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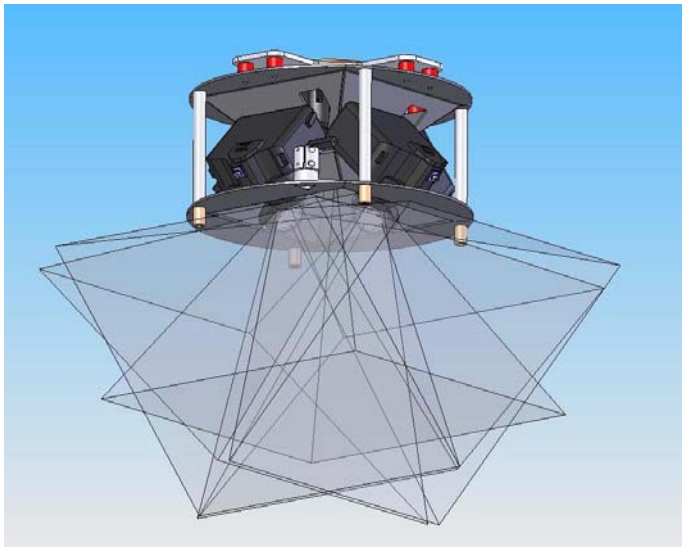


MIDAS

(Multi-cameras **I**ntegrated **D**igital **A**cquisition **S**ystem)

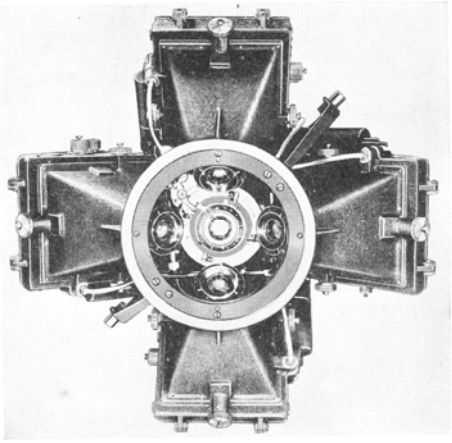
The solution to multi-images collection

FIRST COMMERCIAL DIGITAL
TILTED PHOTOGRAPHY SYSTEM

The MIDAS system was developed by TRACK'AIR together with several partner companies to provide the aerial survey community with a professional non vertical photography digital photographic system. So far it is the only dedicated commercial tilted camera system available for purchase. It is uncomplicated, trouble free and has been in operation for almost two years in Europe, Asia and in the USA.

History

Airborne tilted photography (also known as low oblique) is as old as the first aerial photo. In the 30's sophisticated professional equipment such as Fairchild's five cameras systems were in use. In the 50's, large format cameras were combined together to increase coverage such as the Zeiss Trimetrogon camera which used one vertical and two tilted cameras. Many military reconnaissance camera systems also make use of this configuration. But in the recent years aerial operators have often depended on makeshift systems which have been unreliable, costly and even sometimes unusable. A modern professional digital tilted camera system was much needed.



The 1934 Fairchild T-3A

The first MIDAS system was first introduced at the Reno ASPRS meeting in May 2006. Sixteen systems have been installed so far (6 in the USA) and more are on order. To date several millions aerial photographs have been successfully acquired.

MIDAS Description

The system consists of four tilted and one vertical camera connected to a dedicated data acquisition computer system. The 5 cameras are installed in a special platform which fits in standard 19 inch or larger camera holes. The flight management and cameras are under the control of our recognized XTRACK FMS which is also the core of the Applanix POSTRACK system. As a result MIDAS is a turn key system which can be installed in any aerial survey airplane and fully operational within a day.

