



Eye in the sky

An exciting new affordable tactical UAV helicopter is well into its validation and flight testing phase. Global Defence Review was invited to a recent flight demonstration of the S-100.



FOUNDED IN 1951, the Vienna-based Scheibel Group of companies built up a reputation for developing and producing a range of advanced mine detection equipment including the AN-19/2 that was adopted as the standard mine detector of the US Army.

In the 1990s, the company began developing a short-range vertical take-off and landing (VTOL) unmanned aerial vehicle (UAV), the Camcopter which was extensively trialed by the US Air Force, Army and Coast Guard. The Camcopter 5.1 was ordered by the Egyptian Navy for the maritime reconnaissance role with deliveries completed in 2002. A total of 25 Camcopters was produced before the more advanced S-100 VTOL UAV was launched by Scheibel at IDEX 2005.

The Schiebel Camcopter S-100 is a highly versatile, autonomous UAV system developed to provide a unique balance between advanced capabilities and operation in tactical environments. The system consists of a compact rotary-wing vehicle that can be fitted with a wide variety of payloads tailored to meet diverse user requirements that eliminates the need for launch and recovery equipment.

Schiebel is working closely with civil aviation authorities to assure that the design, production and operation of the S-100 system are compliant with relevant regulations. This is done both in anticipation of operation in civilian airspace, as well as to bring Schiebel's organisation into line with established best practices of the aviation industry. The company plans to have the S-100 certified by the Austrian civil aviation authority by 2006, making it one of the first UAVs to achieve this goal.

The S-100 combines long endurance and large payload capacity into a relatively small outline. It can complete its entire mission automatically, from takeoff to landing, controlled by a triple-redundant flight computer based on proven flight control methods and algorithms. Redundant INS and GPS modules ensure precision navigation and stability in all phases of flight, ensuring that the payload is accurately positioned in accordance with its tasking. The onboard navigation computer is capable of storing and managing all waypoint commands, allowing continuous operation independent of the control station. The datalink receives control inputs from, and transmits position and payload data to, the control station in real-time. Mission radius is dependent upon the user-specified ground antenna configuration and payload weight.

The S-100 has been designed as a platform for a wide variety of payloads, and therefore no standard payload is offered, rather it is integrated according to customer requirements. The UAV features two payload bays, side hard points and an internal auxiliary electronics/avionics bay. The primary payload bay, located directly beneath the main rotor shaft, is capable of mounting payloads weighing up to 50 kg. Fixed-mounted daylight and/or infrared cameras provide the operator with situational awareness and orientation.

The UAV fuselage is a carbon-fibre monocoque, which

Clockwise from top left: The Schiebel S-100 is being test flown in the UAE; Schiebel's first production UAV, the Camcopter; The first production prototype S-100; The S-100 takes off from Gross-Mittel.

CAMCOPTER S-100: DESIGN SPECIFICATIONS

Autonomy:	Fully autonomous take-off Waypoint navigation and landing
Navigation:	Redundant INS and GPS
Power plant:	55hp rotary aviation engine
Data/video link:	Fully digital, compressed video (Up to two simultaneous feeds)
Typical D/L range:	80/130 km (43/70 nm)
Dash speed:	120 kts
Cruise speed:	55 kts (for best endurance)
Service ceiling:	18,000 ft MSL
Endurance:	6 hours (with 25 kg (55 lb) payload)
Maximum payload:	50 kg (121 lb)
MTO weight:	200 kg (440 lb)
Empty weight:	97 kg (214 lb)
Max. dimensions:	3091 mm (122") length 1042 mm (41") height 1238 mm (49") width
Main rotor diameter:	3400 mm (133.9")

gives a superior strength/weight ratio, providing maximum capacity for a wide range of payload/endurance combinations. In a standard configuration, the AV is capable of carrying a 25 kg payload for up to six hours. The S-100 is powered by an aviation-certified 55hp Wankel rotary engine.

It is also being developed for maritime applications, where, like its predecessor, it will be capable of landing on helicopter deck-equipped ships without the use of additional landing equipment.

The control station concept is scalable, from operation from two laptop computers (one for mission planning/control, one for payload control, imagery exploitation) to larger, integrated suites. The mission planning/control workstation displays the UAV's position and status information in real-time, to an aviation-style instrument panel, with integrated checklists and failure procedures. Mission planning and preparation are done using geographical information system (GIS) data, and the entire mission can be viewed and rehearsed within a 3-D synthetic environment. The GIS environment allows the display of additional layers of GIS data, such as threat zones, no-fly zones and other intelligence information. The payload control workstation allows the payload operator to control the payload while also having access to mission planning information.

The pilot control unit provides the operator with the ability to control the UAV manually at any time, and return to the autonomous mission. Directional commands may be transmitted to the UAV's onboard navigation computer via a joystick. A control screen is used to select the flight mode (i.e. vertical take-off and landing, automatic mode, manual mode and return-to-home). Flight status data are displayed on the control panel's LCD screen.

