[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Thursday, July 31, 2008 10:56 AM
To: Borda, Gary G. (HQ-MC000)
Cc: Rotella, Robert F. (HQ-MA000)
Subject: Margolin Letter

Gary,

Here is the letter to Mr. Margolin.

Jan S. McNutt
Attorney-Advisor (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted]

b (6)

01633

[redacted]

From: Borda, Gary G. (HQ-MC000)
Sent: Thursday, July 31, 2008 12:52 PM
To: McNutt, Jan (HQ-MC000)
Cc: Rotella, Robert F. (HQ-MA000)
Subject: RE: Margolin Letter

Jan,
Letter was not attached.
Gary

Gary G. Borda
Agency Counsel for Intellectual Property
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

From: McNutt, Jan (HQ-MC000)
Sent: Thursday, July 31, 2008 10:56 AM
To: Borda, Gary G. (HQ-MC000)
Cc: Rotella, Robert F. (HQ-MA000)
Subject: Margolin Letter

Gary,

Here is the letter to Mr. Margolin.

Jan S. McNutt
Attorney-Advisor (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

01684

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Thursday, July 31, 2008 2:14 PM
To: Rotella, Robert F. (HQ-MA000)
Subject: FW: Margolin Letter

FYI

From: McNutt, Jan (HQ-MC000)
Sent: Thursday, July 31, 2008 2:13 PM
To: Borda, Gary G. (HQ-MC000)
Subject: RE: Margolin Letter

Margolin Letter.doc

Sorry

From: Borda, Gary G. (HQ-MC000)
Sent: Thursday, July 31, 2008 12:52 PM
To: McNutt, Jan (HQ-MC000)
Cc: Rotella, Robert F. (HQ-MA000)
Subject: RE: Margolin Letter

Jan,
Letter was not attached.
Gary

Gary G. Borda
Agency Counsel for Intellectual Property
Office of the General Counsel
NASA Headquarters
[redacted]

b(6)

From: McNutt, Jan (HQ-MC000)
Sent: Thursday, July 31, 2008 10:56 AM
To: Borda, Gary G. (HQ-MC000)
Cc: Rotella, Robert F. (HQ-MA000)
Subject: Margolin Letter

Gary,

Here is the letter to Mr. Margolin.

Jan S. McNutt
Attorney-Advisor (Commercial)

01685

Office of the General Counsel
NASA Headquarters

[redacted]

b(6)

01636

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Tuesday, August 05, 2008 10:33 AM
To: Bayer, Kathy (HQ-MC000)
Cc: Borda, Gary G. (HQ-MC000); Rotella, Robert F. (HQ-MA000)
Subject: Margolin Patent Infringement Claim NASA Case No. I-222

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Red Category

Kathy,

Please prepare the attached letter for my signature.

Margolin Letter_version2.doc

Jan S. McNutt
Attorney-Advisor (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted]

b(6)

01633

Mr. Jed Margolin
[redacted] b(6)

RE: Administrative Claim of Jed Margolin for Infringement of U.S. Patent Nos. 5,566,073 and 5,904,724; NASA Case No. I-222.

Dear Mr. Margolin,

We are in receipt of the Freedom of Information Act Request (FOIA) conveyed to us by email dated June 30, 2008 in which you request copies of all documentation relating to your administrative claim of infringement of U.S. Patent Nos. 5,566,073 and 5,904,724.

We regret the delay in processing your claim and assure you that we are now undertaking measures to provide a resolution of your claim as soon as possible. Unfortunately Mr. Alan Kennedy retired from NASA earlier this year and the action on your claim was not conveyed to management in a timely manner. In addition the local attorney responsible for review of your claim also departed from NASA. We are now cognizant of the importance of proceeding with a review of the claim and will contact you when we have reached a decision.

As to your FOIA request, as the investigation of your claim is ongoing, we kindly request that you allow us a 90 day extension to answer this request. Within that time period we should be able to obtain a better picture of our position vis-à-vis your claim and the request for documents may no longer be required.

We should inform you that we have received a separate communication from a company Optima Technology Group, claiming to have been assigned both of the patents in question. You informed me telephonically that this is the case; however, we have no record of any assignment of your patents to this firm and will need confirmation through appropriate attested documents delivered to the agency in order to recognize any claim of ownership by a party other than the inventor.

Thank you for your patience in this matter. Please contact the undersigned at [redacted] if you any additional questions or comments. b(6)

Sincerely,

Jan S. McNutt
Attorney-Advisor

01689 3
Attachment to
01689

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Wednesday, August 06, 2008 9:44 AM
To: Jed Margolin
Subject: RE: NASA Case I-222
Attachments: Margolin Letter 20080805.pdf

Dear Mr. Margolin,

Please see the attached. Hard copy to follow.

Jan S. McNutt
Attorney-Advisor (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

-----Original Message-----
From: Jed Margolin [mailto:jm@jmargolin.com]
Sent: Tuesday, August 05, 2008 1:56 PM
To: McNutt, Jan (HQ-MC000)
Subject: NASA Case I-222

Dear Mr. McNutt.

I have attached the documents we discussed.

Regards,

Jed Margolin

01694

National Aeronautics and Space Administration
Headquarters
Washington, DC 20546-0001

August 5, 2008

Reply to Attn of: Office of the General Counsel

Mr. Jed Margolin
[redacted] b(6)

Re: Administrative Claim of Jed Margolin for Infringement of U.S. Patent Nos. 5,566,073 and 5,904,724; NASA Case No. I-222.

Dear Mr. Margolin,

We are in receipt of the Freedom of Information Act Request (FOIA) conveyed to us by email dated June 30, 2008 in which you request copies of all documentation relating to your administrative claim of infringement of U.S. Patent Nos. 5,566,073 and 5,904,724.

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We should inform you that we have received a separate communication from a company Optima Technology Group, claiming to have been assigned both of the patents in question. You informed me telephonically that this is the case; however, we have no record of any assignment of your patents to this firm and will need confirmation through appropriate attested documents delivered to the agency in order to recognize any claim of ownership by a party other than the inventor.

Thank you for your patience in this matter. Please contact the undersigned at [redacted] if you have any additional questions or comments. b(6)

Sincerely,

Jan S. McNutt
Attorney-Advisor

01695

[redacted]

From: Fein, Edward K. (JSC-AL)
Sent: Wednesday, August 06, 2008 3:29 PM
To: McNutt, Jan (HQ-MC000)
Cc: Borda, Gary G. (HQ-MC000); Rotella, Robert F. (HQ-MA000)
Subject: RE: Patent Infringement claim from Jed Margolin; NASA Case No. I-222

Jan ... I do vaguely recall this matter, but don't recall the outcome. I'm copying below tons of stuff I found on my computer using Google Desktop. I have not reviewed what I'm sending. There no doubt a good deal of redundancy, for which I apologize.

It looks like Langley may have taken the lead on this. Barry Gibbens at Langley appears to have worked it. Regrettably, Barry is deceased -- a very sad story for another time. But Linda Blackburn may be of some assistance.

Let me take this opportunity to welcome you to the NASA team. I look forward to meeting you in the not too distant future.

-Ed

RE: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

From: Mike Abernathy [redacted]
To: 'Delgado, Francisco J. (JSC-ER2)' [redacted] 'Fein, Edward K. (JSC-AL)' [redacted], 'Kennedy, Alan J. (HQ-MC000)' [redacted] b(6)
CC: 'Fredrickson, Steven E. (JSC-ER)' [redacted]
Date: Sep 26 2006 - 12:13pm

Thank you very much. It means very much to Carolyn and I right now.

Mike Abernathy

Rapid Imaging Software, Inc.

From: Delgado, Francisco J. (JSC-ER2) [redacted]
Sent: Monday, September 25, 2006 9:42 PM
To: Mike Abernathy; Fein, Edward K. (JSC-AL); Kennedy, Alan J. (HQ-MC000); [redacted] b(6)
Cc: Delgado, Francisco J. (JSC-ER2); Fredrickson, Steven E. (JSC-ER)
Subject: FW: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

See email from "Mr. Adams" below.

This is getting more ridiculous by the minute. I have resisted replying in any form as suggested by JSC council. However, this matter has been left open for quite some time and something needs to be done NOW. It has come to my attention that Mr. Adams and company have issued a letter that prohibits RIS from selling any of their software until this issue is resolved. We have had a very "intellectually" fruitful relationship with RIS for almost a decade and would like to

01696

continue this relationship for many years to come. Some of the technology concepts in question were co-developed by RIS and I during many "brainstorming sessions" on how to provide optimal situation awareness to various users.

The folks pressing forward with this claim do not have solid ground to stand on (IMHO). Based on the previous research performed, I do not see how their patent claims are valid and I would like to request that NASA's council take this matter seriously and get the patents invalidated (as it should have been done when this first showed up a couple of years ago). This is not only the right legal thing to do, but also the right moral thing to do. If we allow an individual to continue to harass small companies and stand-by with little/no action, then we are no better than the company doing the harassing. As a government organization, we need to keep the public faith and trust and again, "do the right thing." I realize that patience is important in legal matter, but believe that the time for sitting idle and hoping that this matter goes away is way past due and that something needs to be done ASAP. Putting companies that NASA relies on to help move technology forward out of business with a barrage of unwarranted litigation does not seem like it is in NASA's (or our taxpayers) best interest.

Please let me know what I need to do on my end to help move this along.

BTW: If we do not deal with issue immediately it will only get worse for NASA. I know of several Projects within JSC, JPL, and Langley that use independently developed technology (i.e. technology that does not use what RIS and I came up with) that I am sure Mr. Adams and company would claim infringes on their "Patents." We seem to be on his radar at the moment because we do what government organizations are encouraged to do ("Publish their work").

Thank You,

Frank Delgado

From: Robert Adams [redacted] b(6)
Sent: Mon 9/25/2006 5:58 PM
To: Delgado, Francisco J. (JSC-ER2)
Subject: RE: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

Sir,

Since you have clearly refused to cooperate, please provide us your department's heads information and said contact information including a contact in your IP litigation department. We are aware that you received your read receipt of our email sent to you regarding:

Let us chat on about SCOUT, SC3D, the X-38 program, and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

United States Patent 5,566,073 Margolin October 15, 1996 Pilot aid using a synthetic environment

United States Patent 5,904,724 Margolin May 18, 1999, Method and apparatus for remotely piloting an aircraft

We simple have one goal in mind and that is have a chat regarding the technology and that RIS and NASA take a license of said IP technology.

Thank you

From: Delgado, Francisco J. (JSC-ER2) [redacted] b(6)

01697

Sent: Tuesday, September 19, 2006 7:30 AM
Subject: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

Your message

To: Delgado, Francisco J. (JSC-ER2)

Cc:

Subject: Let us chat on about SCOUT, SC3D, the X-38 program and RIS;

noted below are our patents that cover said technology that RIS and your

groups are using.

Sent: Tue, 19 Sep 2006 08:52:25 -0500

was read on Tue, 19 Sep 2006 09:30:05 -0500

~~~

RE: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

From: Fein, Edward K. (JSC-AL) [redacted]
To: Delgado, Francisco J. (JSC-ER2) [redacted], Kennedy, Alan J. (HQ-MC000) [redacted] b(6)
Date: Sep 26 2006 - 10:58am

Frank ... I've talked with Alan, and he said he'd respond, and give you a call.

-Ed

~~~

RE: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

From: Mike Abernathy [redacted]
To: 'Delgado, Francisco J. (JSC-ER2)' [redacted], 'Fein, Edward K. (JSC-AL)' [redacted] 'Kennedy, Alan J. (HQ-MC000)' [redacted] b(6)
CC: 'Fredrickson, Steven E. (JSC-ER)' [redacted]
Date: Sep 26 2006 - 12:13pm

Thank you very much. It means very much to Carolyn and I right now.

Mike Abernathy

Rapid Imaging Software, Inc.

01698

From: Delgado, Francisco J. (JSC-ER2) [redacted]
Sent: Monday, September 25, 2006 9:42 PM
To: Mike Abernathy; Fein, Edward K. (JSC-AL); Kennedy, Alan J. (HQ-MC000) [redacted]
Cc: Delgado, Francisco J. (JSC-ER2); Fredrickson, Steven E. (JSC-ER)
Subject: FW: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

b(6)

See email from "Mr. Adams" below.

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Please let me know what I need to do on my end to help move this along.

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Frank Delgado

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Subject: RE: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

b(6)

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United States Patent 5,904,724 Margolin May 18, 1999, Method and apparatus for remotely piloting an aircraft

We simple have one goal in mind and that is have a chat regarding the technology and that RIS and NASA take a license of said IP technology.

Thank you

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Sent: Tuesday, September 19, 2006 7:30 AM
Subject: Read: Let us chat on about SCOUT, SC3D, the X-38 program and RIS; noted below are our patents that cover said technology that RIS and your groups are using.

Your message

To: Delgado, Francisco J. (JSC-ER2)

Cc:

Subject: Let us chat on about SCOUT, SC3D, the X-38 program and RIS;

noted below are our patents that cover said technology that RIS and your

groups are using.

Sent: Tue, 19 Sep 2006 08:52:25 -0500

was read on Tue, 19 Sep 2006 09:30:05 -0500

~~~

FW: and the very last communication of the day

From: Fein, Edward K. (JSC-AL) [redacted]
To: Kennedy, Alan J. (HQ-MC000)
CC: Borda, Gary G. (HQ-MC000) [redacted] b(6)
Date: Sep 26 2006 - 8:11am

PSISDG_3691_1_149_1.pdf - 4.7MB - View in Outlook

fyi ...

From: Mike Abernathy [redacted] b(6)
Sent: Monday, September 25, 2006 8:18 PM
To: Delgado, Francisco J. (JSC-ER2); Fein, Edward K. (JSC-AL)
Subject: FW: and the very last communication of the day

01700
~~~

Mike Abernathy

Rapid Imaging Software, Inc.

From: Mike Abernathy [redacted]
Sent: Monday, September 25, 2006 6:25 PM
To: FEIN, EDWARD K. (JSC-HA) (NASA); DELGADO FRANCISCO J. (FRANK) [redacted]
Kennedy, Alan J. (HQ-MC000); [redacted] 'Moore, Thomas, Mr, OSD-ATL';
'Davey, Jon (Bingaman)'
Subject: and the very last communication of the day

b(6)

Hi All,

Let me summarize what I think has just happened to our company.

In late 1995 we introduce our LandForm synthetic vision system to the market as COTS software product.

In 1997/8 we sell this to NASA and together we are the first people on earth to create a synthetic vision flight guidance system for a remotely piloted vehicle. Starting in 1998 the X38 is captive carried and test flown using this system. We documented our success in the attached document written in 1998 and published in early 1999. It was my privilege to be at Edwards when it happened, and is the highlight of my career until the program is cancelled in 2002.

We go on and demonstrate that our software can be used as pilot aid to other UAVs including Predator, Shadow, Tern, and many more. We receive no interest in this application, but instead they use it for sensor operator stations. It is a commercial success and people say good things about it. It is sold to mostly to a commercial UAV manufacturer named AAI Corporation. Many tests are done and the military guys all like it.

In 1999 the patent office issues a patent to a former Atari employee named Margolin for a Synthetic Environment for Remotely Piloted Vehicle. He had evidently applied for it in 1996. Shortly thereafter he begins to complain to NASA that they and RIS infringed upon his patent presumably by flying a system 2 years before he received his patent. Is this a joke?

In 7 years he never so much as asked RIS about using his technology. Margolin as best I can tell never built this system and never test flew it. Can't say as I blame him because his system looks to me like a crater looking for an address. It cannot be safely operated in the form patented (no autopilot). No one is even stupid enough to build it this way, not even him.

Sometime after that, I am alerted to the patent. I read it, but since there are major differences in the way X-38 worked with our software, I felt strongly that we had not infringed. I provide this information, plus evidence of prior art to NASA legal counsel. I am troubled because really I can't see how his system could fly because it would fail during link loss. Margolin also had a patent on synthetic vision for manned aircraft (if you can imagine) and we found copious prior art for that. I am also troubled because I never hear that the request for reexamination has been sent in by NASA.

Last week I received an email from Optima technology group threatening (thinly veiled) to destroy our relationships with our customers and sue us if we don't license their technologies. We explain that we do not sell software for use in piloting unmanned aerial vehicles any more owing to insurance which is true. We had demonstrated this in the past, but there really is not much market that we could see. We also explained that we had not infringed and why we thought we had been respectful of their patent, but they just tried to make it look like we infringed. But we did not.

They know we cannot withstand the onslaught of their lawsuits, even though we are clearly and obviously not guilty of infringement. They think that we will have to fold and accept their license, but we cannot do this because they are legal blackmailers, and because they are selling defective technology. If we give in, then they will just destroy some other little companies they way they did ours. And we cannot let anyone pay them off for us, because that just gives them funds to go destroy another company. For many years our company has tried to provide an innovative product with an excellent value and never compromise our integrity. I cannot let this nonsense bring that to an end by pretending that we are licensing technology when what they are selling is a fraud.

When I asked politely if their system has ever been tested Mr. Adams simply tells us to go get a lawyer, he is referring the matter for filing. I felt that it was not unreasonable to ask to know this but it really made him furious. Anyway I told him to tell it to our lawyer Mr. Ben Allison of Sutinfirm with whom I shall meet tomorrow. Tonight they said that they will issue a cease and desist order, which I believe means that we will be unable to sell our software anymore which will destroy our income stream and that will be it. I can't waste anymore time on this now. It is time for me to get back to work on things that matter for our users.

I have a docs appointment tomorrow at 8-10 local time. I had throat surgery recently so I really can't talk and frankly I find I tend to break into tears very frequently when I try to do so. But I want you all to know that I will stand firm until it is over. What would the soldiers who have used our software in combat think of me if I gave ground? Then bring it on.

I know it sounds bad for us right now, but remember that whatever happens to us no one can take away the honor and the privilege of working with NASA, the OSD, and all the other completely excellent people with whom we have worked.

Mike Abernathy

Rapid Imaging Software, Inc.

Attached are the other communications from them.

From: Robert Adams [redacted] b(6)
Sent: Monday, September 25, 2006 3:51 PM
To: 'Mike Abernathy'
Subject: RE: license

Mike,

Let me try and be clear, all such development at OTG on behalf and or/or by our licensee is covered by NDA's and thus our company can be sued should we violate such agreements. As to your company's infringement of our patents, since that was clearly not covered by a NDA with us; please provide said information in detail:

Other then those items listed at your website and NASA's, what other projects did you do that infringed on our invention? If so when, where, and how?
Who at NASA flight-tested your product that used our invention? Please provide us with the name of the Pilot in Command, the responsible Flight Test Engineer, the model and block number of the vehicle and GCS, and the range or location at which such testing might have taken place with NASA and others. Also, indicate the dates of such testing. If flight test reports are available, as well please provide them to us.

Mike, I have no time to play games with someone who clearly infringes and thinks nothing of respecting our IP.

I will forward said matter to our legal department for further research and filing in accordance with the Federal laws. Please have your legal IP counsel contact our attorneys.

Robert Adams

From: Mike Abernathy [redacted] b(6)
Sent: Monday, September 25, 2006 2:26 PM
To: 'Robert Adams'
Subject: RE: license

Robert,

You have offered to license your technology to our company. You have stated that this technology is useful for "see and avoid applications" for UAVs which is an interesting market arena. We are making a good faith effort to consider your offer. We must know whether this technology has been brought into existence and whether it was ever test flown as a matter of due diligence.

We are not asking these questions out of idle curiosity and we certainly not trying to be difficult – we need this information in order to know the market value of the technology to our users, and there are certain elements of the method that we have concerns about. A flight test report – even if the system was implemented on a model airplane – will almost certainly allay our concerns and we can get on with this. The fact of whether or not this technology has been tested does not require an NDA.

Robert, throughout our dealings I have been honest and responsive to all of your requests, perhaps at peril to our company. I now ask you to please reciprocate my efforts in a small way and provide the requested information so that we may consider your offer of license.

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6)
Sent: Monday, September 25, 2006 2:49 PM
To: 'Mike Abernathy'
Subject: RE: license

Mike,

Neither the company nor I are in any way anxious in signing any more licensees's as we have many already, but as you know we must protect our patents in order to preserve said Intellectual Property.

As to your questions, they do not relate to a license and/or a licensee. Our Intellectual Property has been tested in court and is proven solid by far such standards the Federal Court including the Federal Appeals Court. In addition, as to matters of disclosure, all such development at OTG and by our licensee is covered by NDA's.

Should you wish to challenge such, then I advise you to seek proper legal counseling as we are not an attorney nor will ours advice you on such a matters.

Your company has clearly infringed and OTG must protect itself against such matters just as your company would do if in the same position.

Robert Adams

From: Mike Abernathy [redacted] b(6)
Sent: Monday, September 25, 2006 1:29 PM
To: 'Robert Adams'
Subject: license

Dear Robert,

Please tell the legal team thanks for getting back to us right away – we appreciate it.

You have asked us to consider licensing and this we are now doing. In the interest of due diligence as a prospective licensor of your technology, we ask that you provide us with the following information about the subject invention:

Was this invention ever constructed? If so when, where, and how?
Was this invention ever flight tested? Please provide us with the name of the Pilot in Command, the responsible Flight Test Engineer, the model and block number of the vehicle and GCS, and the range or location at which such testing might have taken place. Also, indicate the dates of such testing. If flight test reports are available please provide them to us, as well.