MIDAS cameras

MIDAS uses 5 off the shelf digital reflex Canon EOS 1Ds Mk2 small format cameras. This camera produces a stunning 17 Mega pixel image and can take full advantage of the many excellent lenses produced by Canon. Alternatively Zeiss lenses can also be used to generate perfect image quality. The Mk II camera is a very dependable camera; very few failures have been reported during the last year for the 80 cameras that have been used in Midas systems. Some of these cameras have logged almost half a million pictures and their shutter (supposedly their weakest point) is still working fine.

The Mk2 can be calibrated and its geometry remains stable with time. At a relatively low cost, approximately US$ 8,000 per unit at the time this is written, this camera has proven to be a true aerial camera perfectly suited for the job. In addition, thanks to the exceptional SDK (Software Development Kit) provided by Canon, this camera can be completely remote controlled by the MIDAS computers, allowing the users to change any settings on the fly without ever touching the cameras. Other cameras with higher resolution are being considered but the Mk2 and its soon to be available successor, the 21 Mega pixels Mk3 will remain the core of our normal Midas system.

Please note that the Canon cameras can be provided by TRACK'AIR only within Europe and the USA, in other countries the customer should preferably purchase the cameras locally to insure proper services and guarantees.

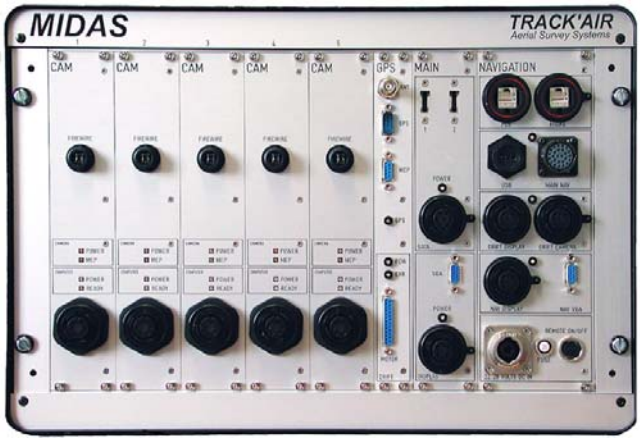
A new high resolution version of MIDAS is under development using 39 Mpixel cameras. The two first such systems combining 4 tilted Canon cameras and one 39 Mpixel vertical camera was delivered in the first half of 2007. A complete 5 x 39 Mpixel system should become available in 2008.

MIDAS Data Computer MDC

The MDC consists of 3 sub systems built into a compact 19 inch housing: The photo unit, the navigation unit and the mount unit.

The photo unit uses an array of computers dedicated to high speed image collection, transfer and saving. The unit was designed to take full advantage of the capabilities of modern digital cameras such as the Canon EOS 1Ds Mk2. MIDAS is capable of continuously firing 5 cameras at their maximum interval (2.5 second interval for the Mk2) and save all the images **to one single hard drive** (for safety, a real time backup is also saved on a second disk). From an operational point of view, the advantage of having all the photos saved to a single drive are many: The crew does not need to manipulate any data, they simply keep one drive as backup drive and send the other one to their office for processing. The drive not only contains the images but also the entire flight data recorded by the XTRACK FMS including IMU data. All the required information is accessible on the drive and further communication with the aircrew is not necessary. With projects that count in the hundreds of thousands of photographs, errors are greatly minimized. Additionally, the project management is uncomplicated because the photos are already renamed and sorted out in real time according to your specifications. MIDAS uses normal commercial SATA disk drives which are available in sizes up to 750 GB and can contain up to 100,000 photos! The photo unit is completed by a display which continuously shows the 5 thumb nails of all photos being taken. The pilot display can also be used to show photos in full size to check image quality on the fly.