An intelligent interface unit with PowerPC core processors acts as a highly reliable hub between ground components and provides an Ethernet link to higher-level networks for

disseminating payload and UAV data. The system's software architecture allows the UAV to be handed over between control stations during flight, thus expanding operational footprint by bypassing obstacles which may interfere with the datalink's line-of-sight. Remote data terminals are also available, to allow tactical personnel to view payload imagery and flight data in real-time during missions.

Equipped with an IR/CCTV/LRF gimbal, the S-100 is designed to fulfill a very wide range of general surveillance roles without modification. The result is rapid deployment and ease of operation. This is particularly valuable to the tactical commander, whose requirement is for quick and accurate intelligence, delivered in real time, by both day and night.

The Control Station (CS) software is designed to allow both pre-planned and manually controlled sorties, and for the immediate interchange between the two options. Therefore a mission can be switched from general surveillance to a point target interrogation, and then revert to an area search, all at the touch of a button. The selection of primary roles will depend on the operational situation and the commander's priorities.

Using two or more systems continuous artillery observation can be achieved over key points, providing early intentions of enemy redeployment or manoeuvre. Targets can be acquired during general surveillance missions, either in the pre-planned or manual modes. Opportunity targets, identified during any mission can be immediately engaged by either aborting the mission, or by suspending the mission only for the duration of the engagement. Once the engagement is complete the S-100 can either resume the original sortie or be tasked to seek out further targets in the new area of interest.

In the maritime surveillance and amphibious support roles the Camcopter S-100 is capable of operating from small naval ships in up-to-moderate sea and weather conditions and offers substantial surveillance enhancement for low cost. Its small size, low radar cross-section, and minimal emission levels combine to provide a highly effective 'over-the-horizon' capability with many applications, while ensuring maximum security. Equipped with a proven auto tracking system, rapidly

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installed as part of the ships communications equipment and compatible with radar and ships communication emissions.

Operating as part of either single ship or task force operations the S-100 expands the area of influence, providing high definition observation well forward of weapon release range, allowing commanders increased decision times for counter action, and for target engagement. At the same time it can be utilised to designate targets for engagement by other assets or can correct fire from surface ships.

The complete system can be stowed in a small space and can be prepared very quickly for a sortie. Its ease of operation and maintenance allows it to be operated, with the necessary training, as a secondary role by existing ships personnel, thus avoiding the requirement to carry extra men. All normal servicing and maintenance can be carried out at sea, and the complete equipment package is designed for the special climatic conditions encountered on maritime operations. Future tasks, subject to the development of appropriate sensors, may include decoy operations using jamming, discharge of chaff, or other similar devices. Communication relay i.e. to parties deployed ashore where the naval task force must remain outside the range of enemy weapons. NBC monitoring.

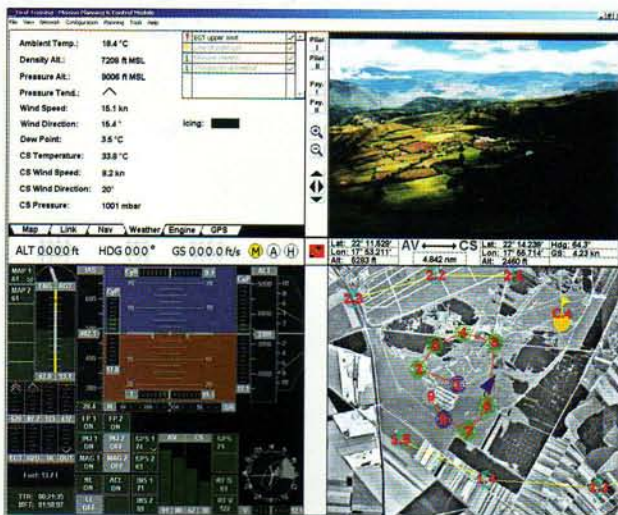
The Schiebel C-100 is in the pre-production phase and validation and flight testing are in progress with two prototypes flying, one at an Austrian military training facility at Gross-Mittel on the outskirts of Vienna, and the other in the United Arab Emirates (UAE). High altitude testing will take place on an Austrian Air Force fast-jet range or in the UAE.

Beginning in late 2005, Schiebel is planning to build up to 100 UAVs by 2007. At the 2005 Paris Air Show, the company announced that it had concluded a marketing agreement with the German reconnaissance and surveillance systems' manufacturer, Diehl BGT Defence.

The company claims that military personnel with, no specific aviation experience, can be trained to operate the S-100 in 10 weeks. It is anticipated that civilian operators would require an IF rating for operation within controlled airspace based on the Australian CAA's requirements.

During the flight demonstration at Gross-Mittel, an S-100 prototype was flown in both the autonomous and manual modes. Flying on a hot day in gusty wind conditions – it has a design cross-wind component of 25 kts – the UAV was extremely stable in take-off, climb and hover. Hovering only a few hundred metres above the ground, the engine noise was low and the vehicle was soon lost to sight as it climbed.

Schiebel have come up with a stealthy rotary-wing UAV design with a performance that is more than comparable to many fixed-wing TUAVs now in service, with the added advantage of it being able to operate from any small open space on land, or a ship's deck, thanks to its VTOL capability. ■



Real-time information on the workstation displays.