I know that you are anxious for us to consider your license offer, please provide us with this information.

Mike Abernathy

Rapid Imaging Software, Inc.

~~~~

latest from Optima

From: Mike Abernathy [redacted]
To: FEIN, EDWARD K. (JSC-HA) (NASA) [redacted], Kennedy, Alan J. (HQ-MC000) [redacted] b(6)
Date: Sep 25 2006 - 3:08pm

image002.gif - 6.9k - View in Outlook

Ed,

This has not blown over. We would rather lose our company than see NASA hurt by this. Ed, it appears that RIS situation is hopeless. They know that we did not infringe, yet they continue because they know that we lack the funds to fight them. Our situation appears hopeless but we cannot accept a license for technology that we know is dangerous to the public, so I cannot accept this deal that they have offered.

Let us know what you think as soon as possible.

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6) 01705
~~~~

Sent: Monday, September 25, 2006 12:26 PM
To: 'Mike Abernathy'
Subject: Privileged and Confidential Settlement Communications Protected Under Rule 408 of the Federal Rules of Evidence

Privileged and Confidential Settlement Communications Protected

Under Rule 408 of the Federal Rules of Evidence

Mike,

My legal team has read your response and it is a personal shame since you would rather cut and run verse facing the facts and take a license for past and future business, as I am sure it would be substantially less then litigation.

As you have been made aware in our prior communications, among other inventions, the Patents protect a number of features that are implemented in products capable of flying any and all UAV's (1.3) remotely and/or using Synthetic Vision and/or using a synthetic environment.

1.1 "Patent Portfolio" shall mean the portfolio consisting of United States Patent Numbers 5,904,724 (Method and Apparatus for Remotely Piloting an Aircraft), 5,566,073 (Pilot Aid Using a Synthetic Environment), and those future United States patents that may be added in accordance with the covenants and warranties.

1.2 "RPV" shall mean "remotely piloted vehicle." A "remotely piloted aircraft" is an RPV. "UAV" shall mean "unmanned aerial vehicle." RPV is an older term for UAV. "UCAV" shall mean "Unmanned Combat Aerial Vehicle." UCAV is also sometimes defined as an "Uninhabited Combat Aerial Vehicle." UCAV is a UAV that is intended for use in combat. UCAS means "Unmanned Combat Air System."

1.3 "Synthetic Vision" is the current term for "Synthetic Environment" and is the three dimensional projected image data presented to the pilot or other observer.

Of the ten companies responsible for the establishment of UAV Specifications or standard, eight of those companies sell UAV-Devices under brands they control, and each of those companies, i.e., Boeing Aerospace; Lockheed; Nakamichi Corporation; General Atomics Corporation; L-3 and Jacor Corporation; Raytheon; and Geneva Aerospace, pay Optima running royalties for the above referenced patents.

The substantial terms and conditions of our licensing Agreement: i) resulted from negotiations with the market leading manufacturers of UAV's; ii) are subject to most favored nation clauses; and iii) are, therefore, not negotiable.

The Agreement i) is exceedingly fair; ii) does not obligate Infringer to anything more than an industry accepted reasonable royalty for the Patents; iii) does not obligate Infringer to anything more than an industry accepted reasonable terms; and iv) may be canceled by Infringer at any time.

Mike, there is no reason to permit Infringer (Your company) to further drag on the execution of said Agreement based on the facts present on the infringement matter.

Infringer must appreciate that the Patents cover a range of different inventions required to implement the UAV using Synthetic Vision Specifications; and there exists pending divisions of the Patents having claims that are read on by implementation of the UAV Specifications. Infringer principal competitors have appreciated the exceptional litigation strength and flexibility of my patent portfolio and have decided to accept a license rather than expose themselves to an injunction.

Infringer must appreciate that if litigation between the parties is initiated: i) the matter will immediately become personal for both parties; ii) I do not have to account to any other person; and iii) no license or settlement of any kind will ever be possible under any of my intellectual properties. Infringer's competitors require that Infringer be either licensed or enjoined.

I have resolved myself to this course of action in the event an agreement reached shortly, I firmly believe that enjoining Infringer from selling UAV-Devices will not result in lost royalties; and it is in Optima's long-term interests to make an example of a company that has refused to take a license.

Anyone who is fully knowledgeable of the strength and scope of my patent portfolio, and who appreciates the risk-taking and tenacity that I have demonstrated, would not, in light of the terms being offered, recommend jeopardizing the UAV business Infringer enjoys in the U.S.

1.

I have just returned from business travel, and have not had a chance to look over your communications in detail. Thank you very much for bringing your concerns to our attention. Let me assure you that we will do everything in our power, now and in the future, to avoid infringement of these or any patents. We have already begun another careful analysis of them and will act swiftly upon what we learn, should any problems be found. We have been aware of these patents for some years and have not ever infringed upon them, and will not do so. When we first learned of them, we carefully examined our activities and those of our customers to make sure there was no possible infringement of them. As soon as we learned of it, we also informed the legal departs of our major customers to alert them to the existence of USP 5,904,724, but so far no UAV manufacturers have been seriously interested in offering synthetic vision for their UAV pilot stations.

RIS own admission they knew about '724 will go to show that their infringement was willful, which means treble damages Robert. (They probably found out about it when NASA interviewed Jed about their X-38 project.) We will find out at trail and/or during the discover phase.

From their web site: http://www.landform.com/

SmartCam3D provides unparalleled situation awareness for UAS sensor operators. It fuses video with synthetic vision to create the most powerful situation awareness technology currently available. SmartCam3D is an augmented reality system that has been developed, flight tested, and deployed in the most demanding conditions including combat, and as a result it is highly evolved technology which is in use today around the world. The reason that SmartCam3D is so popular is simple: it makes sensor operators more effective, and reduces the target response time. SmartCam3D is deployed with US Army Shadow UAV, and is at present being integrated to the USAF Predator, as well as the Army Warrior UAS. SmartCam3D is the war fighter's choice for sensor operator situational awareness.

Improving a patented invention by adding something to it (in this case fusing video with synthetic vision) is still

infringement. Indeed, you may be able to patent the improvement. However, you may not practice the improved inventior without the permission of the original patent holder. (It also means that the holder of the original patent may not practice your improvement without your permission.)

Since they publicly admit SmartCam3D is being used with US Army Shadow, USAF Predator, and Army Warrior his statement "no UAV manufacturers have been seriously interested in offering synthetic vision for their UAV pilot stations" i obviously false.

Also from their web site:

Software License Changes

RIS, Inc. changed insurance carriers, and effective September 1st, 2006 we updated our Software User License agreement. It now states that "The user is prohibited from using this software to pilot manned or unmanned aircraft." Our licenses have always prohibited use of our software for piloting manned aircraft. As you know, we had hoped that we would find a market for our UAV Glass Cockpit Product line. However, there is simply not sufficient market interest for us to bring such a product to market at this time, so we have decided not to release it. As a small company, we need to focus on our energy on the Sensor Operator and Intelligence Analyst at this time.

He is saying that his product should not be used for the very purpose it being advertised, sold, and used for. Lame. And it doesn't get him off the hook as he is still legally liable.

Since it did not state this until September 1, 2006, he has started to take this seriously, and he is clearly worried thus, he changed the terms to try to reduce the liability. I will have our team use wayback site and pull up the old Software User License agreement prior to Sept 1, 2006 this is when I bet they made all their sales and that is what OTG would be entitled too as well.

Here is a short lesson on infringement for Mike.

From: : http://inventors.about.com/library/bl/toc/bl_patent-infringement.htm

Text Box: Infringement can be direct, indirect, or contributory. Anyone who makes, uses, or sells the patented invention is a direct infringer. If a person actively encourages another to make, use, or sell the invention, the person so inducing is liable for indirect infringement. Contributory infringement can be committed by knowingly selling or supplying an item for which the only use is in connection with a patented invention. Good faith or ignorance is no defense for direct infringement, but it can be for indirect or contributory infringement. The remedies for infringement consist of: 1. Injunctive relief,
2. damages (including treble damages for willful infringement),
3. attorneys' fees in some cases, and
4. court costs.

2.

We discovered that the system described the in patent pertaining to remotely piloted vehicles USP 5,904,724 contains an entire clause in claim 1 that did not exist in the X38 or other UAVs that we have seen – this is the final paragraph of clause 1 regarding the method for handling delay in the control loop by "adjusting control sensitivity". This simply is not present in any form in any vehicles with which we have experience. Since all claims of this patent include this clause by reference, that patent is not relevant to these vehicles because none of them have this feature.

The clause he is referring to is:

a set of one or more remote flight controls coupled to said computer for inputting said flight control information, 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.

Time delays in a control system are unavoidable. Normally, a control system has fixed time delays and the system is designed to operate properly with these time delays. Because of the complexity of a UAV system these time delays may

not be known at the time the system (including the control laws) are designed. These time delays may also change during a mission due to the communications path changing. If the system does not properly deal with these changing time delays it will lead to pilot-induced oscillation and there is a good chance the aircraft will crash.

Anyone designing a UAS that does not adjust for changing time delays is an idiot. I don't think the people making UAVs are idiots. That does not relieve him of contributory infringement. It is likely that these time delays are dealt with as part of the control law system which Abernathy might not be privy to and thus a court order will provide us his insider info.

3.

More important however, is that all UAV control systems with which we are familiar require a device called an autopilot which is not contemplated at all in the subject patent. This device is similar to ones in modern manned aircraft, but it is used to control the aircraft flight in the pitch, heading, and roll axes. On UAVs, the communications delay is not handled by determining the delay and adjusting the control sensitivity as Margolin prescribes. Instead, an autopilot is installed onboard the aircraft where it senses changes in pitch, heading, and roll locally on board the aircraft. The pilot still makes control inputs to fly the airplane, but only via the autopilot on board the aircraft. The autopilot corrects attitude drift instantaneously avoiding the problem of substantial communication delays, and allows the pilot to control the vehicle in a more stable manner.

Most important, the autopilot is absolutely required to deal with the frequent communications outages which occur between the UAV and the ground control segment (This can be anywhere from a second to an hour in length, generally). In the system of Margolin, a communications outage would often result in the loss of the aircraft, because the pilot would be unable to correct attitude drift during communication link loss and the air vehicle would go out of control and could crash. In the last decade of working with UAVs never have I witnessed a flight in which the communication link was not lost at least once during the flight. If the control communication link goes down, no control inputs can be made to the aircraft from the pilot on the ground, but the autopilot keeps the airplane from crashing by flying straight and level or gently banking until the link is restored. The system of Margolin does not recognize the problem of link loss, and fails to offer any solution. The autopilot functionality can be located in various components in the X38 it was in the on board GNC (Guidance Navigation and Control) computer, as I recollect.

The fact that '724 does not explicitly teach an autopilot is irrelevant. Adding an autopilot to '724 is still infringement, just as adding a video overlay is infringement.

There is also the matter of the Doctrine of Equivalence. See attached file patents1.pdf

Consider Column 2, lines 12-18:

The computers in the system allow for several modes of operation. For example, the remote aircraft can be instructed to fly to given coordinates without further input from the remote pilot. It also makes it possible to provide computer assistance to the remote pilot. In this mode, the remote flight control controls absolute pitch and roll angles instead pitch and roll rates which is the normal mode for aircraft.

That legal sounds like a defined autopilot to me and that as we need to show infringement at the Markman hearing..

4.

There is another on-board component called a SAS or Stability Augmentation System found on most large modern UAVs such as Predator, and which performs additional real-time stabilization to that done by the autopilot. Again, the SAS is not contemplated by the Margolin patent, yet is required to dampen control system oscillations in order to safely operate a UAV in systems that may suffer from communications delays to remote user control inputs. There are many more differences that we found when we first examined it, but as you can see we have never worked with a vehicle upon which your system could have been implemented and safely flown, and therefore we realized that it is impossible for us to have infringed this patent 5,904,724. You may easily independently verify the fact of these profound and fundamental differences from your system by examining the printed published materials regarding UAV control system and NASAs many publications on X-38 control systems.

Again, adding something to '724 is still infringement.

As far as examining the control systems on NASA's X-38 project is concerned, in a telephone conversation with NASA's Alan Kennedy in the Office of the General Counsel on February 9, 2006, he repeated his claim that, "The X-38 does fly." NASA has a video of the X-38 (flying) on its web site. (See http://www.dfrc.nasa.gov/Gallery/Movie/X-38/HTML/EM-0038-

01.html)

5.

We have never allowed our software to be used as an aid in piloting manned aircraft and thus cannot have infringed 5,566,073. If you aware of anyone doing this with our software, kindly inform us immediately, and we will ask them to desist.

We still have him on infringing on '724.

6.

Finally, let me set your mind at ease by informing you that our software product license currently explicitly contains the following clause: "The user is prohibited from using this software to pilot manned or unmanned aircraft." Alas, the requirements of our current company insurance policy, combined with the profound lack of a market for this possible application of our technology facilitated this business decision. Your letter said we recognize the "value" of this technology, but in view of the current situation "lack of value" is probably more appropriate.

From: Mike Abernathy [redacted] b(6)
Sent: Monday, September 25, 2006 9:08 AM
To: 'Robert Adams'
Subject: question

Robert,

Thanks for your offer to call but I am still getting over throat surgery from 2 weeks ago so my phone is forwarded, but I look forward to email from you and/or your attorneys.

In trying to understand the value of your IP I would like to ask 2 questions regarding USP 5,904,724. Was this system ever built? Was it ever flight tested? Of course you need not answer, but it really would be helpful in understanding what is required to get your technology to market.

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6)
Sent: Monday, September 25, 2006 8:55 AM
To: 'Mike Abernathy'
Subject: RE: Rapid Imaging Software, Inc. patent infringement

Mike,

01710

Thanks for your email, I will forward it today over to my patent and review legal team. Once they complete a review of your comments, I will give you a ring on the phone and a response via the post and/or attorneys.

Respectfully,

Robert Adams

From: Mike Abernathy [redacted] b(6)
Sent: Sunday, September 24, 2006 4:29 PM
To: 'Robert Adams'
Subject: RE: Rapid Imaging Software, Inc. patent infringement

Dear Mr. Adams,

I have just returned from business travel, and have not had a chance to look over your communications in detail. Thank you very much for bringing your concerns to our attention. Let me assure you that we will do everything in our power, now and in the future, to avoid infringement of these or any patents. We have already begun another careful analysis of them and will act swiftly upon what we learn, should any problems be found. We have been aware of these patents for some years and have not ever infringed upon them, and will not do so. When we first learned of them we carefully examined our activities and those of our customers to make sure there was no possible infringement of them. As soon as we learned of it, we also informed the legal departs of our major customers to alert them to the existence of USP 5,904,724, but so far no UAV manufacturers have been seriously interested in offering synthetic vision for their UAV pilot stations.

We discovered that the system described the in patent pertaining to remotely piloted vehicles USP 5,904,724 contains an entire clause in claim 1 that did not exist in the X38 or other UAVs that we have seen – this is the final paragraph of clause 1 regarding the method for handling delay in the control loop by "adjusting control sensitivity". This simply is not present in any form in any vehicles with which we have experience. Since all claims of this patent include this clause by reference, that patent is not relevant to these vehicles because none of them have this feature.

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We have never allowed our software to be used as an aid in piloting manned aircraft and thus cannot have infringed 5,566,073. If you aware of anyone doing this with our software, kindly inform us immediately, and we will ask them to desist.

Finally, let me set your mind at ease by informing you that our software product license currently explicitly contains the following clause: "The user is prohibited from using this software to pilot manned or unmanned aircraft." Alas, the requirements of our current company insurance policy, combined with the profound lack of a market for this possible application of our technology facilitated this business decision. Your letter said we recognize the "value" of this technology, but in view of the current situation "lack of value" is probably more appropriate.

We will get back to you just as soon as we have had a chance to study these patent claims further. For now, is there anything else that our company can reasonably do in regard to the concern that you expressed?

Sincerely,

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6)
Sent: Tuesday, September 19, 2006 7:53 AM
To: [redacted]
Cc [redacted]
Subject: [Norton AntiSpam] Rapid Imaging Software, Inc. patent infringement

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

01712

September 19, 2006

Michael F. Abernathy

Rapid Imaging Software, Inc.

[redacted] b(6)

Sent via US MAIL, FAX & EMAIL

Mr. Abernathy,

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

I am sure that Mr. Francisco Delgado of NASA and your other clients would agree with your company having a proper license of our intellectual property.

Hence as a legal formality, we are inviting your company to license our technology seeing that your company is already commercially using and selling said technology as covered by our IP listed below:

United States Patent 5,566,073 Margolin October 15, 1996 Pilot aid using a synthetic environment

United States Patent 5,904,724 Margolin May 18, 1999, Method and apparatus for remotely piloting an aircraft

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Please contact us so that we can a proper legal license with our attorneys for your use of our technology and/or you may contact our attorneys (HYPERLINK "http://by106fd.bay106.hotmail.msn.com/cgi-bin/compose?mailto=1&msg=0BE8FF07-

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b(6)

Sincerely,

Robert Adams, CEO

Optima Technology Group

RA/cp

-enclosure links-

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FW: question

From: Mike Abernathy [redacted]
To: DELGADO FRANCISCO J. (FRANK) [redacted], 'Fein, Edward K. (JSC-AL)' [redacted] 'Kennedy, Alan J. (HQ-MC000)' [redacted]
Date: Sep 25 2006 - 11:44am

b(6)

One more FYI.

Mike Abernathy

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Sent: Monday, September 25, 2006 10:08 AM
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Subject: question

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Robert Adams, CEO

Optima Technology Group

RA/cp

-enclosure links-

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RE: Rapid Imaging Software, Inc. patent infringement

From: Fein, Edward K. (JSC-AL) [redacted]
To: Mike Abernathy [redacted], DELGADO FRANCISCO J. (FRANK) [redacted]
CC: Kennedy, Alan J. (HQ-MC000) [redacted]
Date: Sep 25 2006 - 10:38am

b(6)

Thanks, Mike.

-Ed

01718
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From: Mike Abernathy [redacted] b(6)
Sent: Monday, September 25, 2006 10:32 AM
To: Fein, Edward K. (JSC-AL); DELGADO FRANCISCO J. (FRANK)
Cc: Kennedy, Alan J. (HQ-MC000)
Subject: FW: Rapid Imaging Software, Inc. patent infringement

FYI

Mike Abernathy

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Dear Mr. Adams,

01719

I have just returned from business travel, and have not had a chance to look over your communications in detail. Thank you very much for bringing your concerns to our attention. Let me assure you that we will do everything in our power, now and in the future, to avoid infringement of these or any patents. We have already begun another careful analysis of them and will act swiftly upon what we learn, should any problems be found. We have been aware of these patents for some years and have not ever infringed upon them, and will not do so. When we first learned of them we carefully examined our activities and those of our customers to make sure there was no possible infringement of them. As soon as we learned of it, we also informed the legal departs of our major customers to alert them to the existence of USP 5,904,724, but so far no UAV manufacturers have been seriously interested in offering synthetic vision for their UAV pilot stations.

We discovered that the system described the in patent pertaining to remotely piloted vehicles USP 5,904,724 contains an entire clause in claim 1 that did not exist in the X38 or other UAVs that we have seen – this is the final paragraph of clause 1 regarding the method for handling delay in the control loop by "adjusting control sensitivity". This simply is not present in any form in any vehicles with which we have experience. Since all claims of this patent include this clause by reference, that patent is not relevant to these vehicles because none of them have this feature.

More important however, is that all UAV control systems with which we are familiar require a device called an autopilot which is not contemplated at all in the subject patent. This device is similar to ones in modern manned aircraft, but it is used to control the aircraft flight in the pitch, heading, and roll axes. On UAVs, the communications delay is not handled by determining the delay and adjusting the control sensitivity as Margolin prescribes. Instead, an autopilot is installed onboard the aircraft where it senses changes in pitch, heading, and roll locally on board the aircraft. The pilot still makes control inputs to fly the airplane, but only via the autopilot on board the aircraft. The autopilot corrects attitude drift instantaneously avoiding the problem of substantial communication delays, and allows the pilot to control the vehicle in a more stable manner.

Most important, the autopilot is absolutely required to deal with the frequent communications outages which occur between the UAV and the ground control segment (This can be anywhere from a second to an hour in length, generally). In the system of Margolin, a communications outage would often result in the loss of the aircraft, because the pilot would be unable to correct attitude drift during communication link loss and the air vehicle would go out of control and could crash. In the last decade of working with UAVs never have I witnessed a flight in which the communication link was not lost at least once during the flight. If the control communication link goes down, no control inputs can be made to the aircraft from the pilot on the ground, but the autopilot keeps the airplane from crashing by flying straight and level or gently banking until the link is restored. The system of Margolin does not recognize the problem of link loss, and fails to offer any solution. The autopilot functionality can be located in various components in the X38 it was in the on board GNC (Guidance Navigation and Control) computer, as I recollect.

There is another on-board component called a SAS or Stability Augmentation System found on most large modern UAVs such as Predator, and which performs additional real-time stabilization to that done by the autopilot. Again, the SAS is not contemplated by the Margolin patent, yet is required to dampen control system oscillations in order to safely operate a UAV in systems that may suffer from communications delays to remote user control inputs. There are many more differences that we found when we first examined it, but as you can see we have never worked with a vehicle upon which your system could have been implemented and safely flown, and therefore we realized that it is impossible for us to have infringed this patent 5,904,724. You may easily independently verify the fact of these profound and fundamental differences from your system by examining the printed published materials regarding UAV control system and NASAs many publications on X-38 control systems.