The MIDAS Data Computer MDC



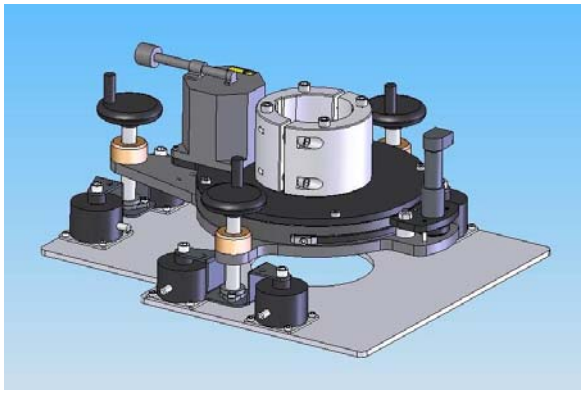
The navigation unit is built around our well-known TRACK'AIR XTRACK flight management system. State of the art computing technology allows the user to fly aerial missions with maximum efficiency and success. Contrary to XTRACK itself, the MIDAS system does not require a laptop computer although the crew may also decide to operate the system from a computer connected to the unit. Normal operation is via a touch screen display which allows for single pilot operation when the display is installed on the control yoke or in the cockpit with our articulated arm. The navigation unit also includes a built in GPS receiver or can be connected to any external GPS receiver.

The mount control unit includes the control system for the drift compensation and optionally for the pitch compensation. Experience has shown that roll compensation does not seem to be necessary for this type of operation while pitch correction might be required to compensate attitude changes due to fuel weight variation during the flight. Drift can be manually compensated with the vertical video drift system included in the MIDAS system or automatically corrected via a heading pickup on the HSI or from the input of the IMU when in use.

The MDC is a highly modular system intelligently designed for easy fault pinpointing and exchange of parts. Numerous LED's on the front panel and several software tools allow for rapid identification of any hardware issue so that the faulty module can be exchanged in a few minutes. MIDAS is specifically designed to eliminate down time due to equipment issues.

The normal power required by MIDAS is approximately 12-13 A at 24V. This together with the relative light Weight, 20kg (+44 lbs.) for the data computer + 20kg (+44 lbs.) for the camera system + 30kg for the mount (+65 lbs.) allows the system to be successfully operated from very small airplanes such as the Cessna 172.

Camera mounting system



The MIDAS mounting platform

The MIDAS mounting platform is a cleverly designed system which allows the cameras to be rapidly installed in many airplane types quite easily. Thanks to an original design with the cameras hanging under the drift rotation table, the cameras can be used in any existing 19 inch camera hole or even placed outside of the airplane with the help of our (STC pending) external fairing. Fully tested in airplanes as small as the Cessna 172 our FAA certifiable external fairing for Cessna 172/182 allows the MIDAS to be installed in an airplane with a hole as small as 8 inches in diameter!

The MIDAS camera pod under a Cessna 172

The camera angles can be set per customer specifications from 30 to 60 degrees. Forty-five (45) degrees has been the standard so far. It is interesting to note that thanks to its 24x36mm sensor the Canon Mk II fitted with a 50mm lens orientated at 45 degrees approximates very well the perspective of the human eye. As a result the tilted photographs have a very natural and appealing look.

Future Developments

The purpose of tilted photography is ultimately to help provide a lifelike three dimensional <<immersion>> (B. Gates) to the users of mapping, games, simulators, etc. Sooner or later the current all <<photo realistic>> three dimensional representations will be replaced by exact virtual views based on authentic photography. Shaded 3D models and wire frame digital models will give place to 3D panorama where the façade of buildings are extracted from actual photographs. TRACK'AIR has already started working on several new developments which will allow operators to meet the growing demand for tilted photographs, such as a 9 cameras system pointing at 45 degrees from each other. The increased number of views will allow smooth and seamless coverage even over congested cities. To conclude, TRACK'AIR is dedicating much of its resources to becoming a leader in this new field of aerial photography.

IMU

Midas is delivered with an integrated Applanix POSAV 210 or 310 IMU. MIDAS is smoothly integrated with these systems which were found to be the most suitable for this type of work. Outside the USA, MIDAS is taking advantage of the IMAR IMU which is not subjected to US export regulation and allows the POSAV to be moved across countries without special permission.

