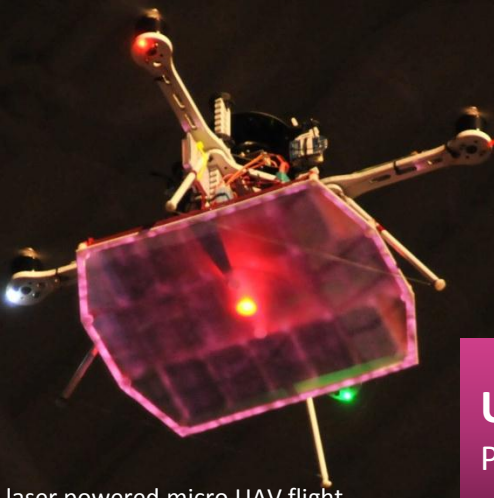


solutions for
EDUCATION - RESEARCH - UNIVERSITIES



UNIVERSITIES & RESEARCH
Platforms for your research projects!

Seattle 2010. World record for laser powered micro UAV flight.

**Ascending
Technologies**
GmbH

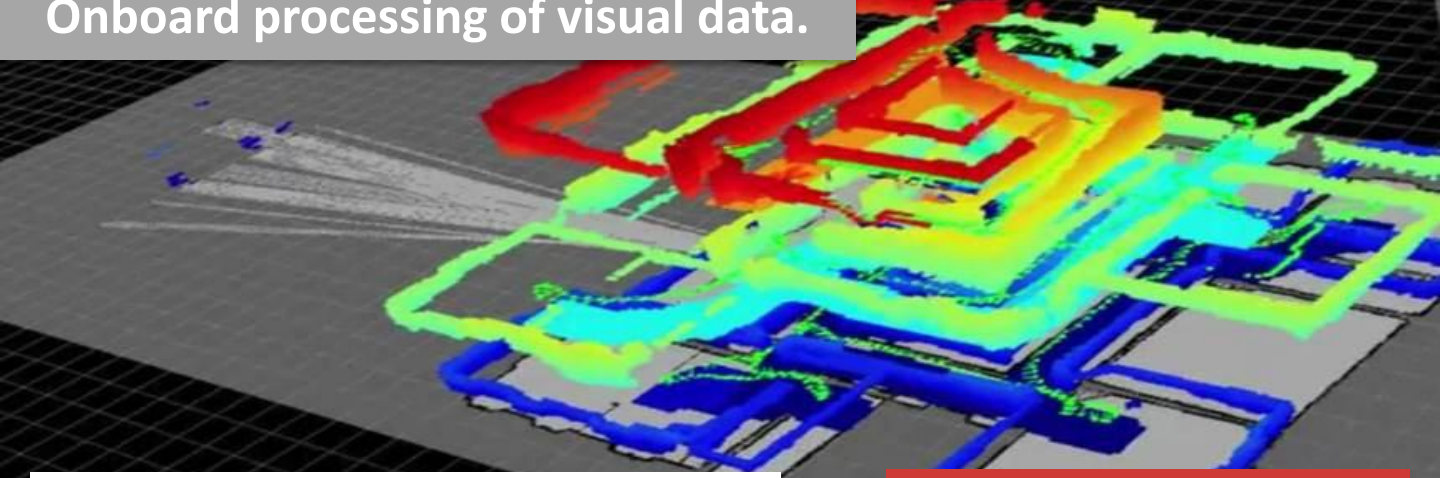
Phone: +49(0)89-89 55 60 79-0
E-mail: team@asctec.de
Web: www.asctec.de

We have recently announced our product line up for 2012, in addition to our current product portfolio which can be found in here.

Please ask us for the 2012 product flyer. A revised price list will be released towards the end of 2011.

SIMULTANEOUS LOCALIZATION & MAPPING

Onboard processing of visual data.



Simultaneous Localization and Mapping (SLAM) is a process implemented in unmanned vehicles to automatically generate a map of an unknown environment and localize its own position in that environment at the same time. Possible applications could be for example search and rescue or reconnaissance missions in contaminated areas.

Lightweight sensors

We offer a complete solution for SLAM tasks, based on the AscTec Pelican standard model. An extremely lightweight camera and a laser scanner specifically modified to the AscTec Pelican are available. All visual data can be computed on-board by the Atom Processor Board.