We have never allowed our software to be used as an aid in piloting manned aircraft and thus cannot have infringed 5,566,073. If you aware of anyone doing this with our software, kindly inform us immediately, and we will ask them to desist.

01720

Finally, let me set your mind at ease by informing you that our software product license currently explicitly contains the following clause: "The user is prohibited from using this software to pilot manned or unmanned aircraft." Alas, the requirements of our current company insurance policy, combined with the profound lack of a market for this possible application of our technology facilitated this business decision. Your letter said we recognize the "value" of this technology, but in view of the current situation "lack of value" is probably more appropriate.

We will get back to you just as soon as we have had a chance to study these patent claims further. For now, is there anything else that our company can reasonably do in regard to the concern that you expressed?

Sincerely,

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6)
Sent: Tuesday, September 19, 2006 7:53 AM
To: [redacted]
Cc:
Subject: [Norton AntiSpam] Rapid Imaging Software, Inc. patent infringement

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

September 19, 2006

Michael F. Abernathy

Rapid Imaging Software, Inc.

[redacted] b(6)

01721

Sent via US MAIL, FAX & EMAIL

Mr. Abernathy,

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

I am sure that Mr. Francisco Delgado of NASA and your other clients would agree with your company having a proper license of our intellectual property.

Hence as a legal formality, we are inviting your company to license our technology seeing that your company is already commercially using and selling said technology as covered by our IP listed below:

United States Patent 5,566,073 Margolin October 15, 1996 Pilot aid using a synthetic environment

United States Patent 5,904,724 Margolin May 18, 1999, Method and apparatus for remotely piloting an aircraft

We are pleased that you recognize the value of using Synthetic Vision to allow UAV's to See-and-Avoid other aircraft; this is covered by our patents as noted above.

Please contact us so that we can a proper legal license with our attorneys for your use of our technology and/or you may contact our attorneys (HYPERLINK "http://by106fd.bay106.hotmail.msn.com/cgi-bin/compose?mailto=1&msg=0BE8FF07-CD08-47B5-A58D-A825698FD5EB&start=0&len=6480&src=&type=x&to=[redacted]&cc=&bcc=&subject=&body=&curmbox=00000000-0000-0000-0000-000000000001&a=ad17460c4976d4c8a2dcf004b74ca88163cef3516fe0531abada331a64870d4c"[redacted] to arrange a proper license of said intellectual property. You have 15 days to do so.

b(6)

Sincerely,

Robert Adams, CEO

Optima Technology Group

RA/cp

-enclosure links-

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✉ **RE: Rapid Imaging Software, Inc. patent infringement**

01728
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From: Fein, Edward K. (JSC-AL) [redacted]
To: Mike Abernathy [redacted], DELGADO FRANCISCO J. (FRANK) [redacted] b(6)
CC: Kennedy, Alan J. (HQ-MC000) [redacted]
Date: Sep 25 2006 - 10:38am

Thanks, Mike.

-Ed

From: Mike Abernathy [redacted] b(6)
Sent: Monday, September 25, 2006 10:32 AM
To: Fein, Edward K. (JSC-AL); DELGADO FRANCISCO J. (FRANK)
Cc: Kennedy, Alan J. (HQ-MC000)
Subject: FW: Rapid Imaging Software, Inc. patent infringement

FYI

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6)
Sent: Monday, September 25, 2006 8:55 AM
To: 'Mike Abernathy'
Subject: RE: Rapid Imaging Software, Inc. patent infringement

Mike,

Thanks for your email, I will forward it today over to my patent and review legal team. Once they complete a review of your comments, I will give you a ring on the phone and a response via the post and/or attorneys.

Respectfully,

Robert Adams

01723

From: Mike Abernathy [redacted] b(6)
Sent: Sunday, September 24, 2006 4:29 PM
To: 'Robert Adams'
Subject: RE: Rapid Imaging Software, Inc. patent infringement

Dear Mr. Adams,

I have just returned from business travel, and have not had a chance to look over your communications in detail. Thank you very much for bringing your concerns to our attention. Let me assure you that we will do everything in our power, now and in the future, to avoid infringement of these or any patents. We have already begun another careful analysis of them and will act swiftly upon what we learn, should any problems be found. We have been aware of these patents for some years and have not ever infringed upon them, and will not do so. When we first learned of them we carefully examined our activities and those of our customers to make sure there was no possible infringement of them. As soon as we learned of it, we also informed the legal departs of our major customers to alert them to the existence of USP 5,904,724, but so far no UAV manufacturers have been seriously interested in offering synthetic vision for their UAV pilot stations.

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More important however, is that all UAV control systems with which we are familiar require a device called an autopilot which is not contemplated at all in the subject patent. This device is similar to ones in modern manned aircraft, but it is used to control the aircraft flight in the pitch, heading, and roll axes. On UAVs, the communications delay is not handled by determining the delay and adjusting the control sensitivity as Margolin prescribes. Instead, an autopilot is installed onboard the aircraft where it senses changes in pitch, heading, and roll locally on board the aircraft. The pilot still makes control inputs to fly the airplane, but only via the autopilot on board the aircraft. The autopilot corrects attitude drift instantaneously avoiding the problem of substantial communication delays, and allows the pilot to control the vehicle in a more stable manner.

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differences that we found when we first examined it, but as you can see we have never worked with a vehicle upon which your system could have been implemented and safely flown, and therefore we realized that it is impossible for us to have infringed this patent 5,904,724. You may easily independently verify the fact of these profound and fundamental differences from your system by examining the printed published materials regarding UAV control system and NASAs many publications on X-38 control systems.

We have never allowed our software to be used as an aid in piloting manned aircraft and thus cannot have infringed 5,566,073. If you aware of anyone doing this with our software, kindly inform us immediately, and we will ask them to desist.

Finally, let me set your mind at ease by informing you that our software product license currently explicitly contains the following clause: "The user is prohibited from using this software to pilot manned or unmanned aircraft." Alas, the requirements of our current company insurance policy, combined with the profound lack of a market for this possible application of our technology facilitated this business decision. Your letter said we recognize the "value" of this technology, but in view of the current situation "lack of value" is probably more appropriate.

We will get back to you just as soon as we have had a chance to study these patent claims further. For now, is there anything else that our company can reasonably do in regard to the concern that you expressed?

Sincerely,

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6)
Sent: Tuesday, September 19, 2006 7:53 AM
To: [redacted]
Cc: [redacted]
Subject: [Norton AntiSpam] Rapid Imaging Software, Inc. patent infringement

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

September 19, 2006

Michael F. Abernathy

Rapid Imaging Software, Inc.

[redacted] b(6)

Sent via US MAIL, FAX & EMAIL

Mr. Abernathy,

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

I am sure that Mr. Francisco Delgado of NASA and your other clients would agree with your company having a proper license of our intellectual property.

Hence as a legal formality, we are inviting your company to license our technology seeing that your company is already commercially using and selling said technology as covered by our IP listed below:

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United States Patent 5,904,724 Margolin May 18, 1999, Method and apparatus for remotely piloting an aircraft

We are pleased that you recognize the value of using Synthetic Vision to allow UAV's to See-and-Avoid other aircraft; this is covered by our patents as noted above.

Please contact us so that we can a proper legal license with our attorneys for your use of our technology and/or you may contact our attorneys (HYPERLINK "http://by106fd.bay106.hotmail.msn.com/cgi-bin/compose?mailto=1&msg=0BE8FF07-CD08-47B5-A58D-A825698FD5EB&start=0&len=6480&src=&type=x&to=[redacted]&cc=&bcc=&subject=&body=&curmbox=00000000-0000-0000-0000-000000000001&a=ad17460c4976d4c8a2dcf004b74ca88163cef3516fe0531abada331a64870d4c[redacted]to arrange a proper license of said intellectual property. You have 15 days to do so.

b(6)

Sincerely,

Robert Adams, CEO

Optima Technology Group

01726

RA/cp

-enclosure links-

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RE: Rapid Imaging Software, Inc. patent infringement

From: Fein, Edward K. (JSC-AL) [redacted]
To: Mike Abernathy [redacted], Delgado, Francisco J. (JSC-ER2) [redacted], Kennedy, Alan J. (HQ-MC000) [redacted]
Date: Sep 25 2006 - 9:59am

b(6)

Thanks, Mike!

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RE: Rapid Imaging Software, Inc. patent infringement

From: Fein, Edward K. (JSC-AL) [redacted]
To: Delgado, Francisco J. (JSC-ER2) [redacted] Mike Abernathy [redacted] Kennedy, Alan [redacted]
Date: Sep 25 2006 - 8:55am

b(6)

I'm including Alan Kennedy, the attorney at NASA Headquarters who handles patent infringement for the agency, on this response. I believe your (Mike's) response to Optima is quite thorough and could very well diffuse this issue. I'm not sure a telecon at this time is warranted. I suggest we wait to see Optima's response.

Alan, do you have any additional thoughts?

-Ed

Edward K. Fein
Deputy Chief Counsel/
Intellectual Property Counsel
NASA Johnson Space Center
[redacted]

b(6)

01727

From: Delgado, Francisco J. (JSC-ER2)
Sent: Monday, September 25, 2006 1:12 AM
To: Mike Abernathy; Fein, Edward K. (JSC-AL)
Subject: RE: Rapid Imaging Software, Inc. patent infringement

Please work with Mr. Fein on a time to call. I can 'sneak' away from any activity tomorrow to join a conference call.

thanks,

Frank

b(6)

From: Mike Abernathy [redacted]
Sent: Sun 9/24/2006 6:38 PM
To: Fein, Edward K. (JSC-AL); Delgado, Francisco J. (JSC-ER2)
Subject: Rapid Imaging Software, Inc. patent infringement

Gentlemen,

I strongly believe that these two patents are defective, but more important I feel strongly that NASA and RIS did not infringe either one of them, in spite of these accusations.

I would like to ask for your help urgently since these people are threatening to sue us and since they have falsely accused us of infringement.

I therefore would like to ask both of you to read my letter attached below which has been sent to Mr. Adams, to make sure that I am stating things properly. Would it be possible for me to call you tomorrow on the phone?

Mike Abernathy

Rapid Imaging Software, Inc.

b(6)

From: Mike Abernathy [redacted]
Sent: Sunday, September 24, 2006 5:29 PM
To: 'Robert Adams'
Subject: RE: [Norton AntiSpam] Rapid Imaging Software, Inc. patent infringement

01728

Dear Mr. Adams,

I have just returned from business travel, and have not had a chance to look over your communications in detail. Thank you very much for bringing your concerns to our attention. Let me assure you that we will do everything in our power, now and in the future, to avoid infringement of these or any patents. We have already begun another careful analysis of them and will act swiftly upon what we learn, should any problems be found. We have been aware of these patents for some years and have not ever infringed upon them, and will not do so. When we first learned of them we carefully examined our activities and those of our customers to make sure there was no possible infringement of them. As soon as we learned of it, we also informed the legal departs of our major customers to alert them to the existence of USP 5,904,724, but so far no UAV manufacturers have been seriously interested in offering synthetic vision for their UAV pilot stations.

We discovered that the system described the in patent pertaining to remotely piloted vehicles USP 5,904,724 contains an entire clause in claim 1 that did not exist in the X38 or other UAVs that we have seen – this is the final paragraph of clause 1 regarding the method for handling delay in the control loop by "adjusting control sensitivity". This simply is not present in any form in any vehicles with which we have experience. Since all claims of this patent include this clause by reference, that patent is not relevant to these vehicles because none of them have this feature.

More important however, is that all UAV control systems with which we are familiar require a device called an autopilot which is not contemplated at all in the subject patent. This device is similar to ones in modern manned aircraft, but it is used to control the aircraft flight in the pitch, heading, and roll axes. On UAVs, the communications delay is not handled by determining the delay and adjusting the control sensitivity as Margolin prescribes. Instead, an autopilot is installed onboard the aircraft where it senses changes in pitch, heading, and roll locally on board the aircraft. The pilot still makes control inputs to fly the airplane, but only via the autopilot on board the aircraft. The autopilot corrects attitude drift instantaneously avoiding the problem of substantial communication delays, and allows the pilot to control the vehicle in a more stable manner.

Most important, the autopilot is absolutely required to deal with the frequent communications outages which occur between the UAV and the ground control segment (This can be anywhere from a second to an hour in length, generally). In the system of Margolin, a communications outage would often result in the loss of the aircraft, because the pilot would be unable to correct attitude drift during communication link loss and the air vehicle would go out of control and could crash. In the last decade of working with UAVs never have I witnessed a flight in which the communication link was not lost at least once during the flight. If the control communication link goes down, no control inputs can be made to the aircraft from the pilot on the ground, but the autopilot keeps the airplane from crashing by flying straight and level or gently banking until the link is restored. The system of Margolin does not recognize the problem of link loss, and fails to offer any solution. The autopilot functionality can be located in various components in the X38 it was in the on board GNC (Guidance Navigation and Control) computer, as I recollect.

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We have never allowed our software to be used as an aid in piloting manned aircraft and thus cannot have infringed

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Finally, let me set your mind at ease by informing you that our software product license currently explicitly contains the following clause: "The user is prohibited from using this software to pilot manned or unmanned aircraft." Alas, the requirements of our current company insurance policy, combined with the profound lack of a market for this possible application of our technology facilitated this business decision. Your letter said we recognize the "value" of this technology, but in view of the current situation "lack of value" is probably more appropriate.

We will get back to you just as soon as we have had a chance to study these patent claims further. For now, is there anything else that our company can reasonably do in regard to the concern that you expressed?

Sincerely,

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6)
Sent: Tuesday, September 19, 2006 7:53 AM
To: [redacted]
Cc: [redacted]
Subject: [Norton AntiSpam] Rapid Imaging Software, Inc. patent infringement

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

September 19, 2006

Michael F. Abernathy

Rapid Imaging Software, Inc.

01730

[redacted] b(6)

[redacted] b(6)

Sent via US MAIL, FAX & EMAIL

Mr. Abernathy,

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

I am sure that Mr. Francisco Delgado of NASA and your other clients would agree with your company having a proper license of our intellectual property.

Hence as a legal formality, we are inviting your company to license our technology seeing that your company is already commercially using and selling said technology as covered by our IP listed below:

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Please contact us so that we can a proper legal license with our attorneys for your use of our technology and/or you may contact our attorneys (HYPERLINK "http://by106fd.bay106.hotmail.msn.com/cgi-bin/compose?mailto=1&msg=0BE8FF07-CD08-47B5-A58D-A825698FD5EB&start=0&len=6480&src=&type=x&to=[redacted]&cc=&bcc=&subject=&body=&curmbox=00000000-0000-0000-0000-000000000001&a=ad17460c4976d4c8a2dcf004b74ca88163cef3516fe0531abada331a64870d4c" [redacted] arrange a proper license of said intellectual property. You have 15 days to do so.

Sincerely, b(6)

Robert Adams, CEO

Optima Technology Group

RA/cp

-enclosure links-

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01731
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RE: Rapid Imaging Software, Inc. patent infringement

From: Delgado, Francisco J. (JSC-ER2) [redacted] b(6)
To: Mike Abernathy [redacted], Fein, Edward K. (JSC-AL) [redacted]
Date: Sep 25 2006 - 1:13am

Please work with Mr. Fein on a time to call. I can 'sneak' away from any activity tomorrow to join a conference call.

thanks,

Frank

From: Mike Abernathy [redacted] b(6)
Sent: Sun 9/24/2006 6:38 PM
To: Fein, Edward K. (JSC-AL); Delgado, Francisco J. (JSC-ER2)
Subject: Rapid Imaging Software, Inc. patent infringement

Gentlemen,

I strongly believe that these two patents are defective, but more important I feel strongly that NASA and RIS did not infringe either one of them, in spite of these accusations.

I would like to ask for your help urgently since these people are threatening to sue us and since they have falsely accused us of infringement.

I therefore would like to ask both of you to read my letter attached below which has been sent to Mr. Adams, to make sure that I am stating things properly. Would it be possible for me to call you tomorrow on the phone?

Mike Abernathy

Rapid Imaging Software, Inc.

From: Mike Abernathy [redacted] b(6)
Sent: Sunday, September 24, 2006 5:29 PM
To: 'Robert Adams'
Subject: RE: [Norton AntiSpam] Rapid Imaging Software, Inc. patent infringement

Dear Mr. Adams,

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and in the future, to avoid infringement of these or any patents. We have already begun another careful analysis of them and will act swiftly upon what we learn, should any problems be found. We have been aware of these patents for some years and have not ever infringed upon them, and will not do so. When we first learned of them we carefully examined our activities and those of our customers to make sure there was no possible infringement of them. As soon as we learned of it, we also informed the legal departs of our major customers to alert them to the existence of USP 5,904,724, but so far no UAV manufacturers have been seriously interested in offering synthetic vision for their UAV pilot stations.

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Sincerely,

Mike Abernathy

Rapid Imaging Software, Inc.

From: Robert Adams [redacted] b(6)
Sent: Tuesday, September 19, 2006 7:53 AM
To: [redacted]
Cc: [redacted]
Subject: [Norton AntiSpam] Rapid Imaging Software, Inc. patent infringement

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

September 19, 2006

Michael F. Abernathy

Rapid Imaging Software, Inc.

[redacted] b(6)

Sent via US MAIL, FAX & EMAIL

01734

Mr. Abernathy,

It has come to our attention that your company provides Synthetic Vision to fly UAV both in real time and in simulation.

I am sure that Mr. Francisco Delgado of NASA and your other clients would agree with your company having a proper license of our intellectual property.

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United States Patent 5,566,073 Margolin October 15, 1996 Pilot aid using a synthetic environment

United States Patent 5,904,724 Margolin May 18, 1999, Method and apparatus for remotely piloting an aircraft

We are pleased that you recognize the value of using Synthetic Vision to allow UAV's to See-and-Avoid other aircraft; this is covered by our patents as noted above.

Please contact us so that we can a proper legal license with our attorneys for your use of our technology and/or you may contact our attorneys (HYPERLINK "http://by106fd.bay106.hotmail.msn.com/cgi-bin/compose?mailto=1&msg=0BE8FF07-CD08-47B5-A58D-A825698FD5EB&start=0&len=6480&src=&type=x&to=[redacted]&cc=&bcc=&subject=&body=&curmbox=00000000-0000-0000-0000-000000000001&a=ad17460c4976d4c8a2dcf004b74ca88163cef3516fe0531abada331a64870d4c"[redacted] to arrange a proper license of said intellectual property. You have 15 days to do so.

b(6)

Sincerely,

Robert Adams, CEO

Optima Technology Group

RA/cp

-enclosure links-
~~~

RE: US Patents 5566073 and 5904724

From: FEIN, EDWARD K. (JSC-HA) (NASA) [redacted]>
To: Barry V. Gibbens, LaRC [redacted]
CC: Linda B. Blackburn [redacted]
Date: Sep 01 2004 - 4:33pm

b(6)

01735
~~~

Rats! I guess I'd should research things better before I blindly send them out. Btw, the real Bahamas get hurricanes too.

-----Original Message-----
From: Barry V. Gibbens, LaRC [redacted] b(6)
Sent: Wednesday, September 01, 2004 3:26 PM
To: FEIN, EDWARD K. (JSC-HA) (NASA)
Cc: Linda B. Blackburn
Subject: RE: US Patents 5566073 and 5904724

Very nice! I went to the Nassau Bay website, and looked under "New Things . . . Check It Out." Three of the highlights were "Storm Preparedness Information," "Hurricane Tracking Chart," and "You Can Now Pay Traffic Fines On Line." Sounds like my kind of place!!!

BG

At 02:44 PM 9/1/2004 -0500, you wrote:

No need to telecommute from the Bahamas, Barry. Nassau Bay is right across the street from JSC! Check out http://www.nassaubay.com/. See -- we got it all! And please do pass the word. I'd even risk the wrath of Linda and Kathy to snag one of you guys.

[redacted] b(5)

Take care ...

-Ed

-----Original Message-----
From: Barry V. Gibbens, LaRC [redacted] b(6)
Sent: Wednesday, September 01, 2004 2:21 PM
To: FEIN, EDWARD K. (JSC-HA) (NASA)
Subject: RE: US Patents 5566073 and 5904724

Thanks Ed - I'll pass the word. Just for future reference, if any of us were to apply for the job, how would you feel about tele-commuting from, say, the Bahamas?????

[redacted] b(5)

At 12:30 PM 9/1/2004 -0500, you wrote:

Thanks Barry ...

[redacted] b(5)

01736

Best regards ...

-Ed

Btw, Jim Cate is retiring at the end of the month, and we definitely will be filling the slot. So please spread the word. Good things about JSC is the high locality pay differential in Houston, and the relatively low cost of living here. The downside is that the poor person will have to deal with my bad a** on a daily basis.

