (Figure 5). The moving map is moved based on the dead reckoned positions of the RPV.

As is well known in the art, dead reckoned positions have accumulating error. To adjust for this error, Lyons describes two basic concepts: 1) map matching (Section 3); and 2) terrain map correlation (Section 4). The map matching concept requires that the RPV transmit some kind of image data to the control center. In Figure 6, the control center is shown having the moving map display and the sensor display (i.e., a display generated from the image data transmitted by the RPV). Lyons contemplates the transmission of two kinds of image data: 1) side looking radar (SLR); and 2) real time forward-looking sensors. When using the SLR system, the SLR generated image data received by the control center allows it to make a downward-looking image. The pilot watches the sensor display (i.e., the display generated based on the transmitted image data) for "likely update features"—landmarks. When the pilot sees a landmark in the sensor display, the pilot presses a transfer button which causes the control center to superimpose the sensor display over the moving map (Figure 5). The pilot then adjusts the moving map so that it matches the overlaid sensor display image and presses an accept button. By adjusting the moving map in this manner, the dead reckoned position of the RPV is updated in an attempt to remove the error associated with the calculation of dead reckoned positions (Page 5-3, second, third, and fourth full paragraphs). The simulated SLR/map update system is illustrated in Figures 7A and 7B.

Having described the SLR-based map matching technique, the real time forward-looking sensor technique will now be described. Lyons describes basically two techniques of updating dead reckoned RPV positions on a moving map using only real time forward-looking sensors: 1) an anamorphic projection technique (page 5-3, fifth full paragraph; figure 8); and 2) a HUD based technique (page 5-3, sixth full paragraph; figure 9). Similar to the SLR based technique, the anamorphic projection technique requires the pilot to watch the sensor display (i.e., the image generated from the transmitted data) for landmarks, press a button which superimposes the transmitted image on the moving map, adjust the moving map, and press an accept button. As described in Lyons, in order to superimpose the forward-looking transmitted image on the moving map, the forward-looking image is transformed using anamorphic projection. Lyons goes on to describe various problems with the anamorphic projection technique, and then describes the HUD based technique.

In the HUD based technique, the pilot is presented with two images: 1) the moving map display (see left-hand image of Figure 9); and 2) the sensor display generated from the image data transmitted from the real time forward-looking sensor on the RPV. The HUD technology is used to allow the pilot to mark landmarks on the forward-looking sensor based image. These HUD markings are then superimposed on the moving map, and the pilot makes the necessary adjustments to the moving map (page 5-3, sixth full paragraph).

In summary, the map matching techniques use the following: 1) the transmission of image data from the RPV to the control center; 2) a display at the control center which shows an image based on the real time image data received from the RPV; 3) a moving map display that is moved based on the dead reckoned position of the RPV; and 4) some manner of superimposing the sensor image onto the moving map to allow the pilot to update the moving map in an effort to correct the error associated with the dead reckoned positions. The sensor display's image is based on image data transmitted from the RPV, while the moving map contemplated by Lyons is a two-dimensional, top down view displayed using film (see Figures 5 and 7).

Having described the map matching techniques from Lyons, Applicant will now describe the terrain map correlation technique of Lyons. The terrain map correlation technique described in Lyons is also used for correcting the error in dead reckoned positions shown to the pilot by a two-dimensional moving map. In particular, Lyons states at page 5-3, last paragraph:

> Reconnaissance or forward-looking sensors provide a convenient method of updating the navigation system. However, these sensors required large datalink bandwidth to transmit the video picture to the control center and hence are vulnerable to ECM... Hence, an alternative method of updating the navigation system is desirable. (emphasis added)

The phrase "updating the navigation system" is used throughout Lyons to refer to the adjustment of a two-dimensional moving map in an effort to correct for error due to dead reckoning.

