The InView Unmanned Aircraft System

The InView Unmanned Aircraft System has been developed for use in scientific, commercial and state applications. The design emphasis has been on safety, flight automation and modularity.

The InView has extensive safety features and a 700 km range. It can take off from, and land on, a grass field, and is large enough to carry high resolution sensors. It is modular in construction, so it is easily transported in a small van, and can readily be assembled by two people in one hour.

The long range InView Unmanned Aircraft System at a glance		
▪ scientific, commercial and state missions	**Payload**	4 kg
▪ comprehensive safety features	**Endurance**	7+ hours
▪ modular and easily transportable	**Max speed**	112 kph
▪ assembled and tested within an hour	**Loiter speed**	24 kph
▪ can operate from a grass field	**Weight**	19.5 kg without fuel
▪ capable of very slow flight	**Wingspan**	4 m
▪ user definable payloads can be carried	**Fuel**	AVGAS 100LL fuel packs
▪ operates in manual, Microprocessor based autopilot and PC autopilot flight modes	**Propulsion**	2x SAITO FG-30 engines Total Power = 3.6 kW

Scientific, commercial and state mission examples	
Maritime border patrol	▪ Detect and monitor fishing, smuggling and immigration activities. ▪ Monitor off-shore oil and gas platforms. ▪ Monitor shipping and detect piracy activities.
Monitor incidents and relief activities	▪ Monitor and map volcanic ash particle densities using LIDAR. ▪ Locate victims following flooding, an Earthquake, or a mud slide. ▪ Provide a communications relay capability to people working in an area where the communications infrastructure has been damaged.
Monitor fires and the spread of toxic plumes	▪ Circle and monitor a fire, where toxic smoke might be given off. ▪ Monitor the travel of a toxic gas cloud from a chemical incident. ▪ Detect and monitor radioactive plumes.
Monitor oil and gas pipelines	▪ Perform routine flights to monitor up to 700 km of pipeline. ▪ Use difference detection software to identify any changes. ▪ Routine flights enable the use of differential thermal imaging
Geophysical survey work	▪ Attach a Caesium beam magnetometer under each wing. ▪ Fly at low level and perform high definition geomagnetic surveys. ▪ InViews flying in formation reduce the survey duration and cost.
Wide area surveillance	▪ Slowly fly along a supply route, around a base, or, around an island. ▪ Use high resolution, side and forward looking, photography to detect and identify distant people and objects.
Security services	▪ Detect and monitor criminal and / or any other suspicious activities. ▪ Detect people automatically using real time face detection software.
Flight training	▪ Fly a real aircraft remotely as part of progressive pilot training. ▪ Experience real flight physics after using flight simulation software. ▪ Fly where no pilot would dare to fly a manned aircraft.
Research and Development	▪ Test the capabilities of electro-optic sensors in an unmanned aircraft. ▪ Explore experimental "Detect and Avoid" technologies. ▪ Test line-of-sight wireless and satellite communications links. ▪ Explore formation flight technologies and the capabilities of a swarm of long range unmanned aircraft flying beyond line-of-sight.

Safety and modularity

- The InView Unmanned Aircraft System consists of the InView Unmanned Aircraft and the InView Ground Control Station. The InView Unmanned Aircraft can fly:
  - on one of its two engines. The safety provided by two engines is a requirement of the exploration companies for aircraft operating Beyond Line of Sight;
  - using one aileron, should the other servo, or servo linkage, fail;
  - using one of the two elevator sections, each section having a dedicated servo;
  - using the ailerons and the elevator should the rudder fail.

- When flying Beyond Line of Sight, the command uplink and the telemetry downlink is via a satellite data communications link.

- Distributed sensors provide an early warning of system failure, allowing the autopilot to fly the aircraft back to base before the system degradation becomes too serious.

- The InView aircraft has an on-board Flight Termination System.

- The InView aircraft is constructed using plywood and carbon fibre composites, and will disintegrate on impact with a structure, to minimise damage to the structure.

- The InView is assembled within an hour from modules that can easily be transported in a small vehicle. Individual sections can be upgraded to suit a particular mission, or replaced as part of routine maintenance, or as a result of damage sustained.