Take care ...
-----Original Message-----
From: Barry V. Gibbens, LaRC [redacted] b(6)
Sent: Wednesday, September 01, 2004 11:29 AM
To: Mike Abernathy; 'Kennedy, Alan'
Cc: Linda B. Blackburn; Dan Baize; 'Trey Arthur'; DELGADO, FRANCISCO J. (FRANK) (JSC-ER2) (NASA); FEIN, EDWARD K. (JSC-HA) (NASA); BOE, ERIC A., LTCOL. (JSC-CB) (NASA)
Subject: Re: US Patents 5566073 and 5904724

Hi Alan (and others),
Just to clarify the message below, I spoke with Mike Abernathy this morning, and I've spoken with Dan Baize on a number of occasions concerning this topic. I've also spoken with you (Alan) briefly, and with Linda Blackburn, Patent Counsel here at Langley (not Linda "Blackwell" :-). It seems clear that the technical folks have determined that the Margolin patent on Synthetic Vision creates a substantial problem for many of our partners in the aviation safety industry for a variety of reasons. It also seems clear that there is substantial prior art in existence to make an argument for re-examination of the Margolin patent. Linda has stated that we at Langley are willing to support an analysis of this situation at the Center level. She has, however, also told me that we first need to perform a formal infringement analysis to confirm (from a legal perspective) that we are in fact practicing the patent as described by its claims. If that analysis shows probable infringement, then we can proceed with a re-examination request, which Dan Baize has indicated he would be willing to fund. It is my understanding that you (again Alan) gave your blessing this morning for us to proceed at the Center level on these activities. If that is the case, I'll go ahead and begin moving on the formal infringement analysis, keeping you apprised of progress as it develops. Please let me know if you are in agreement with the situation as I have described it. If so, I'll begin work here shortly.
Thanks,
Barry

At 09:33 AM 9/1/2004 -0600, Mike Abernathy wrote:

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Best regards,
Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)
www.landform.com
HYPERLINK "http://www.visualflight.com/"www.visualflight.com

01737

Barry V. Gibbens
NASA Langley Research Center
Intellectual Property Law Team - Office of Chief Counsel
[redacted]

b(6)

[redacted]
wwwebsite: http://tech-transfer.larc.nasa.gov/

NEW E-MAIL ADDRESS: Please note that effective immediately, my e-mail address is now [redacted].
Please update your mail systems accordingly. Thanks.

b(6)

Barry V. Gibbens
NASA Langley Research Center
Intellectual Property Law Team - Office of Chief Counsel
[redacted]

b(6)

[redacted]
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Please update your mail systems accordingly. Thanks.

b(6)

Barry V. Gibbens
NASA Langley Research Center
Intellectual Property Law Team - Office of Chief Counsel
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b(6)

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b(6)

~~~

✉ RE: US Patents 5566073 and 5904724

From: FEIN, EDWARD K. (JSC-HA) (NASA) [redacted]
To: Barry V. Gibbens, LaRC <[redacted]
BCC: ROAN, BERNARD J. (JSC-AL) (NASA) <[redacted]
Date: Sep 01 2004 - 2:44pm

b(6)

01739
~~~

No need to telecommute from the Bahamas, Barry. Nassau Bay is right across the street from JSC! Check out http://www.nassaubay.com/. See -- we got it all! And please do pass the word. I'd even risk the wrath of Linda and Kathy to snag one of you guys.

[redacted] b(5)

Take care ...

-Ed

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Sent: Wednesday, September 01, 2004 2:21 PM
To: FEIN, EDWARD K. (JSC-HA) (NASA)
Subject: RE: US Patents 5566073 and 5904724

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[redacted] b(5)

At 12:30 PM 9/1/2004 -0500, you wrote:

Thanks Barry ... b(5)

[redacted]

Best regards ...

-Ed

Btw, Jim Cate is retiring at the end of the month, and we definitely will be filling the slot. So please spread the word. Good things about JSC is the high locality pay differential in Houston, and the relatively low cost of living here. The downside is that the poor person will have to deal with my bad a** on a daily basis.

Take care ...

-----Original Message-----
From: Barry V. Gibbens, LaRC [redacted] b(6)
Sent: Wednesday, September 01, 2004 11:29 AM
To: Mike Abernathy; 'Kennedy, Alan'
Cc: Linda B. Blackburn; Dan Baize; 'Trey Arthur'; DELGADO, FRANCISCO J. (FRANK) (JSC-ER2) (NASA); FEIN, EDWARD K. (JSC-HA) (NASA); BOE, ERIC A., LTCOL. (JSC-CB) (NASA)
Subject: Re: US Patents 5566073 and 5904724

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of occasions concerning this topic. I've also spoken with you (Alan) briefly, and with Linda Blackburn, Patent Counsel here at Langley (not Linda "Blackwell" :-). It seems clear that the technical folks have determined that the Margolin patent on Synthetic Vision creates a substantial problem for many of our partners in the aviation safety industry for a variety of reasons. It also seems clear that there is substantial prior art in existence to make an argument for re-examination of the Margolin patent. Linda has stated that we at Langley are willing to support an analysis of this situation at the Center level. She has, however, also told me that we first need to perform a formal infringement analysis to confirm (from a legal perspective) that we are in fact practicing the patent as described by its claims. If that analysis shows probable infringement, then we can proceed with a re-examination request, which Dan Baize has indicated he would be willing to fund. It is my understanding that you (again Alan) gave your blessing this morning for us to proceed at the Center level on these activities. If that is the case, I'll go ahead and begin moving on the formal infringement analysis, keeping you apprised of progress as it develops. Please let me know if you are in agreement with the situation as I have described it. If so, I'll begin work here shortly.
Thanks,
Barry

At 09:33 AM 9/1/2004 -0600, Mike Abernathy wrote:

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Best regards,

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)

www.landform.com
HYPERLINK "http://www.visualflight.com/"www.visualflight.com

Barry V. Gibbens
NASA Langley Research Center
Intellectual Property Law Team - Office of Chief Counsel
[redacted]

b(6)

[redacted]
wwwebsite: http://tech-transfer.larc.nasa.gov/

b(6)

NEW E-MAIL ADDRESS: Please note that effective immediately, my e-mail address is nov[redacted]

01740

Please update your mail systems accordingly. Thanks.

Barry V. Gibbens
NASA Langley Research Center
Intellectual Property Law Team - Office of Chief Counsel
[redacted]
b(6)
[redacted]
wwwebsite: http://tech-transfer.larc.nasa.gov/

NEW E-MAIL ADDRESS: Please note that effective immediately, my e-mail address is now Barry.V.Gibbens@nasa.gov. Please update your mail systems accordingly. Thanks.

~~~

FW: US Patents 5566073 and 5904724

From: FEIN, EDWARD K. (JSC-HA) (NASA) [redacted]
To: RO, THEODORE U., JD (JSC-HA) (NASA) [redacted], CATE, JAMES M., JD (JSC-HA) (NASA) [redacted]
CC: KRISHEN, KUMAR (JSC-HA) (NASA) [redacted], WHITTINGTON, JAMES (JSC-HA) (USA) [redacted] HAINES, DAVID D. (JSC-HA) (NASA) [redacted], HIEGER, COLLIN (JSC-HA) (UNK) [redacted], LANE, HELEN W. (JSC-AD) (NASA) [redacted] HAYES, GREG W. (JSC-AD) (NASA) [redacted], ROAN, BERNARD J. (JSC-AL) (NASA) [redacted] REMINGTON, DANIEL R. (DAN) (JSC-AL) (NASA) [redacted]
b(6)
Date: Sep 01 2004 - 12:51pm

Claims Analysis of Patent.doc - 2.1MB - View in Outlook

[redacted]
b(5)

-Ed

-----Original Message-----
From: Mike Abernathy [redacted]
b(6)
Sent: Wednesday, September 01, 2004 12:25 PM
To: FEIN, EDWARD K. (JSC-HA) (NASA)
Subject: RE: US Patents 5566073 and 5904724

Here it is.

Best regards,

Mike Abernathy
Rapid Imaging Software, Inc.

01741
~~~

[redacted] b(6)

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www.visualflight.com

-----Original Message-----
From: FEIN, EDWARD K. (JSC-HA) (NASA) [redacted] b(6)
Sent: Wednesday, September 01, 2004 11:19 AM
To: 'Mike Abernathy'
Subject: RE: US Patents 5566073 and 5904724

Barry Gibbens is a good man, Mike, and no, you haven't sent me the claims analysis. I am pleased to learn that the Agency is moving on this.

-Ed
-----Original Message-----
From: Mike Abernathy [redacted] b(6)
Sent: Wednesday, September 01, 2004 11:45 AM
To: FEIN, EDWARD K. (JSC-HA) (NASA)
Cc: DELGADO, FRANCISCO J. (FRANK) (JSC-ER2) (NASA)
Subject: RE: US Patents 5566073 and 5904724
Hi Ed,

Happy to keep you involved. I appreciated that article you sent me on the topic. The one thing that concerned me in the article is that I realized if Alan just sends the claims analysis to the PTO without requesting a re-exam then the owner will have the leisure to think up excuses for why this is not so, and prepare a defense maybe even ask for his own re-exam. Yikes! If NASA does not ask for the re-exam upon finding the prior art, we are basically strengthening his position to sue NASA by allowing him the time to synthesize a defense against the defects of his patent. It appears that Barry Gibbens is ready to press forward, happily.

Have I sent you the claims analysis yet?

Best regards,

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)

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www.visualflight.com

-----Original Message-----
From: FEIN, EDWARD K. (JSC-HA) (NASA) [redacted] b(6)
Sent: Wednesday, September 01, 2004 10:06 AM
To: 'Mike Abernathy'
Subject: RE: US Patents 5566073 and 5904724

Thanks, Mike, for keeping me in the loop.

-Ed
-----Original Message-----
From: Mike Abernathy [redacted] b(6)
Sent: Wednesday, September 01, 2004 10:33 AM
To: 'Kennedy, Alan'
Cc: 'Barry V. Gibbens, LaRC'; Dan Baize; 'Trey Arthur'; DELGADO, FRANCISCO J. (FRANK) (JSC-ER2) (NASA); FEIN, EDWARD K. (JSC-HA) (NASA); BOE, ERIC A., LTCOL. (JSC-CB) (NASA)
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Best regards,

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)

~~~

RE: US Patents 5566073 and 5904724

From: Mike Abernathy [redacted] b(6)
To: 'FEIN, EDWARD K. (JSC-HA) (NASA)' [redacted]
Date: Sep 01 2004 - 12:44pm

Sir,

Could you read this and let me know what you think of it? I know it will evolve a lot in Barry's hands – which is good. But I would like your thoughts on it for my own and Frank's edification.

Best regards,

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)

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www.visualflight.com

-----Original Message-----
From: FEIN, EDWARD K. (JSC-HA) (NASA [redacted] b(6)
Sent: Wednesday, September 01, 2004 11:41 AM
To: 'Mike Abernathy'
Subject: RE: US Patents 5566073 and 5904724

thanks!
-----Original Message-----
From: Mike Abernathy [redacted] b(6)
Sent: Wednesday, September 01, 2004 12:25 PM
To: FEIN, EDWARD K. (JSC-HA) (NASA)
Subject: RE: US Patents 5566073 and 5904724
Here it is.

Best regards,

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)

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www.visualflight.com

-----Original Message-----
From: FEIN, EDWARD K. (JSC-HA) (NASA) [mailto:edward.k.fein@nasa.gov]

01743
~~~

Sent: Wednesday, September 01, 2004 11:19 AM
To: 'Mike Abernathy'
Subject: RE: US Patents 5566073 and 5904724

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Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)

www.landform.com
www.visualflight.com

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01744

Best regards,

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)

www.landform.com
www.visualflight.com

Claims Analysis of Patent.doc

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Re: US Patents 5566073 and 5904724

From: Barry V. Gibbens, LaRC [redacted]
To: Mike Abernathy [redacted] 'Kennedy, Alan' [redacted]
CC: Linda B. Blackburn [redacted], Dan Baize [redacted]
'Trey Arthur' [redacted], DELGADO FRANCISCO J. (FRANK)
[redacted] FEIN, EDWARD K. (JSC-HA) (NASA)
[redacted], Eric Boe [redacted]
Date: Sep 01 2004 - 11:29am

b(6)

Hi Alan (and others),
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Barry

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01745
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Mike Abernathy

Rapid Imaging Software, Inc.

[redacted] b(6)

www.landform.com

HYPERLINK "http://www.visualflight.com/"www.visualflight.com

Barry V. Gibbens
NASA Langley Research Center
Intellectual Property Law Team - Office of Chief Counsel

[redacted] b(6)

wwwebsite: http://tech-transfer.larc.nasa.gov/

NEW E-MAIL ADDRESS: Please note that effective immediately, my e-mail address is now [redacted]
Please update your mail systems accordingly. Thanks.

b(6)

From: McNutt, Jan (HQ-MC000)
Sent: Wednesday, August 06, 2008 1:36 PM

01743

To: Fein, Edward K. (JSC-AL)
Cc: Borda, Gary G. (HQ-MC000); Rotella, Robert F. (HQ-MA000)
Subject: Patent Infringement claim from Jed Margolin; NASA Case No. I-222

Hello Mr. Fein,

I am a new attorney working commercial law and also helping out Gary and Bob. Do you remember working on this infringement claim, and if so, what was the outcome, if any? See attached.

<< File: Kennedy to JSC.pdf >> << File: Margolin FOIA.pdf >> << File: Letter from Optima 20080714.pdf >>

Thank you,

Jan S. McNutt
Attorney-Advisor (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

01747

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Monday, August 11, 2008 3:53 PM
To: Borda, Gary G. (HQ-MC000); Rotella, Robert F. (HQ-MA000)
Subject: FW: NASA FOIA HQ 08-270
Attachments: jm_nasa_foia_x.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Red Category

Gary/Bob

[redacted] b(5)

Jan

-----Original Message-----
From: Jed Margolin [mailto:jm@jmargolin.com]
Sent: Friday, August 08, 2008 2:19 PM
To: McNutt, Jan (HQ-MC000)
Subject: Re: NASA FOIA HQ 08-270

Dear Mr. McNutt.

I will agree to the 90 day extension you have requested for NASA to respond to my FOIA Request (HQ 08-270) if NASA acknowledges that my FOIA request is entirely separate from Optima Technology Group's Claim Case No. I-222.

Please see attached letter.

Sincerely yours,

Jed Margolin
[redacted] b(6)
[redacted]
==========
----- Original Message -----
From: "McNutt, Jan (HQ-MC000)" [redacted] b(6)
To: "Jed Margolin" [redacted]
Sent: Wednesday, August 06, 2008 6:44 AM
Subject: RE: NASA Case I-222

Dear Mr. Margolin,

Please see the attached. Hard copy to follow.

01760

Jan S. McNutt
Attorney-Advisor (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted]

b(6)

-----Original Message-----
From: Jed Margolin [redacted]
Sent: Tuesday, August 05, 2008 1:56 PM
To: McNutt, Jan (HQ-MC000)
Subject: NASA Case I-222

b(6)

Dear Mr. McNutt.

I have attached the documents we discussed.

Regards,

Jed Margolin

01730

Jed Margolin
Phone: 775-847-7845

1981 Empire Rd.
jm@jmargolin.com

Reno, NV 89521-7430
August 8, 2008

Mr. Jan S. McNutt
Office of the General Counsel
NASA Headquarters
Washington, DC 20546-0001

Re: FOIA Request (FOIA HQ 08-270) regarding NASA Case No. I-222

Dear Mr. McNutt,

As we discussed in our recent telephone conversations, my FOIA Request is entirely separate from NASA Claim Case I-222. The patents involved in the claim are now owned by Optima Technology Group, Inc. I trust that Optima Technology Group has now provided you with the documentation you requested in order to establish their ownership of the Patents.

I will agree to the 90 day extension you have requested for NASA to respond to my FOIA Request (HQ 08-270) if NASA acknowledges that my FOIA request is entirely separate from Optima Technology Group's Claim Case No. I-222.

Sincerely yours,

Jed Margolin

Jed Margolin

01771

[redacted]

From: Rotella, Robert F. (HQ-MA000)
Sent: Monday, August 11, 2008 4:12 PM
To: McNutt, Jan (HQ-MC000); Borda, Gary G. (HQ-MC000)
Subject: Re: NASA FOIA HQ 08-270

Jan-

[redacted]

b(5)

My two cents!

Bob

This Message was sent from my BlackBerry

----- Original Message -----
From: McNutt, Jan (HQ-MC000)
To: Borda, Gary G. (HQ-MC000); Rotella, Robert F. (HQ-MA000)
Sent: Mon Aug 11 14:53:23 2008
Subject: FW: NASA FOIA HQ 08-270

Gary/Bob

[redacted]

b(5)

Jan

-----Original Message-----
From: Jed Margolin [mailto:jm@jmargolin.com]
Sent: Friday, August 08, 2008 2:19 PM
To: McNutt, Jan (HQ-MC000)
Subject: Re: NASA FOIA HQ 08-270

Dear Mr. McNutt.

I will agree to the 90 day extension you have requested for NASA to respond to my FOIA Request (HQ 08-270) if NASA acknowledges that my FOIA request is entirely separate from Optima Technology Group's Claim Case No. I-222.

Please see attached letter.

Sincerely yours,

Jed Margolin

[redacted]

b(6)

01772

[redacted] b(6)

==========

----- Original Message -----
From: "McNutt, Jan (HQ-MC000)" <jan.mcnutt@nasa.gov>
To: "Jed Margolin" <jm@jmargolin.com>
Sent: Wednesday, August 06, 2008 6:44 AM
Subject: RE: NASA Case I-222

Dear Mr. Margolin,

Please see the attached. Hard copy to follow.

Jan S. McNutt
Attorney-Advisor (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

-----Original Message-----
From: Jed Margolin [mailto:jm@jmargolin.com]
Sent: Tuesday, August 05, 2008 1:56 PM
To: McNutt, Jan (HQ-MC000)
Subject: NASA Case I-222

Dear Mr. McNutt.

I have attached the documents we discussed.

Regards,

Jed Margolin

01773

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Monday, August 11, 2008 4:39 PM
To: Rotella, Robert F. (HQ-MA000); Borda, Gary G. (HQ-MC000)
Subject: RE: NASA FOIA HQ 08-270

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Red Category

Bob,

[redacted] b(5)

-Jan

-----Original Message-----
From: Rotella, Robert F. (HQ-MA000)
Sent: Monday, August 11, 2008 4:12 PM
To: McNutt, Jan (HQ-MC000); Borda, Gary G. (HQ-MC000)
Subject: Re: NASA FOIA HQ 08-270

Jan-

[redacted]

b(5)

My two cents!

Bob

This Message was sent from my BlackBerry

----- Original Message -----
From: McNutt, Jan (HQ-MC000)
To: Borda, Gary G. (HQ-MC000); Rotella, Robert F. (HQ-MA000)
Sent: Mon Aug 11 14:53:23 2008
Subject: FW: NASA FOIA HQ 08-270

Gary/Bob

[redacted] b(5)

Jan

01774

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From: Jed Margolin [mailto:jm@jmargolin.com]
Sent: Friday, August 08, 2008 2:19 PM
To: McNutt, Jan (HQ-MC000)
Subject: Re: NASA FOIA HQ 08-270

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Please see attached letter.

Sincerely yours,

Jed Margolin
[redacted] b(6)
[redacted]

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----- Original Message -----
From: "McNutt, Jan (HQ-MC000)" [redacted] b(6)
To: "Jed Margolin" [redacted]
Sent: Wednesday, August 06, 2008 6:44 AM
Subject: RE: NASA Case I-222

Dear Mr. Margolin,

Please see the attached. Hard copy to follow.

Jan S. McNutt
Attorney-Advisor (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

-----Original Message-----
From: Jed Margolin [redacted] b(6)
Sent: Tuesday, August 05, 2008 1:56 PM
To: McNutt, Jan (HQ-MC000)

01775

Subject: NASA Case I-222

Dear Mr. McNutt.

I have attached the documents we discussed.

Regards,

Jed Margolin

01776

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Monday, October 06, 2008 11:18 AM
To: Rotella, Robert F. (HQ-MA000)
Cc: Borda, Gary G. (HQ-MC000)
Subject: FW: Optima Technology Group - Margolin Patents

First attorney.

-----Original Message-----
From: krukar@olpatentlaw.com [redacted]
Sent: Friday, October 03, 2008 5:13 PM
To: Mike Abernathy
Cc: McNutt, Jan (HQ-MC000); [redacted]
Subject: RE: Optima Technology Group - Margolin Patents

b(6)

Hi Jan,

Richard Krukar, the guy that prepped the reexam request here.

Another issue we found is that Rapid Imaging Software (RIS) is not infringing either directly or indirectly.

...richard

On Fri, October 3, 2008 2:48 pm, Mike Abernathy wrote:
> Privileged and Confidential
>
>
>
>
> Dear Jan,
>
>
>
>
> We will of course be happy to help however possible. Our company
> prepared a request for re-examination of these patents based on prior art
> and would have used it had OTG not gone away.
>
>
>
> These patents are defective because the invention is both obvious and
> non-novel as evidenced by numerous printed published works. (We can
> provide these references if needed). Ironically, they claim patent on
> work already published by NASA over a decade earlier.
>
>
>
> The attached NASA technical publication by Shahan Serrafian, Simulator
> Evaluation of a Remotely Piloted Vehicle Lateral Landing Task Using a
> Visual
> Display, dates from 1984 and fully anticipates both Margolin patents, and
> is referenced by neither one.