High payload

With its 500 g payload and incredible flight stability, the AscTec Pelican is worldwide known to be the perfect UAVs for SLAM applications.

Many labs worldwide use customizes systems based on this configuration.

References

- University of Pennsylvania: www.grasp.upenn.edu
- The City College of New York: <http://robotics.cuny.cuny.edu>
- Massachusetts Institute of Technology: www.csail.mit.edu

Recommended SLAM configuration:

1x AscTec Pelican standard model	#10063
2x LiPo battery TP 6000 mAh	#10043
1x Atom Processor Board	#10065
1x LVDS display	#10066
1x WLAN module	#10067
1x Laser scanner 30 m range	#10075
1x Prop protection 'small'	#10078
1x Camera mount option 1	#10135
1x Micro 1/3" CMOS camera	#10133

FLIGHT DYNAMICS & FLIGHT CONTROL

Precise handling for tricky maneuvers.



Small size, robust airframe

A small and robust UAV is what you need if you do research in flight dynamics and flight control.

Access all IMU sensor data easily

By being able to access all sensor data (raw data and calculated data) easily via SPI bus you can compute it in your own code at the additional on-board micro processor.

Flight stabilization at 1.000Hz for precise maneuvers

The UAV is able to execute 1.000 direct motor commands per second. This high update rate allows you flying very precise maneuvers.

Fly even harsh maneuvers

The high thrust to weight ratio provides you with enough power to fly harsh maneuvers.

References

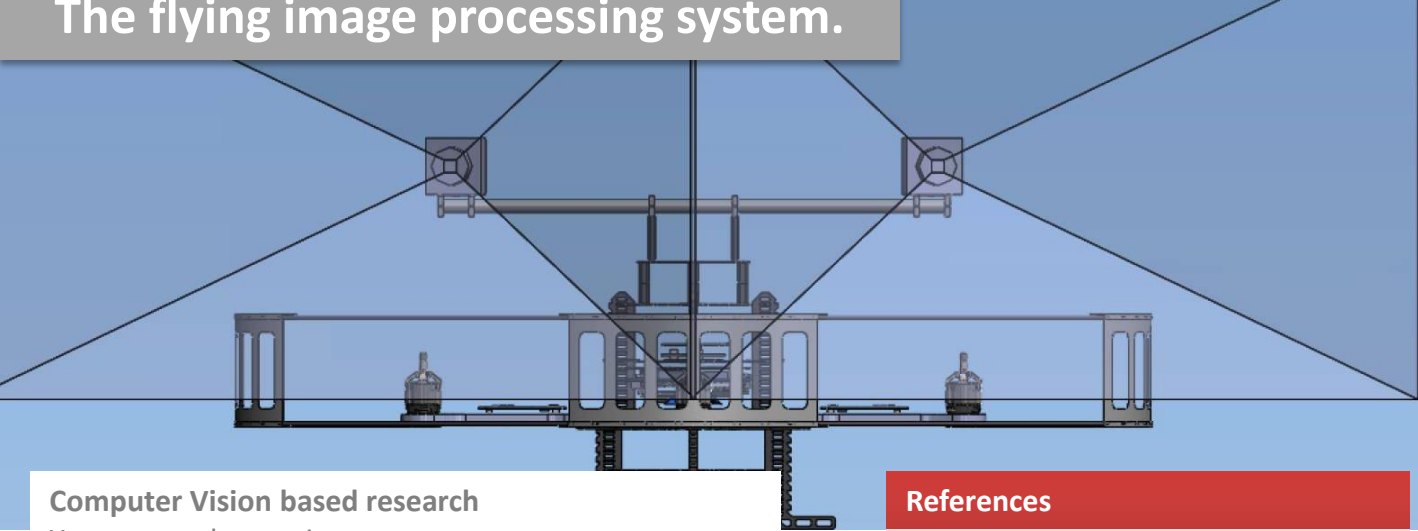
University of Pennsylvania:
www.grasp.upenn.edu

Recommended DYNAMIC configuration:

1x AscTec Hummingbird AutoPilot	#10062
2x LiPo battery TP 2100 mAh	#10044
1x Data link XBee 2.4 Ghz	#10064
1x JTAG Module	#10002

COMPUTER VISION

The flying image processing system.