External orientation of tilted photography

In the next future, MIDAS will be capable of automatically computing the external orientation for the tilted photograph using standard commercial off the shelf photogrammetric tools. This approach will take advantage of the built in IMU. It will allow the operator to add the value of the EO to his product.

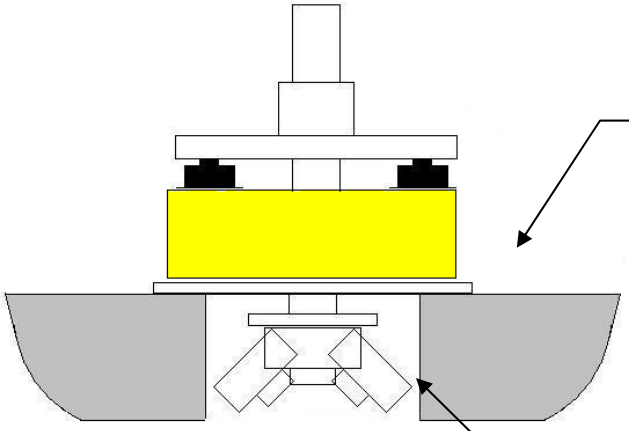
More generally tilted photographs can be orientated using common photogrammetric methods which are published in all handbook of photogrammetry, including the ones published by the ASPRS since many years.

Patents and other issues

The Midas system is entirely developed and produced in The Netherlands. The MIDAS development was started by Track Air in 1997 with the help of a Dutch government subsidy based on European funds. The first design of Midas was filed in 1997 with the Dutch authorities. Since then it has been fully documented on a yearly basis with these authorities. By design Midas only uses technologies which are commercially available or publicly known since many years. It has been insured that the Midas does not infringe on any existing European patent, brevet, etc. In return, although the design of the Midas is copyrighted according to European and Dutch laws, it has been established that there is nothing of Midas which can be patented according to European rules.