> http://en.wikipedia.org/wiki/Highly Maneuverable Aircraft Technology
>
> In other words, OTG is attempting force NASA to pay for a patent
> infringement on something that NASA in fact invented and published more
> than a decade prior to the patent filing.
>
> Would Wednesday at 10AM MT be convenient for you?
>
> Mike Abernathy
>
> Rapid Imaging Software, Inc.
>
> [redacted] b(6)
> [redacted]
>
> www.landform.com
>
> From: McNutt, Jan (HQ-MC000) [redacted] b(6)
> Sent: Friday, October 03, 2008 1:37 PM
> To: mikea@landform.com
> Subject: Optima Technology Group - Margolin Patents
>
> Dear Mr. Abernathy,
>
> I am a new attorney working on Intellectual Property and Commercial Law
> matters at NASA and have been assigned to handle a long outstanding claim
> against the agency for patent infringement due to NASA's collaboration
> with your company in the late 90s. Mr. Ed Fein of the Johnson Space
> Center
> suggested I contact you to discuss the infringement action brought against
> us by the Optima Technology Group regarding a patent they own by the
> inventor Jed Margolin. I would like to set up a conference next week
> sometime for this purpose. Please let me know if you are inclined to
> speak with NASA on this and if so, when would be a good time for you.
>

> Regards,
>
>
> Jan S. McNutt
> Senior Attorney (Commercial)
> Office of the General Counsel
> NASA Headquarters
> [redacted] b(6)
>
>
>

01362

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Monday, October 06, 2008 11:18 AM
To: Rotella, Robert F. (HQ-MA000)
Cc: Borda, Gary G. (HQ-MC000)
Subject: FW: Optima Technology Group - Margolin Patents

Second attorney.

From: Benjamin W. Allison [redacted] b(6)
Sent: Friday, October 03, 2008 5:46 PM
To: Mike Abernathy; McNutt, Jan (HQ-MC000)
Cc: krukar@olpatentlaw.com
Subject: RE: Optima Technology Group - Margolin Patents

Jan,

We're assisting RIS in the Optima matter as well, and I would like to participate in the call Wednesday. Let me know call-in information when you can.

Regards,

Ben

Benjamin Allison
Sutin Thayer & Browne PC
[redacted] b(6)

From: Mike Abernathy [redacted] b(6)
Sent: Friday, October 03, 2008 2:49 PM
To: 'McNutt, Jan (HQ-MC000)'
Cc: Benjamin W. Allison; krukar@olpatentlaw.com
Subject: RE: Optima Technology Group - Margolin Patents

Privileged and Confidential

Dear Jan,

We will of course be happy to help however possible. Our company prepared a request for re-examination of these patents based on prior art and would have used it had OTG not gone away.

These patents are defective because the invention is both obvious and non-novel as evidenced by numerous printed published works. (We can provide these references if needed). Ironically, they claim patent on work already published by NASA over a decade earlier.

01363

The attached NASA technical publication by Shahan Serrafian, *Simulator Evaluation of a Remotely Piloted Vehicle Lateral Landing Task Using a Visual Display,* dates from 1984 and fully anticipates both Margolin patents, and is referenced by neither one.

http://en.wikipedia.org/wiki/Highly_Maneuverable_Aircraft_Technology

In other words, OTG is attempting force NASA to pay for a patent infringement on something that NASA in fact invented and published more than a decade prior to the patent filing.

Would Wednesday at 10AM MT be convenient for you?

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)
www.landform.com

From: McNutt, Jan (HQ-MC000) [redacted] b(6)
Sent: Friday, October 03, 2008 1:37 PM
To: mikea@landform.com
Subject: Optima Technology Group - Margolin Patents

Dear Mr. Abernathy,

I am a new attorney working on Intellectual Property and Commercial Law matters at NASA and have been assigned to handle a long outstanding claim against the agency for patent infringement due to NASA's collaboration with your company in the late 90s. Mr. Ed Fein of the Johnson Space Center suggested I contact you to discuss the infringement action brought against us by the Optima Technology Group regarding a patent they own by the inventor Jed Margolin. I would like to set up a conference next week sometime for this purpose. Please let me know if you are inclined to speak with NASA on this and if so, when would be a good time for you.

Regards,

Jan S. McNutt
Senior Attorney (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

01564

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Monday, October 06, 2008 11:19 AM
To: Rotella, Robert F. (HQ-MA000); Fein, Edward K. (JSC-AL)
Cc: Borda, Gary G. (HQ-MC000)
Subject: FW: patent
Attachments: HiMAT Claims Analysis of Patent 5904724.doc; HIMAT_Kempel_1988_0006558_1989006558.pdf

Second email from Abernathy.

From: Mike Abernathy [redacted] b(6)
Sent: Saturday, October 04, 2008 7:08 PM
To: McNutt, Jan (HQ-MC000)
Cc: [redacted]
Subject: patent

Privileged and confidential

Hi Jan,

Richard is quite correct to point out that we did not infringe. Our software license in fact prohibits this use of our software.

I have attached a claims chart regarding NASA research fully anticipating the patent, to help you become familiar with the patent in question. Please keep this information confidential for now.

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)
www.landform.com

From: McNutt, Jan (HQ-MC000) [redacted] b(6)
Sent: Friday, October 03, 2008 1:37 PM
To: mikea@landform.com
Subject: Optima Technology Group - Margolin Patents

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Regards,

Jan S. McNutt
Senior Attorney (Commercial)

01665

Office of the General Counsel
NASA Headquarters
[redacted]

b(6)

01366

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Tuesday, October 07, 2008 9:27 AM
To: Mike Abernathy
Cc: [redacted] Edward K. (JSC-AL)
Subject: RE: patent

b(6)

Hello Mike,

I've set up a telephone conference for 10:00 AM MT (12:00 PM EDT), Wednesday, October 15th. The call in number is Toll Free: (866) 459-3154 and the Passcode is: 3230932. I think I have the time right. Please check this (Arizona??).

Mr. Bob Rotella from HQ and Mr. Ed Fein with JSC will be joining us.

Thanks and looking forward to talking to you.

Regards,
Jan

From: Mike Abernathy [redacted] b(6)
Sent: Saturday, October 04, 2008 7:08 PM
To: McNutt, Jan (HQ-MC000)
Cc: ballison@sutinfirm.com; krukar@olpatentlaw.com
Subject: patent

Privileged and confidential

Hi Jan,

Richard is quite correct to point out that we did not infringe. Our software license in fact prohibits this use of our software.

I have attached a claims chart regarding NASA research fully anticipating the patent, to help you become familiar with the patent in question. Please keep this information confidential for now.

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)
www.landform.com

01900

From: McNutt, Jan (HQ-MC000) [redacted] b(6)
Sent: Friday, October 03, 2008 1:37 PM
To: mikea@landform.com
Subject: Optima Technology Group - Margolin Patents

Dear Mr. Abernathy,

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Regards,

Jan S. McNutt
Senior Attorney (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

[redacted]

From: [redacted] b(6)
Sent: Wednesday, October 08, 2008 12:59 PM
To: McNutt, Jan (HQ-MC000)
Cc: Rotella, Robert F. (HQ-MA000); Fein, Edward K. (JSC-AL)
Subject: RE: patent

It was a pleasure to hear your viewpoints on the Margolin patent. I'm just shooting a side email to mention how thankful I am for NASA's work over the last 50 years and for how much of it is searchable online. I've actually used some NASA reports from the '60s (Apollo program) in filing a reexamination request for another client.

all for now
Richard Krukar
Ortiz and Lopez, PLLC

01562

[redacted]

From: Mike Abernathy [redacted] b(6)
Sent: Wednesday, October 08, 2008 1:29 PM
To: McNutt, Jan (HQ-MC000)
Cc: [redacted] Rotella, Robert F. (HQ-MA000); Fein, Edward K. (JSC-AL)
Subject: RE: patent

Privileged and confidential

Dear Jan,

After speaking with Richard and Ben RIS, Inc. has decided to honor your request to provide NASA with our research regarding the subject patent.

We sincerely appreciate your interest in protecting NASA's important published work in synthetic vision research for the benefit of the American people.

I will begin forwarding the subject research papers and Richard's claims charts in several emails.

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)
www.landform.com

From: McNutt, Jan (HQ-MC000) [redacted]
Sent: Tuesday, October 07, 2008 7:27 AM
To: Mike Abernathy b(6)
Cc: [redacted] Rotella, Robert F. (HQ-MA000); Fein, Edward K. (JSC-AL)
Subject: RE: patent

Hello Mike,

I've set up a telephone conference for 10:00 AM MT (12:00 PM EDT), Wednesday, October 15th. The call in number is [redacted] I think I have the time right. Please check this (Arizona??).

Mr. Bob Rotella from HQ and Mr. Ed Fein with JSC will be joining us. b(6)

Thanks and looking forward to talking to you.

Regards,
Jan

01563

From: Mike Abernathy [redacted] b(6)
Sent: Saturday, October 04, 2008 7:08 PM
To: McNutt, Jan (HQ-MC000)
Cc: ballison@sutinfirm.com; krukar@olpatentlaw.com
Subject: patent

Privileged and confidential

Hi Jan,

Richard is quite correct to point out that we did not infringe. Our software license in fact prohibits this use of our software.

I have attached a claims chart regarding NASA research fully anticipating the patent, to help you become familiar with the patent in question. Please keep this information confidential for now.

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)
www.landform.com

From: McNutt, Jan (HQ-MC000) [redacted] b(6)
Sent: Friday, October 03, 2008 1:37 PM
To: mikea@landform.com
Subject: Optima Technology Group - Margolin Patents

Dear Mr. Abernathy,

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Regards,

Jan S. McNutt
Senior Attorney (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

01961

[redacted]

From: McNutt, Jan (HQ-MC000)
Sent: Wednesday, October 08, 2008 2:30 PM
To: Mike Abernathy
Cc: [redacted]; Rotella, Robert F. (HQ-MA000); Fein, Edward K. (JSC-AL)
Subject: RE: patent

b(6)

Hi Mike,

I'm sorry we were cut off earlier when you called. I must have pushed the wrong button when I put on my headset.

Thank you also for taking the time and effort and to allow us to benefit from your years of dealing with this technology. A quick look confirms that I have received all the attachments that you sent, so we will spend a little time looking them over. It's nice to know NASA technology has been of such benefit for all of you. NASA tries hard to make technology available to the world without restrictions unless absolutely necessary. In fact, my main job is to assist the efforts of technology transfer, rather than have it locked up in our agency. See: http://www.ipp.nasa.gov/ .

I will let you know the development of this in as much as I can. Hopefully, we will find a solution that everyone can share in.

Regards,
Jan

From: Mike Abernathy [redacted]
Sent: Wednesday, October 08, 2008 1:29 PM
To: McNutt, Jan (HQ-MC000)
Cc: [redacted] Rotella, Robert F. (HQ-MA000); Fein, Edward K. (JSC-AL)
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b(6)

Privileged and confidential

Dear Jan,

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We sincerely appreciate your interest in protecting NASA's important published work in synthetic vision research for the benefit of the American people.

I will begin forwarding the subject research papers and Richard's claims charts in several emails.

Mike Abernathy
Rapid Imaging Software, Inc.

01565

[redacted]
www.landform.com

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Thanks and looking forward to talking to you.

Regards,
Jan

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To: McNutt, Jan (HQ-MC000)
Cc: [redacted]
Subject: patent

Privileged and confidential

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Rapid Imaging Software, Inc.
[redacted] b(6)
www.landform.com

01966

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Regards,

Jan S. McNutt
Senior Attorney (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted] b(6)

01567

[redacted]

From: Mike Abernathy [redacted]m] b(6)
Sent: Wednesday, October 08, 2008 4:18 PM
To: McNutt, Jan (HQ-MC000)
Cc: [redacted] Rotella, Robert F. (HQ-MA000); Fein, Edward K. (JSC-AL)
Subject: draft article
Attachments: REVISEDAUVSIcolumn v5 clean.doc

Hi All,

The attached article is one written by myself and Dr. Mark Draper and Gloria Calhoun of the Air Force Research Lab about the history of synthetic vision naturally with particular focus on the USAF and with an eye toward UAVs. This is a draft technical journal article which has not yet been published, but which will be submitted for publication in the near future as soon as it is approved through AFRL channels.

I am sending it to you because it tells the story of how NASA and USAF developed this powerful technology called synthetic vision. The article is entitled "*Synthetic Vision Technology for Unmanned Aerial Vehicles: Historical Examples and Current Emphasis*". I hope you find it interesting and useful.

Mike Abernathy
Rapid Imaging Software, Inc.
[redacted] b(6)
www.landform.com

From: McNutt, Jan (HQ-MC000) [redacted] b(6)
Sent: Wednesday, October 08, 2008 12:30 PM
To: Mike Abernathy
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01568

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Subject: RE: patent

Privileged and confidential

Dear Jan,

After speaking with Richard and Ben RIS, Inc. has decided to honor your request to provide NASA with our research regarding the subject patent.

We sincerely appreciate your interest in protecting NASA's important published work in synthetic vision research for the benefit of the American people.

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[redacted] b(6)
www.landform.com

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Thanks and looking forward to talking to you.

Regards,
Jan

From: Mike Abernathy [redacted]
Sent: Saturday, October 04, 2008 7:08 PM
To: McNutt, Jan (HQ-MC000)
Cc: [redacted]
Subject: patent

b(6)

Privileged and confidential

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Mike Abernathy
Rapid Imaging Software, Inc.
[redacted]
b(6)
www.landform.com

From: McNutt, Jan (HQ-MC000) [redacted] b(6)
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Regards,

Jan S. McNutt
Senior Attorney (Commercial)
Office of the General Counsel
NASA Headquarters
[redacted]
b(6)

01570

Synthetic Vision Technology for Unmanned Aerial Vehicles: Historical Examples and Current Emphasis

Michael Abernathy[a], **Mark Draper**[b], **Gloria Calhoun**[b]
[a] Rapid Imaging Software, Inc.
[b] Air Force Research Laboratory, Wright-Patterson Air Force Base, OH

Background – Flight Simulation Real-Time 3D Computer Graphics

In the aviation context, synthetic vision can be described, in simplest terms, as the use of a computer and a terrain database to generate a simulated 3D view of an environment in real time. The application of synthetic vision to remotely piloted vehicles (RPVs) and unmanned aerial vehicles (UAVs) goes back three decades and has recently evolved from a piloting aid for UAV pilots to a potentially powerful tool for sensor operators [1]. It is anticipated that integration of this technology can ameliorate many factors that currently compromise the utility of UAV video imagery: narrow camera field-of-view, degraded datalinks, poor environmental conditions, limited bandwidth, and highly cluttered visual scenes such as in urban areas. With this technology, spatially-relevant information, constructed from databases (e.g., terrain elevation, cultural features, maps, photo imagery) as well as networked information sources, can be represented as computer-generated imagery and symbology overlaid conformal, in real time, onto a dynamic video image display. This computer-generated imagery and symbology appears to co-exist with real objects in the visual scene, highlighting points of interest and helping the operator maintain situation awareness of the environment. The purpose of this paper is to briefly summarize the evolution of this technology towards RPV/UAV applications.

The story begins in the 1970's when the use of computers to create 3D real-time out-the-window synthetic environments was beginning to see wide acceptance for training pilots of manned aircraft. Evans and Sutherland (E & S) had seen the commercial potential for flight simulation and had introduced special purpose graphics computers, like their Picture System, which transformed and projected 3D terrain data as simple 3D polygons to a pilot's perspective view in real-time (30 Hz) [2]. In 1975 an engineering student named Bruce Artwick wrote "Flight Simulator" for the Apple II computer [3]. He formed a company and in 1980 marketed the product that ultimately became Microsoft Flight Simulator®.

In fact it was this phenomenon – the emergence of computer flight simulation in the 1970s – that appears to have sparked a monumental amount of research. The Air Force began its Visually Coupled Airborne Systems Simulator (VCASS) program, with a particular eye toward future generation fighters [4]. NASA was developing synthetic vision for the Super Sonic Transport and for its High Maneuverability Aircraft Testbed (HiMAT) RPV program. Educational institutions studied the limitless new possibilities for virtual reality human-machine interfaces. By the mid-1980s, synthetic vision for RPV simulation was even commercially available for radio control aircraft hobbyists.

Actually, there is a large body of research from the 1970s to the present that addresses the application of synthetic vision to manned and unmanned aircraft. In the interest of brevity, we will focus on select systems that were important enablers towards UAV synthetic vision systems.

Pictorial Format Avionics Displays

In 1977, NASA researchers published "Pathway-in-the-Sky Contact Analog Piloting Display" [5], which included a complete design for a synthetic vision system. It featured a computer that projected a 3D view of the terrain, given the aircraft's position and orientation. This out-the-window perspective view was displayed on a CRT type display. Such displays were called "Pictorial Format" avionics systems, but we recognize them as containing all of the essential elements of a modern synthetic vision display.

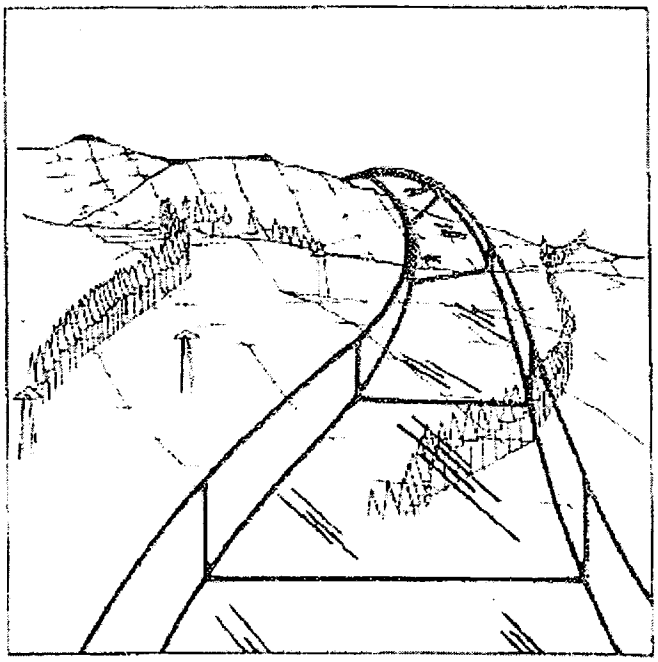

Figure 1 1984 USAF pictorial format avionics synthetic vision display.

In 1979 the Air Force completed its "Airborne Electronic Terrain Map Applications Study (AETMS)", and in 1981 published "The Electronic Terrain Map: A New Avionics Integrator" describing how a computerized terrain database could be displayed as an out-the-window 3D view allowing the pilot to "see" even at night and in other limited visibility situations [6].

Also in 1979, the Air Force published research [7] identifying human factors problems that would have to be overcome in RPV cockpit design. NASA would use this in the design of the HiMAT RPV 3D visual system in 1984.

Pictorial format avionics (i.e., synthetic vision) formed a key ingredient of the Air Force Super Cockpit concept. This program included a bold future vision in which "*the pilot need not be present in the actual vehicle which he is piloting since with the appropriate data links a "remote" super cockpit would provide the visual and aural "telepresence" cues as if he were located in the vehicle*" according to Air Force researcher Tom Furness [8].

Figure 2. USAF Super cockpit helmet, simulator, and sample visual format (photo courtesy http://www.hitl.washington.edu)

HiMAT: Remotely Piloted Aircraft with Synthetic Vision

In 1984, NASA published research that investigated synthetic vision for lateral control during RPV landings [9]. These tests featured the USAF/NASA HIMAT (High Maneuverability Aircraft Testbed), a remotely piloted research vehicle flown at Dryden Flight Research Center. These aircraft (Figure 3) were dropped from a B-52 and remotely piloted from a ground station to a landing on the lakebed. The vehicle had a nose camera which produced video that could be shown in the remote cockpit, allowing the comparison of nose camera imagery versus synthetic vision during pilot testing.

Vehicle position was computed using RADAR computations, along with a radio altimeter. Electro-mechanical gyroscope systems were installed onboard the RPV aircraft and measured the 3D attitude of the vehicle. The position and attitude were down-linked from the RPV to a remote cockpit, and pilot control inputs were up-linked from the remote cockpit via the radio communication system [10].

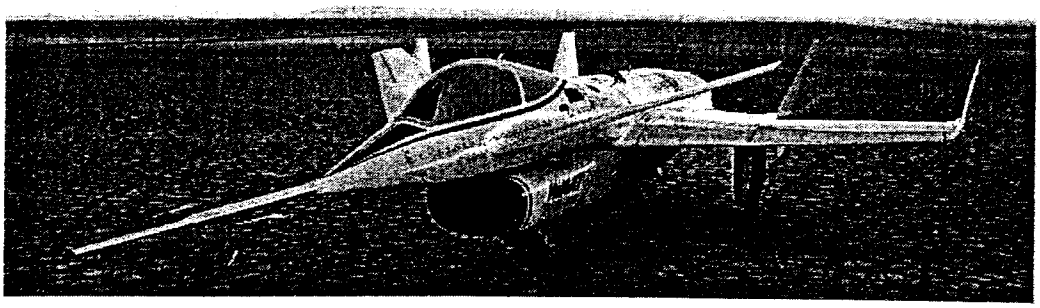

Figure 3. HiMAT Remotely Piloted Vehicle after flight at Dryden Flight Research Center. (Photo courtesy NASA)

The remote cockpit (Figure 4) included a joystick and rudder controls connected to the computer and control signals were up-linked to the RPV. The computer compensated for delays in the control/communications loop [10].