Rather than requiring the user to actively update the moving map display (i.e., push a button which causes the images to be superimposed, adjusting the moving map, and pushing an accept button), the terrain map correlation technique attempts to adjust the moving map (i.e., correct for the dead reckoned error) without pilot intervention using a laser range measurements and a digital elevation database. In operation, the RPV transmits to the control center a set of laser range measurements (including an altimeter reading). The control center uses dead reckoned positions to both adjust the two-dimensional moving map and to estimate the location of the RPV over a digital database map of elevation points stored in the control center (Figure 10). Based on a calculation of the possible error associated with the dead reckoned positions, a search area is identified in the digital database (Figure 12). A search is then performed within this search area to identify the position that most closely matches the transmitted laser range data. The RPV's position is then updated to the location that best matches the transmitted laser ranges in an attempt to correct the error associated with the dead reckoned positions. The moving map is then automatically adjusted (without pilot intervention) to reflect the updated RPV position.

speed, direction, etc), that has accumulating error, and that must be corrected before generating any image. As such, the Lyons paper discusses techniques for correcting or updating the dead reckoned positions. In particular, Lyons states "The objective is to make use of equipment normally carried for RPV operation to supplement a simple dead reckoning navigation system." (abstract).

In particular, Lyons describes transmitting laser measurements for updating the dead reckoned position. The pilot station determines error associated with dead reckoning; identifies a search area in the digital ELEVATION database based on the dead reckoned position - where the current dead reckoned position is the center of the search area ("expected RPV position" in Figure 12) and the search area represents the locations the RPV could be due to the accumulating error in the current dead reckoned position; compares the transmitted laser measurements for various positions in the search area in an effort to locate a corrected dead reckoned position of the RPV.[3]

In fact, Lyons states the following:

> This paper discusses methods by which the navigation function for a Remotely Piloted Vehicles (RPVs) can be achieved without the need for complex specialized navigation equipment. The objective is to make use of equipment normally carried for RPV operation to supplement a simple dead reckoning navigation system. In this way significant improvements in navigation capability can be achieved with little or no added complexity in the vehicle itself. The additional processing is carried out at the control centre where restrictions on equipment size and cost are not so prohibitive. (Abstract)

Thus, the digital database of Lyons (conceptually illustrated in Figure 10) is used to update the two-dimensional moving map in an effort to correct for the error in the dead reckoned positions.

[3] In addition, the office action cites pages 5-4, third paragraph, and Figure 8 as disclosing a single system that accesses a database based on the remotely piloted aircraft's transmitted position and orientation and transforms the terrain data into a projected image. However, Figure 8 is for a first system in which the RPV uses a "forward looking sensor" to transmit a video image and the pilot station uses anamorphic projection to overlay that image on a 2D moving map, which is not generated by transforming a database of polygons (see page 5-3, paragraph 6), while pages 5-4, third paragraph describe a second system in which the RPV transmits laser measurements in lieu of a video stream - Lyons describes the advantages of using one over the other.

Again, none of the data transmitted by the RPV (whether it be flight data for dead reckoning, the dead reckoned position, nor the laser measurements) is the position of the aircraft; everything transmitted by Lyon's RPV is data used by the pilot station to determine a corrected dead reckoned position of the aircraft through complicated processing, which corrected dead reckoned position is used for display.

Now that Applicant has put forth a more correct reading of Lyons, Applicant will address what results from combining Lyons with Wysoki or Fant or Beckwith.

3) The combination of Lyons and Wysoki or Fant or Beckwith, in further view of Kanaly

Lyons describes that the remote pilot station displays to the remote pilot a two-dimensional moving map (which is not based at all on the digital elevation database) on which the position of the remote aircraft is indicated. In particular, Lyons uses the digital elevation database in the remote pilot station in conjunction with the laser measurements for automatically updating the dead reckoned position indicated on the two-dimensional moving map.

The Office Action asserts that the combination of Lyons and Wysoki or Fant or Beckwith would result in a system that produces "a three dimensional image data from the digital database and the navigation information." First, the claims are not that the image is generated from the digital database and some vague notion of "navigation information," but require that the **transmitted** position and orientation **be used to generate the three dimension image** (as stated above, Lyons describes a very different system in which the transmitted data is not used for image generation, but that the transmitted data goes through complicated processing to generate a corrected dead reckoned position and that it is the corrected dead reckoned position that is used for image generation). Thus, the Office Action's language is improperly disregarding limitations in the claims.