Computer Vision based research

Your research area is

- 3D mapping based on visual information,
 - Visual flow based flight stabilization,
 - Obstacle avoidance or
- any other area where live images are taken and have to be processed in flight!?

Get a perfectly integrated flying camera system

We offer perfectly integrated camera solutions for our UAVs and high on-board CPU power for processing the footage live. We selected extremely lightweight high quality cameras and mounts to enhance the AscTec Pelican to a flying camera and image processing solution without losing too much flight time.

References

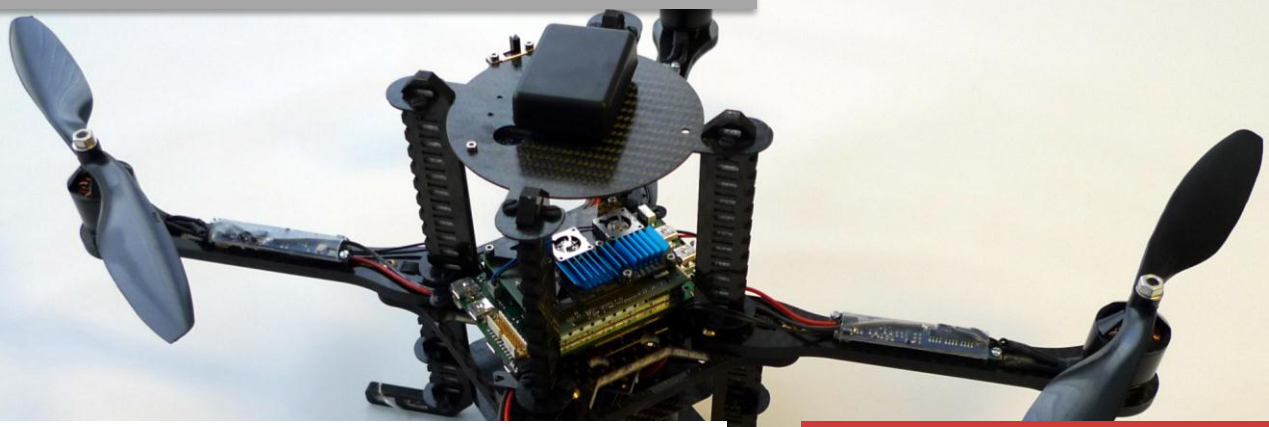
Do you want to be mentioned as reference?
Simply contact us.

Recommended CV configuration:

1x AscTec Pelican standard model	#10063
2x LiPo battery TP 6000 mAh	#10043
1x Atom Processor Board	#10065
1x LVDS display	#10066
1x WLAN module	#10067
1x Prop protection 'small'	#10078
1x Camera mount option 2	#10136
1x Camera mount option 4	#10138
3x Micro 1/3" CMOS camera	#10133

ASCTEC PELICAN

„Can carry a lot of fish.“



“Uh, this one can carry a lot of fish”.

1st place IARC 2009 USA

This was a statement made by one of our first customers purchasing this system. And it exactly describes what it has been made for: high payload - you do not necessarily have to carry fish.

As a result of its high payload capacity and its modular design it is able lift laser scanners or different cameras (e.g. on a large boom, see “camera mount option 2”).

Furthermore, it is built in a modular fashion allowing you to change your boards quickly and easily. The main core is designed like a tower, making it plug-and-play.

However, the “crux” of the system is the potential to be equipped with an Intel Atom processor board (1.6 GHz, 1 GB RAM, 90 g gross weight).

The AscTec Pelican is perfect for you if you need:

- Very high payload capacity
- High onboard CPU power
- Easy access to all electronics
- Flexibility in add-on sensors and cameras

Key features

GPS	<input type="checkbox"/>
ARM7 micro processor	2
Gyro sensors	MEMS
Opt. Atom Processor Board	<input type="checkbox"/>
Payload	500 g
Modular tower design	<input type="checkbox"/>

Flight performance

Cruise speed	36 km/h
Max. speed	50 km/h
Max. wind speed	36 km/h
Usual operating altitude	50 m
Max. flight time	20 min

Details:

The details about transmitting data etc. are the same as for the AscTec Hummingbird AutoPilot. See also “communication” page.