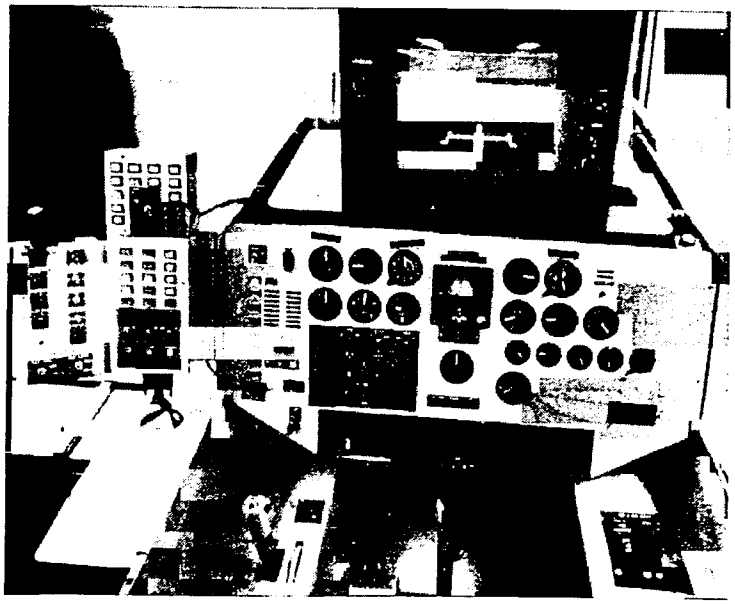

Figure 4. HiMAT RPV remote cockpit showing synthetic vision display (photo courtesy of NASA)

The Edwards Air Force Base dry lake bed and runway were represented in three dimensions in the terrain database as polygons (triangles and rectangles). An Evans and Sutherland (E&S) Picture System computer transformed the terrain in the database into a projected 3D out-the-window view at the pilot cockpit. Finally, the projected 3D out-the-window view was displayed on an E&S Calligraphic video display system capable of 4000 lines of resolution (Figure 5). According to the pilots participating in the study, the synthetic vision compared well to the nose camera view. By the mid 1990s, NASA had migrated the RPV synthetic vision concept used on HiMAT to PC computers for X-36 and on X-38 [11].

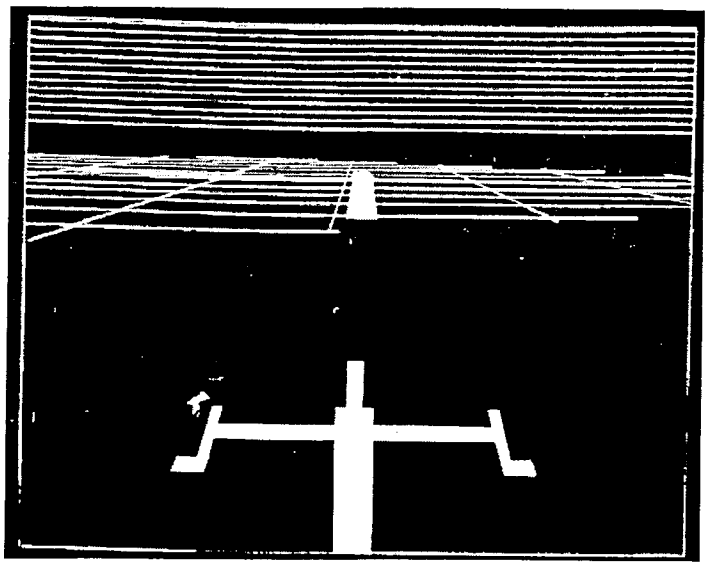

Figure 5. HIMAT synthetic vision display showing terrain and runway. Note the synthetic vision representation of the HiMAT nose probe at center bottom.

Synthetic Vision for Recreational Remotely Piloting Vehicles

One of the early uses of synthetic vision for RPVs was recreational simulation. In 1986 Ambrosia Microcomputer Products introduced RC AeroChopper, a radio controlled aircraft simulator which enabled pilots to learn to fly a remotely controlled aircraft, without risk to their aircraft.,. According to the AeroChopper Owner's Manual [12], the product accepted aileron, elevator, rudder, and throttle pilot inputs via joysticks to control the simulated aircraft. The product also contained data files containing a 3D terrain database provided with AeroChopper representing the earth's surface as well as buildings and obstructions.

The software was run on a computer (an Amiga for example) and was connected to the flight controls and communicated the aircraft position and attitude in three-space to the user. The computer used the terrain data to create a projected view of the aircraft and its environment in three dimensions (Figure 6). Like most visual simulations of its time, the program used relatively few polygons to represent the terrain and man-made objects, and so looks relatively crude by today's standards.

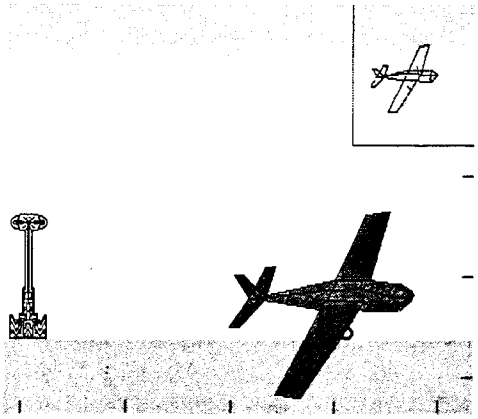

Figure 6. This 3D synthetic vision simulation display for radio controlled aircraft is from RC AeroChopper.

Synthetic Vision for Sensor Operations

Although most of the historical focus with synthetic vision has been on aiding flight management, recent efforts have focused on how synthetic vision can aid UAV sensor operator functions. Ongoing research at the US Air Force Research Laboratory's Human Effectiveness Directorate is exploring how to improve UAV sensor operator utility of video imagery. The overall objective is to determine the value of combining synthetic vision imagery/symbology with live camera video presented on a UAV control station camera display. One research study [13] evaluated the utility of computer-generated video overlays for four different task types: controlling the camera to locate specific ground landmarks in the 360 degree area surrounding the loitering UAV, designating multiple ground targets marked with synthetic symbology, tracing a synthetically highlighted ground convoy route with the UAV camera boresight, and reading text from synthetic overlaid symbology. UAV telemetry update rate was manipulated from 0.5 Hz to 24 Hz. The results indicated the potential of synthetic symbology overlay for enhancing situation awareness, reducing workload, and improving the designation of points of interest, at nearly all the update rates evaluated and for all four task types. However, data across the task types indicated that update rates larger than 2-4 Hz generally resulted in improved objective performance and subjective impressions of utility.

A second research area focused on a picture-in-picture (PIP) concept where video imagery is surrounded by a synthetic-generated terrain imagery border on the physical camera display,

increasing the operator's instantaneous field-of-view (Figure 7). Experimental data showed that the PIP helps mitigate the "soda-straw effect", reducing landmark search time and enhancing operator situation awareness. In an evaluation [14] examining the impact of PIP display size and symbology overlay registration error, results indicated that performance on a landmark search task was particularly better with the more compressed video imagery (Figure 7c), reducing average designation time by 60%. Also, the registration error between the virtual flags and their respective physical correlates was less critical with the PIP capability enabled.

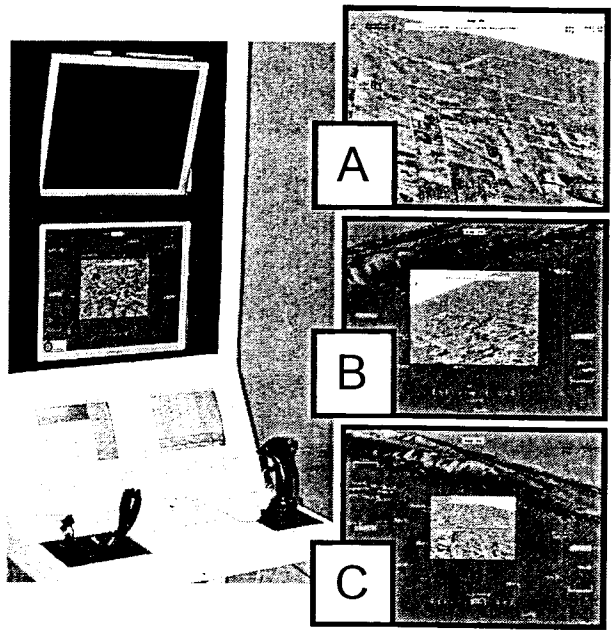

Figure 7 UAV Control Station Simulator. (A: no picture-in-picture (PIP), B: video imagery compressed to 50% original size, C video imagery compressed to 33% original size.)

Summary

More than three decades of research regarding synthetic vision for RPVs and UAVs began with the emergence of computers and display systems capable of creating real-time 3D projected moving displays. This research was conducted by the US Air Force, NASA, US Army, and numerous commercial and educational entities. Several systems, including the NASA HiMAT in 1984, demonstrated the utility for synthetic vision in remotely piloting aircraft and simulated aircraft. The recent availability of sophisticated UAV autopilots capable of autonomous flight control has fundamentally changed the paradigm of UAV operation, potentially reducing the utility of synthetic vision for supporting UAV piloting tasks. At the same time, research has demonstrated and quantified a substantial improvement in the efficiency of sensor operations through the use of synthetic vision sensor fusion technology. We expect this to continue to be an important technology for UAV operation.

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United States Patent [19]

Margolin

[11] Patent Number: 5,904,724

[45] Date of Patent: May 18, 1999

[54] **METHOD AND APPARATUS FOR REMOTELY PILOTING AN AIRCRAFT**

[76] Inventor: **Jed Margolin**, 3570 Pleasant Echo, San Jose, Calif. 95148

[21] Appl. No.: **08/587,731**

[22] Filed: **Jan. 19, 1996**

[51] **Int. Cl.**[6] **G06F 165/00**; H04N 7/18

[52] **U.S. Cl.** **701/120**; 701/2; 701/24; 244/189; 244/190; 348/114

[58] **Field of Search** 364/423.099, 424.012, 364/424.013, 424.021, 424.022, 449.2, 449.7, 460, 439, 424.028; 340/825.69, 825.72, 967, 989, 991, 992, 993; 244/189, 190, 181, 17.13, 3.11, 3.15; 348/42, 51, 113, 114, 117, 123, 143; 382/154; 395/118, 119, 125

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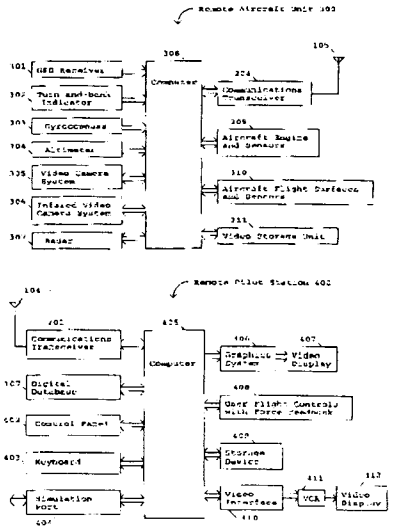
Primary Examiner—Tan Q. Nguyen

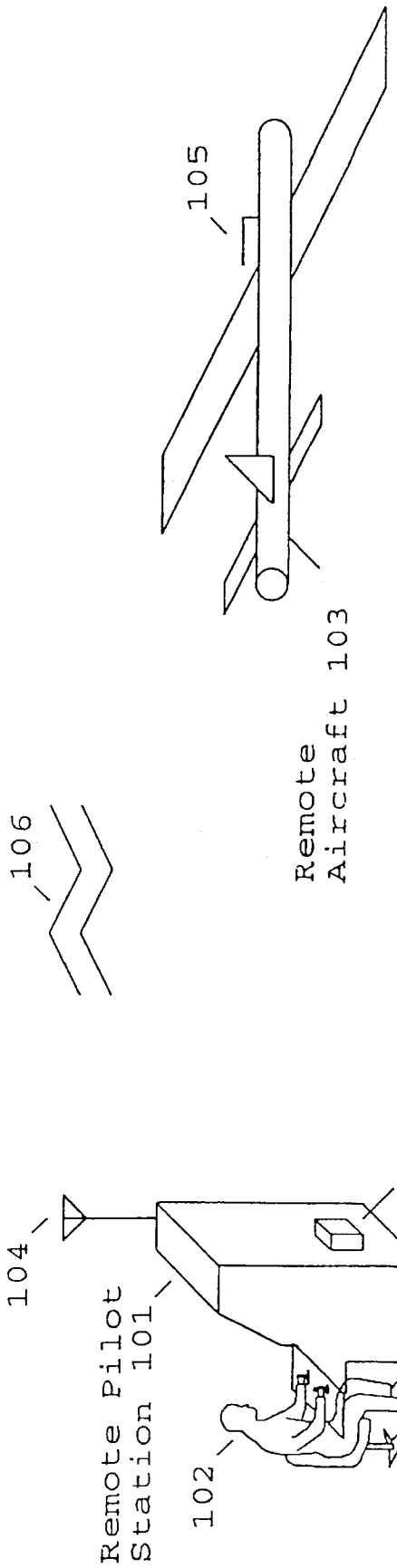
Attorney, Agent, or Firm—Blakely, Sokoloff, Taylor and Zafman LLP

[57] **ABSTRACT**

A method and apparatus that allows a remote aircraft to be controlled by a remotely located pilot who is presented with a synthesized three-dimensional projected view representing the environment around the remote aircraft. According to one aspect of the invention, a remote aircraft transmits its three-dimensional position and orientation to a remote pilot station. The remote pilot station applies this information to a digital database containing a three dimensional description of the environment around the remote aircraft to present the remote pilot with a three dimensional projected view of this environment. The remote pilot reacts to this view and interacts with the pilot controls, whose signals are transmitted back to the remote aircraft. In addition, the system compensates for the communications delay between the remote aircraft and the remote pilot station by controlling the sensitivity of the pilot controls.

20 Claims, 7 Drawing Sheets

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Remote Aircraft 103
106
Digital Database 107
104
Remote Pilot Station 101
102

Fig. 1

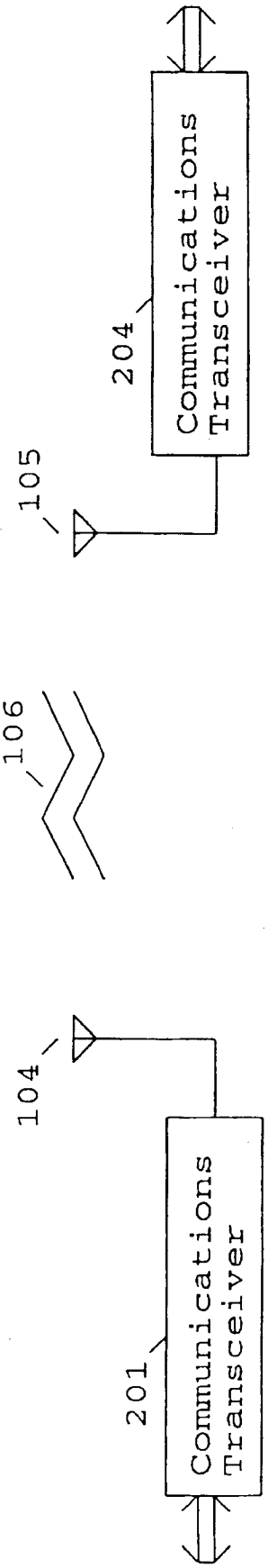
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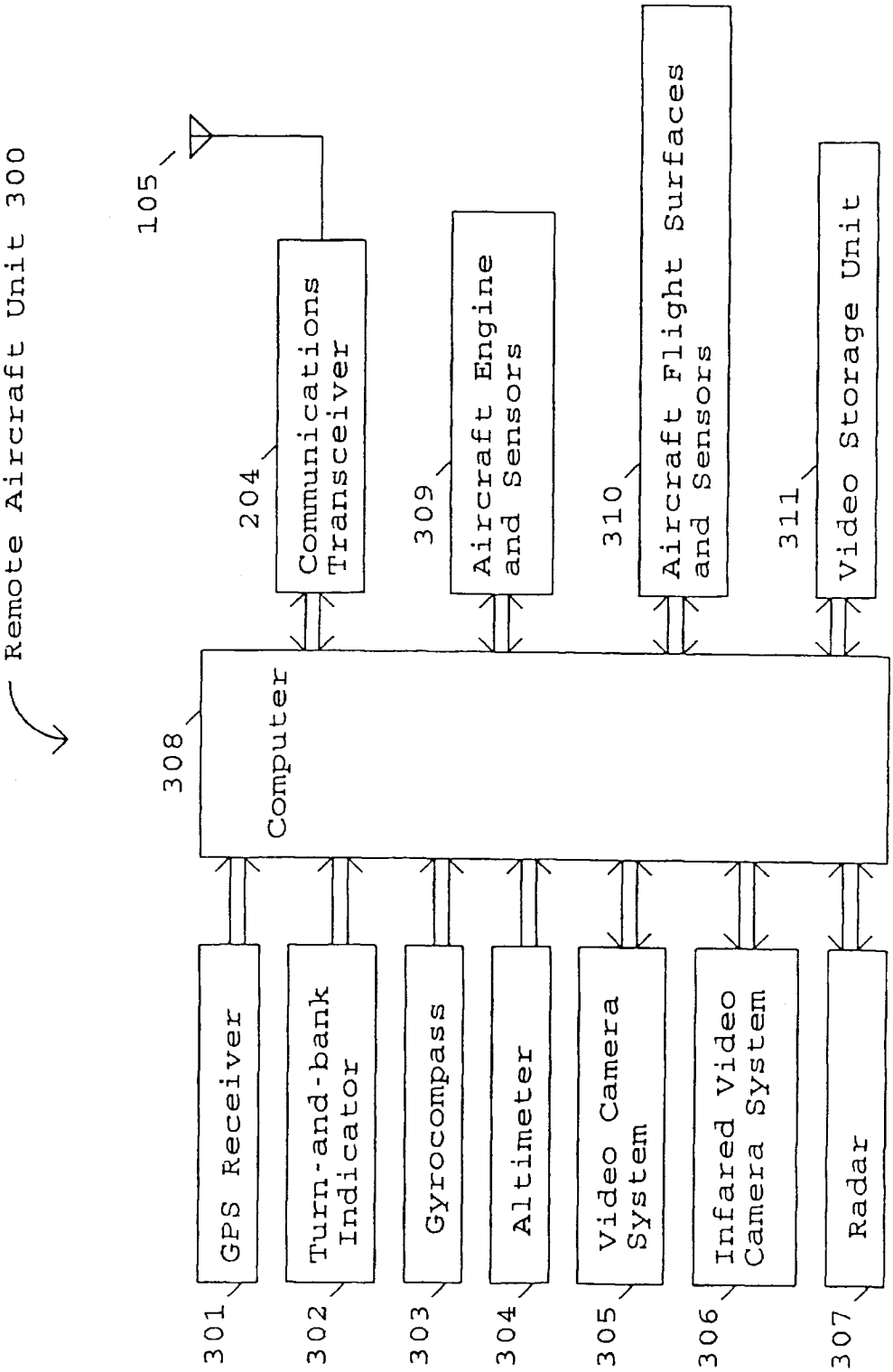
Fig. 2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Communications Transceiver
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Aircraft Engine and Sensors
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Aircraft Flight Surfaces and Sensors
311
Video Storage Unit
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Computer
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GPS Receiver
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Turn-and-bank Indicator
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Gyrocompass
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Altimeter
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Video Camera System
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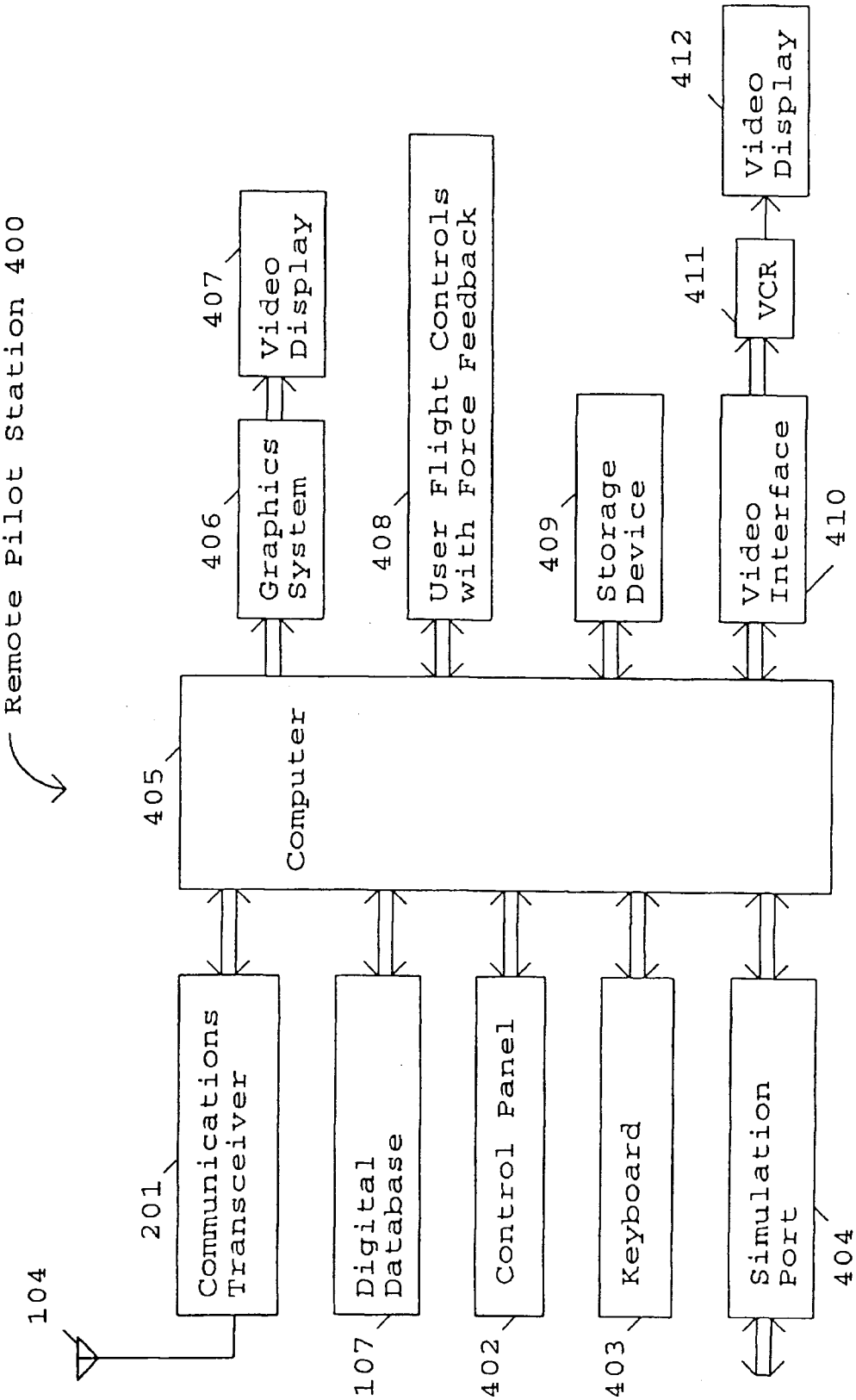
Infared Video Camera System
307
Radar