INSTALLATION SAMPLES

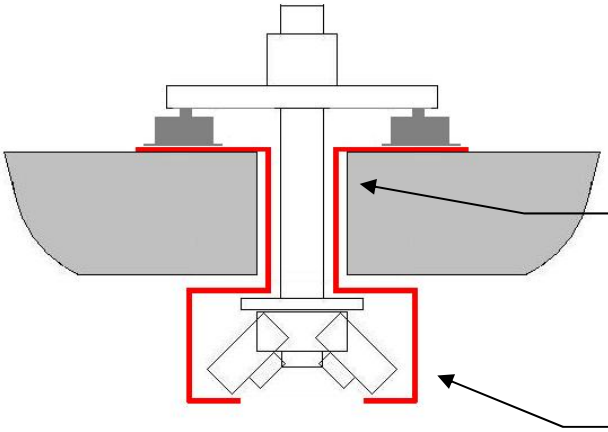
Standard 19 inch camera port



AIRPLANE FLOOR

19 INCH CAMERA HOLE

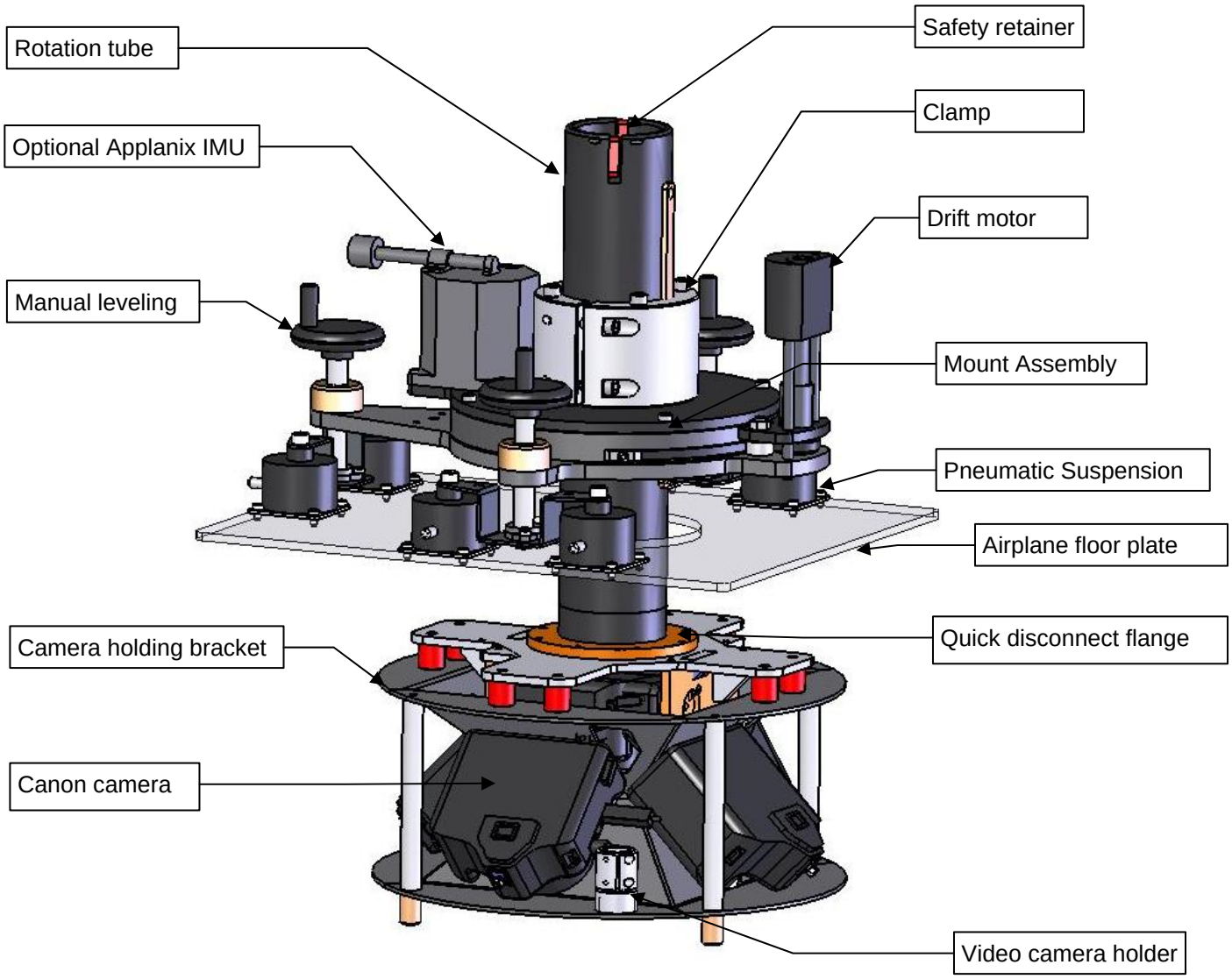
Installation on a light aircraft using an external fairing



8 INCH CAMERA HOLE

FAIRING POD

MIDAS CAMERA ASSEMBLY



MIDAS

(Multi-camera **I**ntegrated **D**igital **A**cquisition **S**ystem)

TECHNICAL SPECIFICATIONS

Technical specifications MDC

Power requirements	24-28 Volts at 12-13 Amp
Weight	Approx 20 Kg
Size	19 x 13 x 15 inch (490 x 330 x 390 mm)
Navigation/camera control	Integrated XTRACK flight management system
GPS	Integrated Garmin 15 or any external receiver
FMS interface	Flat panel touch screen
Single pilot operation	Possible with automated drift correction
Drift correction	Integrated drift motor controller
Drift measurement	Integrated vertical video with display
Cameras	5 Canon EOS 1Ds Mk II (1 vertical + 4 tilted)
Images	5 x 17 Mega pixels raw images
Image quality control	Integrated real time viewer with display
Image storage	2 Regular SATA hard disk drives
Performance	2.5 second interval with Canon EOS 1Ds
Altitude	Max 15,000 feet
Operation temperature	32-140 Fahrenheit (0-60 Celsius)
Chock/vibration	Pneumatic shock absorbers
IMU	Integrated Applanix POSAV 210/310