Second, the combination of Lyons Kanaly and Wysoki or Fant or Beckwith would result in a system according to the following table, where the addition of Kanaly for the purposes asserted by the Office Action would merely result in making a determination of the time delay of the entire system to illustrate that the combination is better than the prior art and/or fast enough not to be perceptible by the human eye.

Lyons in view of Wysoki or Fant or Beckwith, and further in view of Kanaly	Applicant's Invention
Aircraft transmits dead reckoning information	Aircraft determines its own position and orientation, and then transmits its own position and orientation
Aircraft transmits laser measurements for automatic dead reckoned position update	
Pilot station determines error associated with dead reckoning; identifies a search area in the digital database based on the dead reckoned position - where the current dead reckoned position is the center of the search area ("expected RPV position" in Figure 12) and the search area represents the locations the RPV could be due to the accumulating error in the current dead reckoned position; compares the transmitted laser measurements for various position in the search area in an effort to locate a corrected position of the RPV.	

As modified by Wysoki, Fant or Beckwith, the pilot station would then also transform the digital database relative to the corrected dead reckoned position to generate a three dimensional image.	The pilot station transforms the digital database relative to the position and orientation transmitted from the aircraft to generate a three dimensional image.
Knowing the time delay and that it is imperceptible to the human eye	The pilot station computer measuring the time delay to communicate with the aircraft (see claims 1 & 14)
	The pilot station computer adjusting the sensitivity of the controls based on the measured time delay (see claims 1 & 14)

Thus, the asserted combination would result in forgoing Lyon's two-dimensional map, and instead using Lyons digital database to generate a three-dimensional image (through some technique in Wysoki, Fant or Beckwith) relative to a corrected dead reckoned position. The above table is a fair read of the combination of Lyons and Wysoki or Fant or Beckwith because none of Wysoki or Fant or Beckwith describe a manner of piloting of a remotely piloted aircraft; in contrast Wysoki and Fant and Beckwith describe how to generate three dimensional images from various databases (none of which store the terrain as a set of polygons).

4) The Claimed Invention is Not Obvious in view of the combination of Lyons and Wysoki or Fant or Beckwith, and further in view of Kanaly

Clearly, the above table illustrates that the combination of Lyons and Wysoki, Fant or Beckwith does not describe Applicant's claimed invention. In particular, the combination of Lyons, Kanaly, and Wysoki or Fant or Beckwith results in a system that uses transmission of dead reckoning information by the aircraft, some mechanism in the

pilot station to correct the dead reckoned positions, and some scheme to generate images based on the corrected dead reckoned position.[4]

The laser measurement system of Lyons[5] relied on by the Office Action requires the use of "terrain-referenced navigation" - that is, Lyons describes searching an elevation database in a search area (based on the estimated error in the dead reckoned position) for a match to a set of elevation based laser measurements. Terrain-referenced navigation suffers from a number of disadvantages, including an inability to function over non-unique terrain (e.g., flat terrain such as deserts, water, etc.). For example, assume that Lyons RPV is flying over water. The three or more laser measurements taken by the RPV will all indicate that the terrain over which the RPV is flying is a relatively constant elevation. According to Lyons, the three or more laser measurements would be compared to locations in an estimated error region that is a relatively constant elevation because it maps a body of water. As such, the laser measurements can no longer be used to correct the dead reckoned position. In fact, Lyons states:

> Apart from the errors involved in the actual laser measurements the accuracy of terrain representation has a considerable influence on the feasibility of the method. In addition, the technique is ineffective over the sea or over flat, featureless terrain. (section 4). (emphasis added).