Fig. 3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Digital Database
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Control Panel
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Keyboard
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Simulation Port
405
Computer
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Video Display
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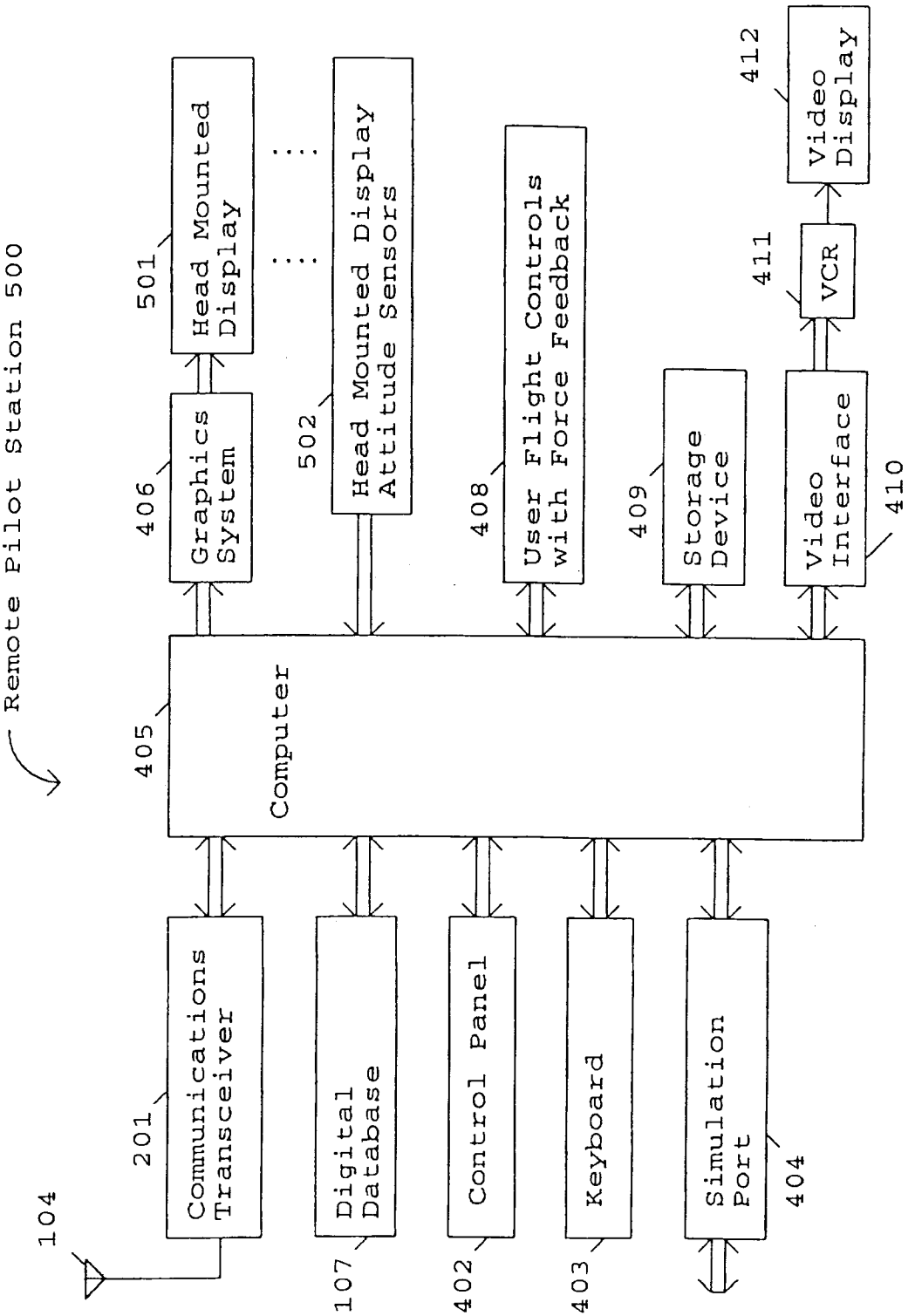
User Flight Controls with Force Feedback
409
Storage Device
410
Video Interface
411
VCR
412
Video Display

Fig. 4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Control Panel
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Keyboard
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405
Computer
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Head Mounted Display
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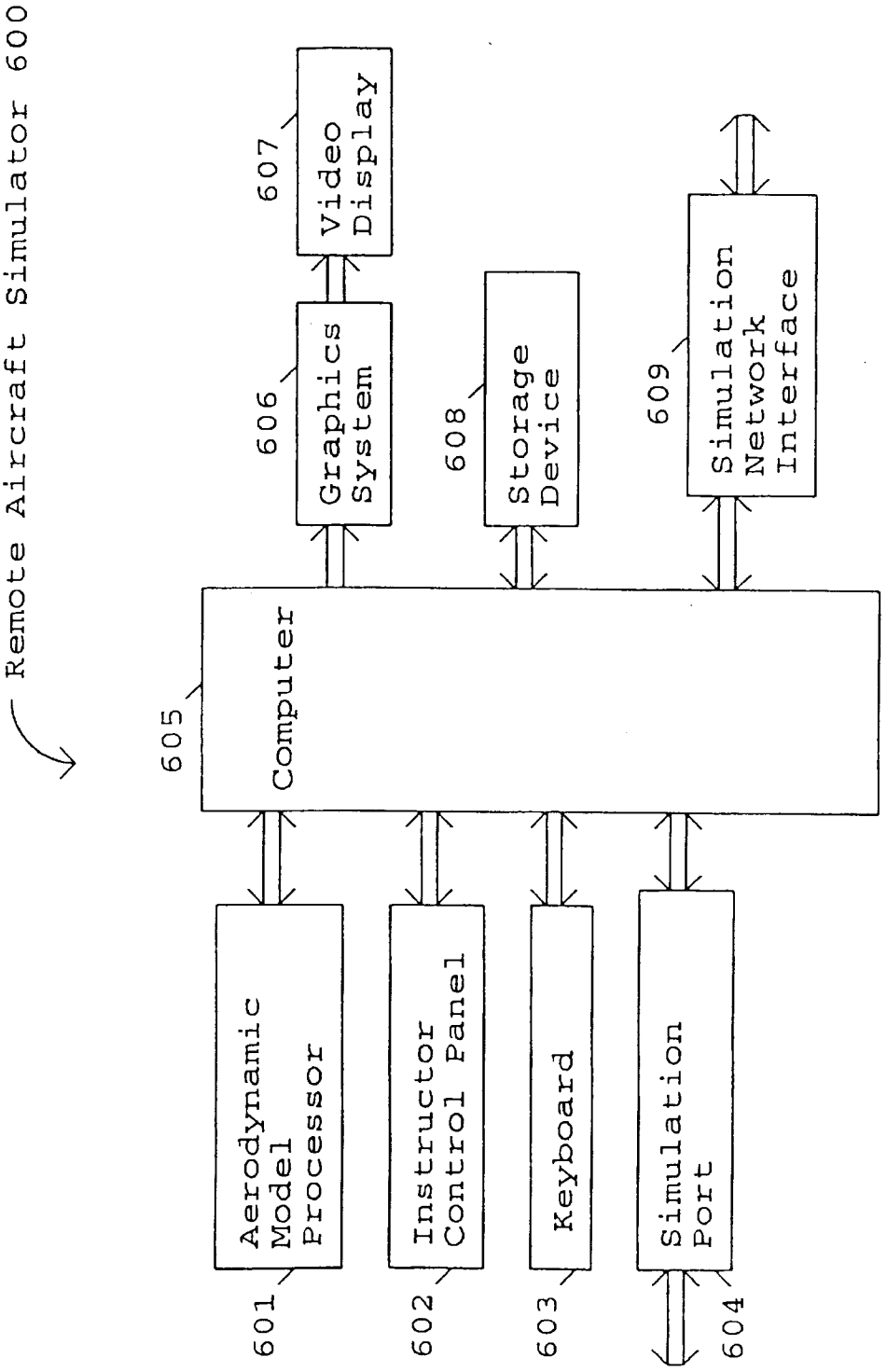
Storage Device
410
Video Interface
411
VCR
412
Video Display

Fig. 5


Remote Aircraft Simulator 600
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Computer
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Video Display
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Graphics System
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Storage Device
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Simulation Network Interface
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Aerodynamic Model Processor
602
Instructor Control Panel
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Keyboard
604
Simulation Port

Fig. 6

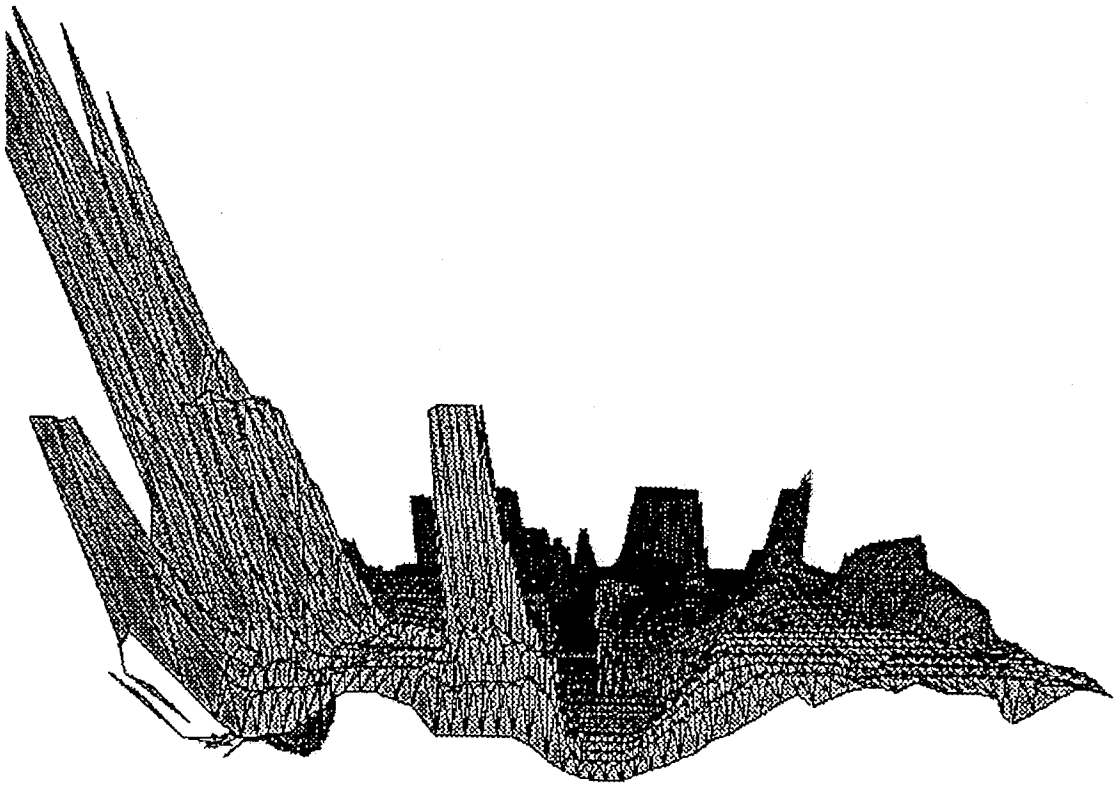

Figure 7

METHOD AND APPARATUS FOR REMOTELY PILOTING AN AIRCRAFT

BACKGROUND OF THE INVENTION—CROSS REFERENCES TO RELATED APPLICATIONS

"Pilot Aid Using a Synthetic Environment", Ser. No. 08/274,394 filed Jul. 11, 1994. "Digital Map Generator and Display System", Ser. No. 08/543,590, filed Oct. 16, 1995.

1. Field of Invention

This invention relates to the field of remotely piloted vehicles (RPVs) and unmanned aerial vehicles (UAVs).

2. Discussion of Prior Art

RPVs can be used for any number of purposes. For example, there is a large organization that promotes the use of remote controlled planes. Certain RPVs are controlled by viewing the plane with the naked eye and using a hand held controller to control its flight Other RPVs are controlled by a remote pilot using simple joysticks while watching the video produced by a camera in the remote aircraft. This camera is also used to produce the reconnaissance video. There are tradeoffs involving the resolution of the video, the rate at which the video is updated, and the bandwidth needed to transmit it. The wider the bandwidth the more difficult it is to secure the signal. The freedom to balance these tradeoffs is limited because this video is also used to pilot the aircraft and must therefore be updated frequently.

Certain UAVs are preprogrammed to follow a predetermined course and lack the flexibility to deal with unexpected situations.

The 1983 patent to Kanaly (U.S. Pat. No. 4,405,943) shows a control and communications system for a remotely piloted vehicle where an oculometer determines where the remote operator is looking and signals the remote vehicle to send the high resolution imagery corresponding to the area around where the remote operator is looking and low resolution imagery corresponding to the remote operator's peripheral vision. The objective is to minimize the bandwidth of the information transmitted to the remote operator.

SUMMARY

A method and apparatus is described that allows a remote aircraft to be controlled by a remotely located pilot who is presented with a synthesized three-dimensional projected view representing the environment around the remote aircraft According to one aspect of the invention, a system is used that includes an aircraft and a remote pilot station.

The aircraft uses a communications link to send its location, attitude, and other operating conditions to the remote pilot station. The remote pilot station receives the data and uses a database describing the terrain and manmade structures in the remote aircraffs environment to produce a 3D view of the remote aircraft environment and present it to the remote human pilot.

The remote pilot responds to the information and manipulates the remote flight controls, whose positions and forces are transmitted to the remote aircraft. Since the amount of data is small, it can be readily secured through encryption and spreadspectrum techniques.

Also, because the video reconnaissance cameras are no longer needed to remotely pilot the aircraft there is great flexibility in their use. To minimize bandwidth and reduce the possibility of being detected, the video data can be sent at a slow update rate. The data can also be stored on the remote aircraft for later transmission. Alternatively, low resolution pictures can be sent in real-time, while the corresponding high resolution pictures can be at a later time. The reconnaissance video can even be transmitted through a different communications link than the control data. There may also be more than one reconnaissance camera.

The delay in the control link must be minimized in order that the remote aircraft can be properly flown. The system can measure the link delay and make this information available to the pilot. This delay link measurement can also be used to modify the control software through which the remote pilot flies the remote aircraft. This is to prevent pilot-induced-oscillation.

The computers in the system allow for several modes of operation. For example, the remote aircraft can be instructed to fly to given coordinates without further input from the remote pilot. It also makes it possible to provide computer assistance to the remote pilot. In this mode, the remote flight control controls absolute pitch and roll angles instead pitch and roll rates which is the normal mode for aircraft In addition, adverse yaw can be automatically corrected so that the resulting control laws make the remote aircraft extremely easy to fly. Because this comes at the expense of being able to put the remote aircraft into unusual attitudes, for complete control of the remote aircraft a standard control mode is provided to give the remote pilot the same type of control that is used to fly a manned aircraft. Since the remote aircraft is unmanned, the remote pilot can subject the remote aircraft to high-G maneuvers that would not be safe for a pilot present in the aircraft.

To facilitate training, a simulated remote aircraft is provided that allows an instructor to set up the training mission and parameters. This is especially useful in giving remote pilots experience flying with different control link delays. In this simulated mode, the system can be further linked to a battlefield simulator such as SIMNET.

In the first embodiment, the remote pilot is provided with a standard video display. Additional display channels can be provided to give the remote pilot a greater field of view. There can even be a display channel to give a rearward facing view.

A second embodiment uses a head mounted display for the remote pilot instead of a standard display. This permits the remote station to be made more compact so that it can be used in a wider variety of installations. An example would be in a manned aircraft flying several hundred miles away.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention may best be understood by referring to the following description and accompanying drawings which illustrate the invention. In the drawings:

FIG. **1** is a general illustration showing a remote pilot at a remote pilot station operating a remote aircraft according to one embodiment of the invention.

FIG. **2** is a block diagram showing the communications link between a remote pilot station and a remote aircraft according to one embodiment of the invention.

FIG. **3** is a block diagram of a remote aircraft according to one embodiment of the invention.

FIG. **4** is a block diagram of a remote pilot station according to one embodiment of the invention.

FIG. **5** is a block diagram of a remote pilot station according to another embodiment of the invention.

FIG. **6** is a block diagram of a remote aircraft simulator used for training remote pilots according to one embodiment of the invention.

FIG. **7** is an example of a three dimensional projected image presented to a remote pilot by a remote pilot station according to one embodiment of the invention.

DETAILED DESCRIPTION

In the following description, numerous specific details are set forth to provide a thorough understanding of the invention. However, it is understood that the invention may be practiced without these specific details. In other instances, well-known circuits, structures and techniques have not been shown in detail in order not to obscure the invention.

A method and apparatus is described that allows a remote aircraft to be controlled by a remotely located pilot who is presented with a synthesized three-dimensional projected view representing the environment around the remote aircraft. Since the video from a reconnaissance camera located on the remote aircraft is not used to pilot the remote aircraft, the amount of data transmitted between the remote aircraft and the remote pilot is small. This provides greater flexibility in how the remote aircraft is used and allows the transmitted data to be made more secure. The remote aircraft may be of any type, for example a remote control plane or helicopter as used by recreational enthusiast.

FIG. **1** is a general illustration showing a remote pilot at a remote pilot station operating a remote aircraft according to one embodiment of the invention. FIG. **1** shows Remote Pilot **102** interacting with Remote Pilot Station **101** and controlling Remote Aircraft **103**. Remote Pilot Station **101** and Remote Aircraft **103** respectively include an Antenna **104** and an Antenna **105** for communicating Information **106**.

In one embodiment, Information **106** includes status information concerning the status of Remote Aircraft **103** and flight control information for controlling the flight of Remote Aircraft **103**. The status information is generated by Remote Aircraft **103** and includes the three dimensional position and the orientation (also termed attitude, and comprising heading, roll, pitch) of Remote Aircraft **103**. The status information may also include information concerning the flight surfaces, the engine, an additional altitude reading, etc. Remote Pilot Station **101** uses this status information to retrieve data from a Digital Database **107** which contains a three-dimensional description of terrain and manmade structures over which Remote Aircraft **103** is flying. Based on the three dimensional data retrieved from Digital Database **107**, Remote Pilot Station **101** projects a synthesized three-dimensional projected view of the terrain and manmade structures in the vicinity of Remote Aircraft **103**. Based on this view of the terrain and manmade structures, the Remote Pilot Station **101**, on its own and/or in response to input from Remote Pilot **102**, generates and transmits flight control information to Remote Aircraft **103** which adjusts its flight accordingly.

In one embodiment, the Remote Aircraft **103** is a remote controlled plane or helicopter used for recreational purposes. Since remote controlled planes and helicopters tend to be small in size, the circuitry in such remote aircraft to generate and receive Information **106** is minimized. In such systems, the Remote Pilot Station **101** may be implemented by including additional attachments to an existing portable computer. This allows the user to easily transport the remote aircraft and pilot station to an appropriate location for flight.

FIG. **2** is a block diagram showing a bi-directional communications link between a remote pilot station and a remote aircraft according to one embodiment of the invention. FIG. **2** shows Communications Transceiver **201** coupled to Antenna **104** of Remote Pilot Station **101**, as well as Communications Transceiver **204** coupled to Antenna **105** of Remote Aircraft **103**. In addition, FIG. **2** shows Information **106** being communicated between Antenna **104** and Antenna **105**.