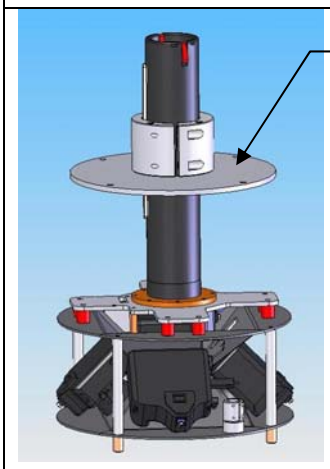
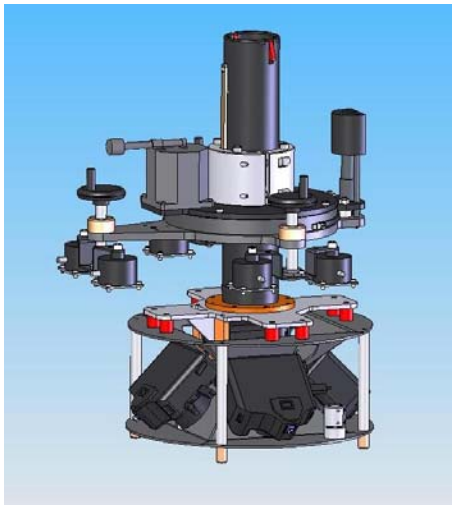
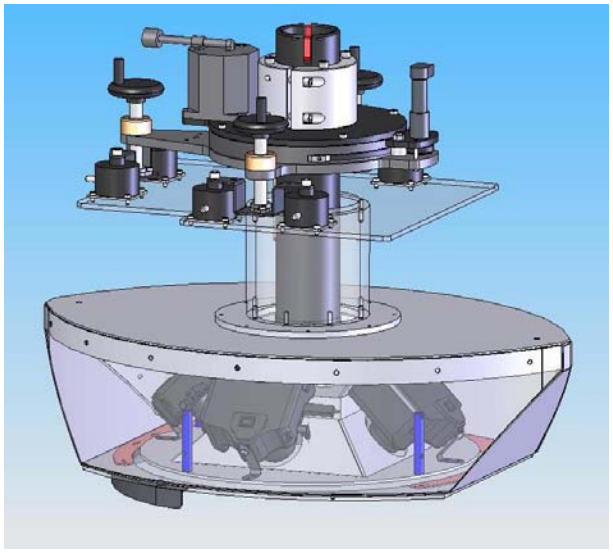
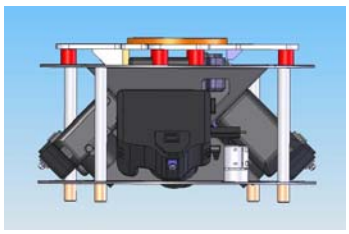
Technical specifications camera mount

Weight	Approx 30 Kg
Weight cameras	Approx 10 Kg
Drift correction	motorized
Pitch/roll leveling	manual (optional motorized pitch)
Camera angle	Fixed (30 to 60 degrees brackets available)
Chock/vibration	Pneumatic shock absorbers

Technical specifications camera pod/fairing

US certification (each airplane must be individually certified)	Cessna 172/182 (other airplanes possible, ask)
Weight	Approx 25 Kg