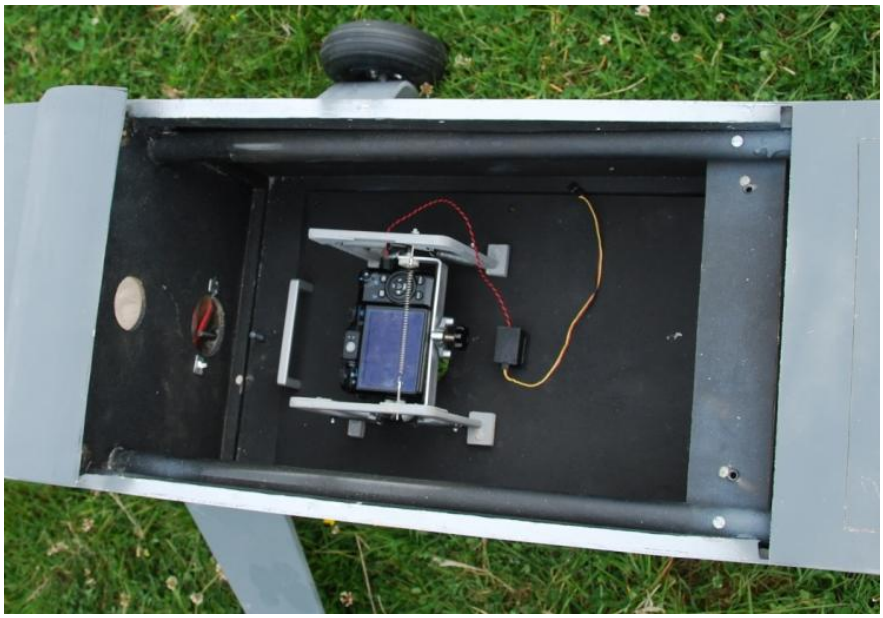
"Plug and Play" high performance sensors

	
Canon EOS 5D Mk II camera body ▪ 5,616 x 3,744 Pixels = 21 MPixels ▪ computer interface and control via USB 2 ▪ weight = 810 g	Canon EF 70 - 200mm f/2.8L zoom lens ▪ viewing angle = 10° x 7° at 200mm ▪ 4 stop image stabilisation ▪ weight = 1,490 g

Camera resolution test with a car as a target 600 feet from the camera.	
	
Canon G10 midsize camera at max zoom.	Canon EOS 5D and 70-200mm lens at 200mm.

Examples of other professional sensors that can easily be carried:

- a camera mounted on the underside of each wing forms a **stereo imaging system** used to record synchronised pairs of photographs which are processed into 3D representations of the air space and the underlying terrain;
- a scalar **Caesium beam magnetometer**, mounted under each wing and a vector fluxgate magnetometer in the tail section, enable mapping of the Earth's vector magnetic field;
- a high resolution **Radio Direction Finding** unit, based on the use of two sets of wide baseline antenna assemblies, one attached to the underside of each wing.



Above: the Canon G10 digital camera in the modular payload section in the fuselage illustrates the space available for cameras and sensors to suit scientific, commercial and state missions.

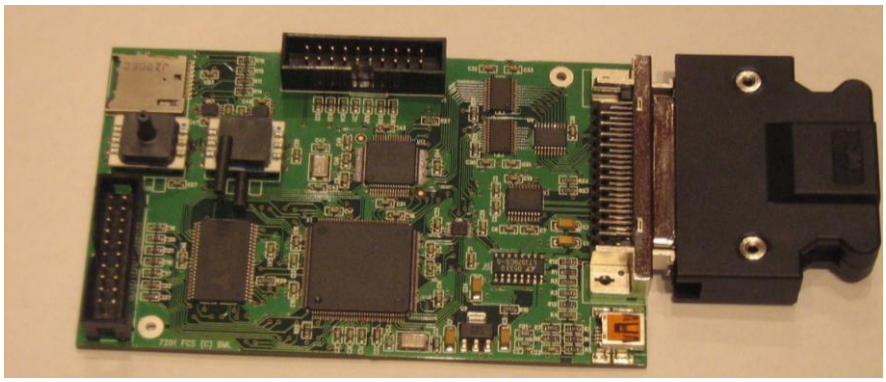
A high definition SONY camcorder is used on long range photographic reconnaissance missions to record the mission and augment the coverage of the digital cameras in the payload bay.