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[4] Lyons states the following:

> This paper discusses methods by which the navigation function for a Remotely Piloted Vehicles (RPVs) can be achieved without the need for complex specialized navigation equipment. The objective is to make use of equipment normally carried for RPV operation to supplement a simple dead reckoning navigation system. In this way significant improvements in navigation capability can be achieved with little or no added complexity in the vehicle itself. The additional processing is carried out at the control centre where restrictions on equipment size and cost are not so prohibitive. ... Use can also be made of an on-board laser to provide range-to-terrain measurements which, when correlated with a computer stored map, enables the RPV position to be continuously updated. (Abstract)

[5] Lyons describes basically two systems: 1) a higher bandwidth system that uses dead reckoning and transmits images from the RPV to the pilot station for updating the dead reckoned positions; and 2) a lower bandwidth system that also uses dead reckoning, but uses laser measurements for updating the dead reckoned positions. Unlike the former, Applicant's claimed system does not require the transmission of images to fly the aircraft and to correct dead reckoned positions, but has the remotely piloted aircraft determine and transmit its position and generates three-dimensional images from the database in the pilot station from that transmitted position. As described in the text, unlike the later, Applicant's claimed system does not use terrain-referenced navigation.

> Where the data link is limited in bandwidth the laser/terrain correlation technique should give good accuracy and the process could be completely automated to provide a continuous indication of RPV position. Disadvantages of the system are the large amount of data storage and computation necessary at the control centre, the development work required to produce an operational system and the unsuitability of the system over featureless terrain. (section 5). (emphasis added)

Applicant's claimed invention does not use Lyons dead reckoned positions that must be corrected in the pilot station using terrain-referenced navigation, but rather Applicant's claimed invention requires the remotely piloted aircraft determines and transmits its own position to the pilot station and that it is this transmitted position and orientation that is used to generate the three dimensional images (not an untransmitted corrected dead reckoned position). Again, the asserted combination results in a system in which the digital database in the pilot station is accessed based on the error associated with the dead reckoned position, and then the digital database is accessed using the correct dead reckoned position to generate the three dimensional image (in other words, the asserted combination does not generate the three-dimensional image using the position and orientation transmitted from the RPV; in contrast the asserted combination uses a corrected dead reckoned position that was not transmitted by the RPV). Thus, none of the data transmitted by the RPV (whether it be flight data for dead reckoning, the dead reckoned position, image data, or the laser measurements) is the position of the aircraft; rather, everything transmitted by Lyon's RPV is data used by the pilot station to determine a corrected dead reckoned position of the aircraft through complicated processing, which corrected dead reckoned position is used for display. Thus, Lyons teaches away from Applicant's claimed invention in that Lyon's "objective" is to put the onus of determining the position of the RPV on the pilot station to "supplement a simple dead reckoning navigation system," whereas Applicant's claimed invention puts the onus

of determining position on the remotely piloted vehicle and uses the transmitted position to generate the three dimensional image.

In particular, Applicant's claim 32 requires "determining the current position of said remotely piloted aircraft in three dimensions; ... communicating said current position .. from said remotely piloted aircraft to a pilot station; transforming said terrain data into image data representing a simulated three dimensional view according to the current position; displaying said simulated three dimensional view using said image data." Thus, Applicant's claim 32 requires that the three-dimensional image be produced from the TRANSMITTED position, not one that is corrected or updated using some laser measurement dead reckoning scheme. Since Applicant's claimed invention requires the remotely piloted aircraft to determine and transmit its own position to the pilot station and that it is this transmitted position and orientation that is used to generate the three dimensional images, Applicant's system provides an advantage over Lyons in that Applicant's system does not have difficulty over featureless terrain.