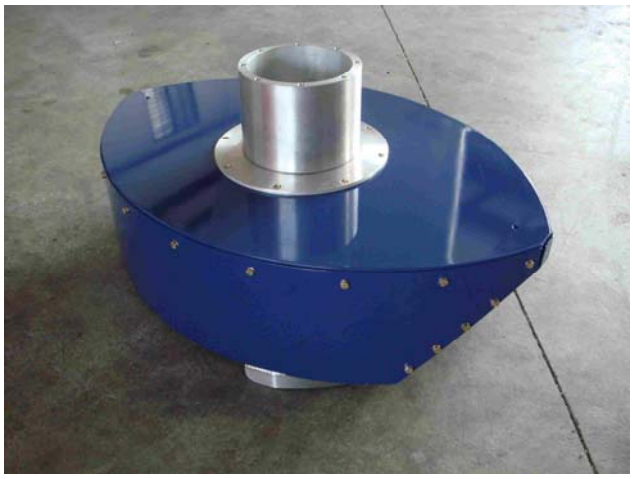
INTRODUCTORY PRICES VALID UNTIL DECEMBER 31 2006
CANON CAMERAS NOT INCLUDED!

	Description	Price
	**Complete system to be installed in an existing mount (GSM, PAV30, TAS, etc)** 1 MIDAS MDC unit 1 Image quality control display 1 8.4 inch pilot display with yoke mount 1 Integrated GPS with antenna 1 XTRACK software suite with 8 seats All required cables 1 Video drift camera and display 1 Supplemental navigation display 1 camera assembly unit with adaptor plate Installation and training on site Price ……	Call
	**Complete system with Track'Air mount** 1 MIDAS MDC unit 1 Image quality control display 1 8.4 inch pilot display with yoke mount 1 Integrated GPS with antenna 1 XTRACK software suite with 8 seats All required cables 1 Video drift camera and display 1 Supplemental navigation display 1 camera assembly unit 1 Track'Air mounting platform Installation and training on site Price……	Call
	**Complete system with Track'Air mount and TRACK'AIR fairing** 1 MIDAS MDC unit 1 Image quality control display 1 8.4 inch pilot display with yoke mount 1 Integrated GPS with antenna 1 XTRACK software suite with 8 seats All required cables 1 Video drift camera and display 1 Supplemental navigation display 1 camera assembly unit 1 Track'Air mounting platform 1 Complete fairing (FAA authorization only for Cessna 172/182. Require 8 inch hole and individual certification of each modified airplane) Installation and training on site Price……	Call
	**Additional camera bracket assembly** 1 assembly at any angle between 30 and 60 degrees (focal lens limitations may arise) Price……	Call

PHOTOS GALLERY

Installation of the fairing in a Cessna 182 Nov 2006

The fairing is nicely painted to match the aircraft color



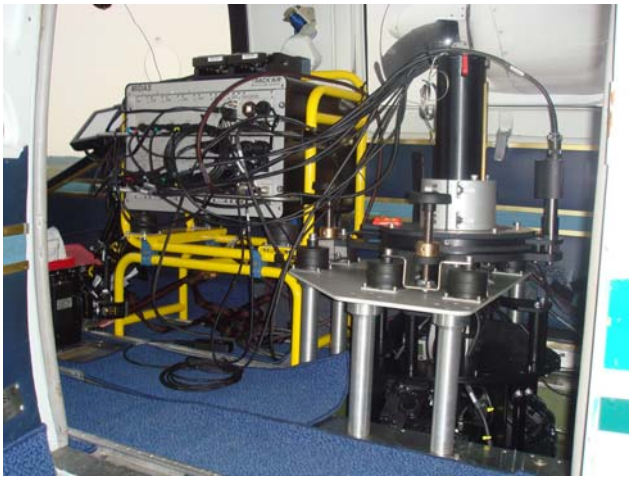
The mount installed in a Cessna 172 (USA)

Installation in Cessna 206 (USA)

Installation in a Cessna 172 (UK)

Installation in a Cessna Caravan (USA)

Installation in a Cessna 404 (Belgium)



Installation in a Partenavia (Denmark)

With Hasselblad/Phase One vertical camera