FIG. **3** is a block diagram of a remote aircraft unit used in the remote aircraft according to one embodiment of the invention. FIG. **3** shows Remote Aircraft Unit **300** including Computer **308** coupled to GPS Receiver **301**, Turn-and-bank Indicator **302**, Gyrocompass **303**, Communications Transceiver **204**, Aircraft Engine and Sensors **309**, and Aircraft Flight Surfaces and Sensors **310**. GPS Receiver **301** receives signals from the satellites that make up the global positioning system (GPS) and calculates the aircraft's position in three dimensions. Turn-and-bank Indicator **302** and Gyrocompass **303** provide the aircraft's orientation which comprises heading, roll, and pitch. This data is sent to Computer **308** for transformation into the previously described status information. Computer **308** transmits this status information to Communications Transceiver **204** which produces a radio signal and supplies it to Antenna **105**.

The Aircraft Engine and Sensors **309** are coupled to control the aircraft's engine, while the Aircraft Flight Surfaces and Sensors **310** are coupled to control the aircraft's flight surfaces. The flight control information is received from the remote pilot station by Computer **308** through Antenna **105** and Communications Transceiver **204**. This flight control information is processed by Computer **308** into the necessary signals for transmission to Aircraft Engine and Sensors **309** and Aircraft Flight Surfaces and Sensors **310** to control the aircraft's engine and flight surfaces, respectively. The operation of the aircraft's flight control surfaces will be later described with reference to FIG. **4**.

In order to protect against ECM, the communications link between the Remote Pilot Station **101** and the Remote Aircraft **103** may be secured. While any number of different techniques may be used to secure this link, in one embodiment Computer **308** is implemented to encrypttdecrypt the data transmitted and Communications Transceiver **204** is implemented to use spread spectrum techniques.

Computer **308** may optionally be coupled to Altimeter **304**, Video Camera System **305**, Infrared Video Camera System **306**, Radar **307**, and/or Video Storage Unit **311**. Altimeter **304** provides an output of the aircraft's altitude as a safety check in the event GPS Receiver **301** malfunctions. Thus, this additional altitude reading may also be transmitted to Remote Pilot Station **101** as part of the status information.

Video Camera System **305** is controlled by Computer **308** which determines where the camera is pointing as well as focusing and the zoom factor. The video produced by the camera is not used by the remote pilot for flying the remote aircraft, so there is more flexibility in using the video. As a result, any number of techniques can be used for receiving the images captured by Video Camera System **305**. As examples:

1. High resolution, high update images may be sent back in real-time through the Communications Link, when the high bandwidth needed can be tolerated.
2. High resolution, low update images may be sent back in real-time through the Communications Link to reduce the bandwidth.
3. The video may be recorded in Video Storage Unit **311** for later transmission.
4. The video may be transmitted through a separate communications link.
5. There may be multiple video cameras.

Infrared Video Camera System **306** is similar to Video Camera System **305** and has the same operating modes.

Radar **307** in Remote Aircraft **103** may be passive or active. It may scan a particular pattern or it may track a

selected object. Radar **307** may consist of several Radar units. The information from Radar **307** is processed by Computer **308** so that only the desired information is transmitted over the communication link to the Remote Pilot Station **101** for display.

FIG. **4** is a block diagram of a remote pilot station according to one embodiment of the invention. FIG. **4** shows a Remote Pilot Station **400** including a Computer **405** coupled to Communications Transceiver **201**, Digital Database **107**, Graphics System **406**, User Flight Controls with Force Feedback **408**, and a Storage Device **409**. The Storage Device **409** represents one or more mechanisms for storing data. For example, the Storage Device **409** may include read only memory TROM), random access memory (RAM), magnetic disk storage mediums, optical storage mediums, flash memory devices, and/or other machine-readable mediums. Of course, Digital Database **107** may be stored in one or more machine-readable mediums and/or in Storage Device **409**.

As previously described, Antenna **104** receives the radio signals transmitted by Remote Aircraft **103** representing the status information of Remote Aircraft **103**. These radio signals are transformed by Communications Transceiver **201** and sent to Computer **405**. Communications Transceiver **201** is set to the same mode as Communications Transceiver **204**, so that if, for example, spread spectrum techniques are used, the signal will be transparently received. Computer **405** recovers the data (de-encrypting, if required) so that the data communications from Computer **308** in the Remote Aircraft to Computer **405** in the Remote Pilot Station is transparent. Thus, the bi-directional communications link comprises the combination of Communications Transceiver **201**, Antenna **104**, Antenna **105**, and Communications Transceiver **204**.

As previously described, the status information received by Computer **405** includes the three dimensional position and the orientation of Remote Aircraft **103**. The status information may also include information concerning the flight surfaces, flight sensors, the engine, an additional altitude reading, etc. Computer **405** uses this status information to retrieve data from Digital Database **107** which contains a three-dimensional description of terrain and manmade structures over which Remote Aircraft **103** is flying. The composition and creation of the Digital Database **107** is further described later. Based on the three dimensional data retrieved from Digital Database **107**, Computer **405** performs the mathematical operations to transform and project the three dimensional data to generate video data representing a synthesized three-dimensional projected view of the terrain (and, if desired, manmade structures) in the vicinity or environment of Remote Aircraft **103**. This video data is transmitted to Graphics System **406**, which displays the synthesized three-dimensional projected view on Video Display **407**.

Since the image is generated from the digital database, virtually any image of the environment of the Remote Aircraft **103** can be generated. As examples, the pilot may select the environment to be: 1) a simulated image of what would be seen out of the cockpit of a manned aircraft on a similar flight path; 3) a simulated image of what would be seen when looking in any direction (e.g., backwards, out a side window, etc.); 3) a simulated image of what would be seen if a camera were tailing the remotely piloted aircraft; etc. In addition, the simulated image may be set to any magnification. Thus, the phrase environment of Remote Aircraft **103** is intended to include any image generated with reference to the remote aircraft's position.

The User Flight controls with Force Feedback **408** are used by the remote pilot to input flight path information. The User Flight Controls may be of any number of different types, some of which are further described later herein. The status information received by Computer **405** also includes information received from Aircraft Flight Surfaces and Sensors **310**. This information is used to actuate force feedback circuitry in User Flight Controls With Force Feedback **408**. Remote Pilot **102** observes the synthesized three-dimensional environment displayed on Video Display **407**, feels the forces on User Flight Controls With Force Feedback **408** and moves the controls accordingly. This flight control information is sent through the communications link, to Computer **308**, and is used to control the aircraft flight surfaces in Aircraft Flight Surfaces and Sensors **310**. Remote Pilot **102** also receives data from Aircraft Engine and Sensors **309** through the communications link and is able to send data back to control the engine.

Flight Control

To illustrate the operation of the remote aircraft, a fixed-wing airplane will be described as an example. However, the basic principles apply to other types of aircraft as well. The basic control surfaces of an airplane consist of the ailerons, the horizontal elevators, and the rudder. The ailerons are moved differentially (one up, one down) to rotate the airplane around its roll axis; the horizontal elevators cause the airplane to rotate around its pitch axis; and the rudder causes the airplane to rotate around its yaw axis.

When the ailerons are used to modify the lift characteristics of the wings, one wing creates more lift while the other wing creates less lift. This also changes the drag characteristics of the wings and results in a yaw force that is opposite to the yaw force that results from the tail section causing the airplane to weather-cock into the relative wind. It is this yaw force caused by the airplane weather-cocking into the relative wind that causes a banked airplane to turn. The opposite yaw force produced by using the ailerons is called adverse yaw; the rudder control is used to counteract this force to produce a coordinated turn.

The simplest type of flight control consists of a joystick and a set of rudder pedals. The controls are directly connected to the flight control surfaces. With a joystick, moving the stick left and right moves the ailerons, while moving the stick forward and backward moves the horizontal elevators. The rudder is controlled by two foot pedals, one for each foot, that are mounted on a common shaft and hinged in the middle like a seesaw. Pressing one foot pedal forward causes the other foot pedal to move backward and causes the rudder to also move in one direction. Pressing the other foot pedal causes it to move forward and the opposite pedal to move backward and causes the rudder to move in the opposite direction.

An alternative to the joystick is the control yoke which consists of a wheel attached to a shaft that moves in and out of the control housing. Turning the wheel clockwise or counterclockwise moves the ailerons; moving the wheel shaft in and out moves the horizontal elevators. The rudder pedals as the same as those used with a joystick.

In order to aid in a description of remote aircraft operation, it is thought worthwhile to first describe the operation of non-remotely piloted vehicles. Non-remotely piloted vehicles can be operated in one of two ways (also termed as flight control modes); direct control or computer control (also termed as computer mediated).

Direct Control Non-Remotely Piloted Vehicles

When the flight controls are connected directly to the control surfaces the result is a second order system. Using

the joystick as an example, moving the joystick left or right establishes a roll rate. The airplane continues to roll until the joystick is returned to the center position, after which the airplane remains in the bank angle thus established. The foot pedals are used to counteract the adverse yaw as previously described. Moving the joystick forward or backward establishes a pitch rate. The airplane continues to pitch until the joystick is returned to the center position, after which the airplane remains in the pitch angle thus established. Both the roll rate and the pitch rate are subject to the limits of the airplane's design.

Since the joystick is directly connected to the control surfaces, the aerodynamic forces on the control surfaces are transmitted back to the pilot, giving him or her valuable feedback on how the airplane is flying.

The successful operation of the second order system with the pilot in the loop depends on several factors such as the area and placement of the control surfaces, how much the control surfaces move in response to the movement of the pilot controls, and how long the airplane takes to respond to changes of the control surfaces. The total system characteristics also depend on the reaction time of the pilot. If the resulting system is poorly designed it may be unstable, which means it may not be possible for a human pilot to fly it safely. An example of an unstable system is where the pilot desires to perform a gentle roll to the right and so moves the joystick to the right, the airplane's roll rate is faster than the pilot desires so he/she attempts to compensate by moving the joystick to the left, the airplane rolls left at a rate that is faster than the pilot desires so he/she moves the joystick to the right, and so on, with the pilot constantly overcorrecting and with the aircraft's rolling motions constantly getting larger and larger until the aircraft gets into a condition from which it may not be possible to recover, (e.g., spinning into the ground). The type of loss of control described is usually referred to as 'pilot induced oscillation' and although it may be caused by an inexperienced or inattentive pilot, it is more often caused by poor airplane design. Therefore, new airplane designs are extensively tested to make sure they can be safely flown. Examples of airplanes that use direct control of the control surfaces (Direct Control Second Order Systems) are the Cessna 150 and the Piper Cub.

Computer Mediated Non-Remotely Piloted Vehicles

Computer mediated control systems use a computer between the pilot controls and the control surfaces. The pilot controls are read by the computer, the data are modified in a particular way, and the computer sends control signals to the control surfaces. The computer may also sense the forces on the control surface and use it to control force feedback to the pilot controls. This type of computer mediated control may be used to fly an airplane that would otherwise be unstable, such as the F16 or the F117. Aircraft such as the F16 and F117 are also second order systems because the position of the pilot's joystick represents rate of rotation.

There are risks inherent in a computer mediated system. Although the program can be simulated extensively before using it in an actual airplane, the computer program may be quite large and therefore difficult to simulate under all possible conditions. An example of this is the Swedish JAS 39 Gripen Fighter. Despite extensive simulation of the flight control system, during a test flight a Gripen crashed due to " . . . the flight control system's high amplification of stick commands combined with the pilot's" large, rapid stick movements"." The pilot had entered a low-speed high-banked turn at a 280 meter altitude with lit afterburners and was leaving the turn when his actions led to 'pilot-induced oscillation'. (Aviation Week & Space Technology, Aug. 23, 1993, pages 72–73).

Having described techniques for operating non-remotely piloted vehicles, the Fight Control Modes for RPVs will be described.

Second Order RPV Flight Control Mode

A second order control system for an RPV is inherently computer mediated because the remote pilot must interact through two computers: the computer in the remote aircraft and the computer in the remote pilot station.

Flying an RPV is further complicated because there are additional time delays in the loop. The computer in the remote aircraft must first determine the aircraft's position and orientation. The additional processing for transmitting a secure signal by encryption and/or spread spectrum techniques may create additional delays. Transmission delay of signals between the remote aircraft and remote pilot station is negligible for a direct path. However, if the signals are relayed through other facilities the delay time may be appreciable, especially if an orbiting satellite is used. There are additional delays in the remote pilot station as the remote aircraft's position and orientation are used to transform the data from the digital database to present the pilot with the synthesized 3D projected view from the remote aircraft. In one embodiment, the RPV system measures the various delays and modifies the control laws used by the computer in the remote pilot aircraft and in the feedback provided by the computer in the remote pilot station to the remote pilot. For example, the computer may adjust the sensitivity of the User Flight Controls **408** according to the delay (e.g., as the delay increases, the computer will decrease the sensitivity of the flight controls). The system also displays the measured delay to the remote pilot.

First Order RPV Flight Control Mode

The stability of the flight control system, and thus the flyability of an RPV, can be improved considerably by using a first order system. In one embodiment of such a first order system the position of the remote pilot's joystick represents an angle relative to the horizon, instead of representing a rate of rotation as in a second order system. The position of the joystick is transmitted to the computer in the remote aircraft which moves the control surfaces as required to place the remote aircraft in the requested orientation. The control system in the remote aircraft is still a second order system but the delays in the communications link and the remote pilot station are no longer a part of the system's loop.

When a joystick is centered, the remote aircraft will fly straight and level. When the joystick is to the right of center the remote aircraft will be in a right banked turn. When the joystick is to the left of center the remote aircraft will be in a left banked turn. When the joystick is backward from center the remote aircraft will be in a pitch up orientation. When the joystick is forward of center the remote aircraft will be in a pitch down orientation.

The amount of bank and pitch permitted depends on the design of the remote aircraft. A high performance remote aircraft will be capable of a greater amount of pitch and bank than will a low performance remote aircraft.

Referring again to FIG. **4**, Computer **405** may optionally be coupled to Control Panel **402**, Keyboard **403**, Simulation Port **404**, Video Interface **410**, VCR **411**, and/or Video Display **412**. In one embodiment, Control Panel **402** con-

tains specialized lights, displays, and switches to allow a quicker response to situations than can be provided by Keyboard **403**. Control Panel **402** can be arranged to approximate the look and feel of an actual aircraft cockpit. Keyboard **403** allows the remote pilot to select various operating modes. For training purposes, Simulation Port **404** allows the remote pilot station to be connected to a remote aircraft simulator instead of an actual remote aircraft. The remote aircraft simulator will be further described with reference to FIG. **6**. Storage Device **409** allows the flight data to be recorded. During playback this previously recorded data is substituted for real-time data from the remote aircraft to replay the mission for analysis. Any video received from any reconnaissance cameras on the Remote Aircraft **103** is converted by Video Interface **410** so that it can be recorded on VCR **411** and displayed on Video Display **412**. VCR **411** can also operate in straight-through mode so that the reconnaissance video can be viewed in real time.

FIG. **5** is a block diagram of a remote pilot station according to another embodiment of the invention. FIG. **5** shows Remote Pilot Station **500**. Remote Pilot Station **500** is similar to Remote Pilot Station **400** of FIG. **4**, except Video Display **407** is replaced by Head Mounted Display **501**. In addition, Head Mounted Display Attitude Sensors **502** are coupled to Computer **405**. Head Mounted Display Attitude Sensors **502** measure the attitude of Head Mounted Display **501**. This information is used by Computer **405** to produce an additional three dimensional transformation of the data from Digital Database **107** to account for the attitude of the remote pilots Head Mounted Display **501**. This does not require any additional data from the remote aircraft. Of course, alternative embodiments could include both a video display and a head mounted display.

FIG. **6** is a block diagram of a simulated remote aircraft used for training remote pilots according to one embodiment of the invention. FIG. **6** shows Remote Aircraft Simulator **600** including Computer **605** coupled to Aerodynamic Model Processor **601**, Instructor Control Panel **602**, Keyboard **603**, Simulation Port **604**, Graphics System **606**, Storage Device **608**, and Simulation Network Interface **609**. Remote Aircraft Simulator **600** communicates with Remote Pilot Station **400** or **500** through Simulation Port **604**. Aerodynamic Model Processor **601** executes a mathematical model that simulates the behavior of a remote aircraft. An instructor uses Instructor Control Panel **602** and Keyboard **603** to select various training scenarios. Graphics System **606** and Video Display **607** are used to observe the operation of the system. Storage Device **608** is used to record the training session for later evaluation of the session. In addition to proficiency training, the Remote Aircraft Simulator can also be used to practice a proposed mission. The data communicated to the remote pilot station can include training and evaluation data for processing and/or display. This training and evaluation data can include any relevant information, such as flight path accuracy, etc.

Simulation Network Interface **609** permits participation in a battlefield simulation system such as SIMNET, mixing aircraft, tanks, and ground troops for training in the coordination of mixed forces. Thus, the system is designed to allow for the communication of this battlefield simulation information between the remote aircraft simulator and the remote pilot station. This allows the remote pilot station to display one or more other simulated entities (e.g., tanks, ground troops, other aircraft, etc.) described by the battlefield simulation information.

The Database

The Digital Database **107** can be comprised of any type of data from which a three dimensional image can be generated. For example, the U.S. Geological Survey (USGS) makes available various databases, two of which are of particular interest The first is the Digital Elevation Model data which consist of an array of regularly spaced terrain elevations.

The other USGS database is the Digital Line Graph data which includes: political and administrative boundaries; hydrography consisting of all flowing water, standing water, and wetlands; major transportation systems consisting of roads and trails, railroads, pipelines, transmission lines, and airports; and significant manmade structures. The Digital Line Graph data is two-dimensional. In the present invention features such as water, roads, railroads, and pipelines are represented as polygons with elevations determined from the Digital Elevation Model data. Transmission lines and significant manmade structures are defined as three-dimensional objects made of polygons and are placed according to the elevations determined from the Digital Elevation Model data. The different types of objects are tagged so that the remote pilot can select them to be highlighted by category or by specific object.

Data from additional digital databases can also be incorporated. An example of such a database is from Jeppesen Sanderson whose NavData Services division provides aeronautical charts and makes this information available in digital form.

The procedure for generating the synthesized three-dimensional view from the Digital Database may use any number of techniques, including those disclosed in the 1987 patent to Beckwith et al. (U.S. Pat. No. 4,660,157 REAL TIME VIDEO PERSPECTIVE DIGITAL MAP DISPLAY METHOD), and the 1993 patent to Dawson et al. (U.S. Pat. No. 5,179,638 METHOD AND APPARATUS FOR GENERATING A TEXTURE MAPPED PERSPECTIVE VIEW). One disadvantage of generating the synthesized three-dimensional view from these elevation databases in real time is the amount of storage space they require. To avoid this large amount of data storage, one embodiment of Digital Database **107** is composed of terrain data that represents the real terrain using polygons. This database may be generated using any number of techniques. For example, this database may be generated by transforming one or more elevation databases into a polygon database using the technique taught in "Pilot Aid Using a Synthetic Environment", Ser. No. 08/274,394 filed Jul. 11, 1994. Another method for transforming one or more elevation databases into a polygon database is taught in "Digital Map Generator and Display System", Ser. No. 08/543,590, filed Oct. 16, 1995. An example of a three dimensional projected image created from this database is shown in FIG. **7**.

While the invention has been described in terms of several embodiments, those skilled in the art will recognize that the invention is not limited to the embodiments described. The method and apparatus of the invention can be practiced with modification and alteration within the spirit and scope of the appended claims. The description is thus to be regarded as illustrative instead of limiting on the invention.

What is claimed is:

1. A system comprising:

a remotely piloted aircraft including,

a position determining system to locate 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;

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, 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.

2. The system of claim **1**, wherein:

said remotely piloted aircraft includes a device for capturing image data; and

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.

3. The system of claim **1**, wherein the flight data communicated between said remotely piloted aircraft and said computer is secured.

4. The system of claim **1**, wherein said remotely piloted aircraft further comprises a set of one or more video cameras.

5. The system of claim **4**, wherein said communications system is also for communicating video data representing images captured by said set of one or more video cameras, said video data for displaying said images.

6. The system of claim **5**, wherein said video data is transmitted on a different communication link than said flight data.

7. The system of claim **4**, wherein at least one camera in said set of one or more video cameras is an infrared camera.

8. The system of claim **1**, wherein said display is a head mounted display.

9. The system of claim **1**, wherein said set of one or more remote flight controls is responsive to manual manipulations.

10. The system of claim **1**, wherein said set of one or more remote flight controls allows for inputting absolute pitch and roll angles instead of pitch and roll rates.

11. The system of claim **1**, wherein said computer is also used for correcting adverse yaw without requiring input from said set of one or more remote flight controls.

12. The system of claim **1**, wherein:

said remotely piloted aircraft includes a device for capturing image data; and said system operates in at least a first mode in which said image data is not transmitted from said remotely piloted craft to said computer but stored in said remotely piloted aircraft.

13. 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.

14. The station of claim **13**, wherein said communications unit is also configured to receive video data representing images captured by a set of video cameras on said remotely piloted aircraft, said video data for displaying said images.

15. The station of claim **14**, wherein said video data is transmitted on a different communication link that said flight control information and said status information.

16. The station of claim **13**, wherein said display is a head mounted display.

17. The station of claim **13**, wherein said set of remote flight controls is responsive to manual manipulations.

18. The station of claim **13**, wherein said set of remote flight controls are configured to allow inputting absolute pitch and roll angles instead of pitch and roll rates.

19. The station of claim **13**, wherein said computer is also configured to correct adverse yaw without requiring input from said set of remote flight controls.

20. The station of claim **13**, wherein said communications unit includes at least one of a communications transceiver and a simulation port.

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