Furthermore, Claims 1 and 14 have additional limitations that the Office Action improperly asserts are found in Kanaly. The determination by Kanaly that the delay time for his overall system is imperceptible by the human eye does not even come close to teaching or suggesting the claimed limitation of having the computer in the pilot station measure the time delay, much less doing anything about it (e.g., adjusting the sensitivity of the controls). In fact, Kanaly indicates that the delay is imperceptible (0.2 is "substantially less" than 0.5 seconds), and thereby indicates no need to do anything about the delay. Thus, Kanaly teaches away from the claimed invention by teaching that the delay is not perceptible to the human eye. In contrast, the language of claims 1 and 14 requires that the computer in the pilot station determine the delay and adjust the sensitivity of the controls. If there was a static time delay in transmission and/or the delay was imperceptible, the sensitivity of the flight controls of Applicant's system could be permanently set. However, Applicant claim language requires that the computer in the

01056

pilot station determine the time delay of the communication and adjust the sensitivity of the controls, thereby requiring at least one real time measurement of the delay and some adjustment.

Furthermore, Applicant's claims 24 and 32 require that the database store the terrain data as polygons. As previously described, none of art used in the rejection make use of a database that stores the terrain data as a set of polygons. In particular, Lyons describes the use of an Elevation Database in which each point represents an elevation. Although Figure 10 from Lyons shows (for illustrative purposes only because Lyons does not display an image from the database) lines connecting the elevation points, the points in an elevation database are not stored as polygons. While the images generated by Wysoki or Beckwith of Fant may look like one or more polygons, the terrain is not stored in their databases as polygons.[6] In contrast, Applicant's claim 24 requires the transmitted "position and orientation" be transformed "into a three dimensional projected image of said remotely piloted aircraft's environment according to a database representing real terrestrial terrain using polygons." Similarly, Applicant's claim 32 requires "accessing a database comprising terrain data that represents real terrestrial terrain as a set of polygons." Thus, claims 24 and 32 require that the database stores the terrain as polygons.

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[6] As described above, the data in the database of Lyons is not used to generate an image, but simply to update the dead reckoned position.

With respect to Beckwith, the digital elevation data in the database is points with a constant north up position, not polygons (see col. 6, lines 52-61; col. 7, lines 30-36).

Fant describes the use of two databases: 1) the object library database which contains real-world images; and 2) the gaming area database which provides the information necessary for the placement of the contents of the object library, surfaces, and special effect on a grid or gaming area (see col. 6, line 38 - col. 7, line 10). In particular, the Fant patent is for a high performance computer graphics system that combines Computer Generated Imagery (CGI) with Computer Synthesized Imagers (CSI) to form Computer Generated Synthesized Imagery (CGSI) (see col. 2, line 53 - col. 3, line 12).

Wysoki describes a database of digital orthophotographs (see col. 4, lines 43-51). Digital orthophotographs are computerized images generated by making geometric corrections to scanned aerial photographs. In particular, an aerial photograph contains some degree of distortion. In contrast, maps maintain a constant scale, but lack the detail of an aerial photograph. Orthophotography combines the features of maps and aerial photographs. The aerial photographs are unwrapped (to remove the distortion) and fitted to a particular map projection to create an image map that has uniform scale and known accuracy.

The remaining rejected claims are each dependent on one of the allowable base claims. For at least these reasons, Applicant respectfully request this rejection be withdrawn.

35 U.S.C. §103 rejection, over Lyons in view of Wysoki or Fant or Beckwith, and further in view of Thornberg

The Examiner has rejected Claims 12-13 and 21-22 under 35 U.S.C. §103 as being obvious over Lyons in view of Wysoki or Fant or Beckwith, and further in view of Thornberg.

Claims 12-13 and 21-22 are each dependent on one of the allowable base claims 1 and 14. For at least this reason, Applicant respectfully submits that claims 12-13 and 21-22 are allowable.

Conclusion

Applicant respectfully submits that the rejections have been overcome by the amendments and remarks, and that the Claims are now in condition for allowance. Accordingly, Applicant respectfully requests the rejections be withdrawn and the Claims as amended be allowed.

Drawing Corrections

The drawings have been objected to by the draftsman. The Applicant will file amended drawings at the time of allowance of the present application.

Invitation for a telephone interview

The Examiner is invited to call the undersigned at 408-720-8598 if there remains any issue with allowance of this case.

Charge our Deposit Account

Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

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