Outstanding features of the InView Unmanned Aircraft System	
Safety	The InView has two engines, and can fly on one. The InView can fly even if an aileron, a rudder or elevator servo, or even a servo linkage, fails. The InView has a dual heterogeneous autopilot control system.
Long flight range **small logistical footprint**	The InView can fly 700 km with a 4 kg payload. The aircraft can take-off from, and land on, a grass field. Only two people are needed to operate the InView.
Modular construction and ease of transportation	The InView can be assembled in one hour by two people from parts transported in three boxes in the back of a small van.
Capable of slow flight, thanks to the engines moving air over the wings and the Fowler flaps	This platform can be used to take higher quality photographs due to less motion induced blurring. This aircraft can be used to make quality measurements through the greater use of signal averaging.
Lower crash damage	Crash damage is directly related to the kinetic energy of the aircraft and the rigidity of the airframe. The InView has a low kinetic energy: it has a maximum weight of 27 kg with fuel and has a maximum speed of 112 kph. The InView is constructed from carbon fibre and environmentally friendly LitePly, so it will disintegrate on impact.
Appropriate payload	The sensors used in reconnaissance and in survey work weigh less than 4 kg, so a larger payload is not needed.
Environmentally friendly	This small aircraft has been constructed from less than 20 kg of materials. Less waste is associated with its disposal. This aircraft uses less fuel per km flown than a manned counterpart, and uses fuel efficient four stroke engines. The engines have been effectively silenced to make this aircraft difficult to detect and less of a disturbance to people and animals.
Global operation	The InView contains quality, high performance, commercially available, sensors and systems. The InView contains nothing that has a military sensitivity. The InView has been developed, and is manufactured, in the U.K.

Efficient lift flaps enable slow flight and short take-off from, and landing on, a grass field

- The high lift flaps behind each powerful wing mounted engine, shown above, ensure:
  - a short take-off from and landing on, a path, a dirt road, a patch of sand, or, a wild grass field, even with a surrounding fence;
  - unusually slow flight capability, ideally suited to taking high resolution forward and side looking photographs and precision magnetic field measurements;
  - ability to carry a heavy payload, such as extra fuel for a long 7+ hour flight.

Three flight modes are supported: manual, PC autopilot and Microprocessor based autopilot



Manual Radio Control Mode	The operator controls all aspects of the aircraft and flies the aircraft using the video downlink from the underside camera.
Microprocessor autopilot Mode	Control Unit, with Real Time Operating System, as above. The aircraft flies on a flight path that has been pre-defined, as a sequence of GPS waypoints,
PC autopilot Mode	The PC autopilot, with Windows 7 OS, is more capable and extendable. If the PC fails, control passes to the Microprocessor based autopilot.

The InView is built to order and can be ordered now

Above: the InView can carry a variety of under-wing payloads in addition to the main payload in the fuselage under the central wing section.

Benefits in brief

- Far less expensive than a manned aircraft. Even with a limited budget, you may still be able to both purchase and routinely operate a small fleet of InView Unmanned Aircraft.
- Very much less expensive to fly than manned aircraft on routine missions. No nearby airport is needed, and the aircraft can be transported in the back of a small van.
- Use a formation of unmanned aircraft, managed by a Pilot-in-Command and a Co-Pilot at the Ground Control Centre, to achieve even greater operational cost savings.
- Fly anywhere without danger to the Pilot, or, ever needing to rescue a Pilot.
- Fly the routine and / or dangerous missions you need to without pilot constraints, such as low level night flights, or long range flights over the desert, or, over icy Arctic waters.

Contact Barnard Microsystems Limited, or their representative, for pricing for the Unmanned Aircraft and for the Ground Control Station. The InView takes from 6 to 8 weeks to build and test. A typical system consists of three Unmanned Aircraft and one Ground Control Station.

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