ASCTEC ATOM PROCESSOR BOARD

The first flying notebook.

1st place IARC 2009 USA
(Best performance ever)



Small is beautiful.

This was the motive for searching for a small, light weight computer that can be carried by our UAVs. We now have found/developed a processor board that meets our requirements.

“Big” is powerful.

Simultaneously we looked for a board that was “big” in terms of performance and this led us to the Atom processor board.

A small yet “big” flying micro processor, is the best.

The combination of the Atom processor board and the AscTec Breakout-Board provides you with mind-blowing performance. A spectacular amount of interfacing is available at such a small size. The ultra light weight design guarantees outstanding flight performance.

Ideal if you need a high performance system that is

- of small size
- light weight
- reliable

To put it in a nutshell:

Innovative technology that will bring you your success!

Interfaces available

USB 2.0 (1 client/host, 6 host)	7
Serial interface (UART)	2
LVDS graphics port	1
Mini PCI Express slot	1
Micro SD Card slot (SDHC compatible)	1

Key features

Intel Atom 1.6 GHz processor	<input type="checkbox"/>
x86 technology	<input type="checkbox"/>
Standard OS (Ubuntu pre-installed on SD Card)	<input type="checkbox"/>
DDR2 soldered RAM	1 GB
Dimensions (mm)	100*60*25
Gross weight	90 g
Max. power consumption	5 W
Voltage	9V – 12,6 V

ASCTEC HUMMINGBIRD RESEARCHPILOT

Compact. Robust.



The AscTec Hummingbird is self-stabilizing, highly maneuverable and powerful enough for rapid accelerations.

It only needs attitude commands either by R/C or the wireless serial interface. Hence, the system is perfect for all kinds of self developed positioning applications.

With its magnesium alloy/ CFRP sandwich construction the AscTec Hummingbird is extremely lightweight and robust at the same time. Most crashes will leave no damage to the system.

This established system has proven itself again and again in labs around the world. Its small size propellers make it a harmless lab-flyer. It is even suitable for fun applications during your coffee breaks.

Flight performance

Cruise speed	36 km/h
Max. speed	50 km/h
Usual operating altitude	50 m
Max. flight time	20 min
Max. payload	200 g

Key features	AscTec AutoPilot	AscTec ResearchPilot
GPS	<input type="checkbox"/>	-
ARM7 micro processor	2	1
Gyro sensors	MEMS	Piezo
Payload	200 g	200 g

Details:

All data generated by the IMU can be sent to your PC via cable or wireless XBee data link. By using the same link you can also send attitude commands to the UAV. E.g. „5°/s in roll“.

See “communication” page for more information.

ASCTEC HUMMINGBIRD AUTOPILOT

Hummingbird Supremacy.



The AscTec Hummingbird Autopilot is a fusion of our robust Hummingbird frame and the AscTec AutoPilot sensor board with GPS for autonomous outdoor flight. This combination uses the best components available from our product line. It truly is: the Hummingbird at its best.

There is only the need to send the waypoints to it to operate it autonomously. The high level processor can be programmed with your own code.

By using external optical positioning systems, this system can be used indoors for all kinds of swarm tasks or aggressive autonomous flights.

The AscTec Hummingbird AutoPilot is perfect for you:

- If you do not want to bother with the flight control
- If you need a hovering platform for (outdoor) navigational purposes
- If you would like to develop your own flight stabilization on-board at the ARM7 processor

Flight performance

Cruise speed	36 km/h
Max. speed	50 km/h
Usual operating altitude	50 m
Max. flight time	20 min
Max. payload	200 g
GPS position hold up to	10 m/s

Key features	AscTec AutoPilot	AscTec ResearchPilot
GPS	<input type="checkbox"/>	-
ARM7 micro processor	2	1
Gyro sensors	MEMS	Piezo
Payload	200 g	200 g

Details:

In addition to the communication capabilities of the AscTec Hummingbird ResearchPilot, waypoints can be sent to the vehicle. You can program your own flight control code on the second processor. In case of a malfunction, you can switch to AscTec code in flight. See also "communication" page.

COMMUNICATION

Levels of communication:

There are three different levels of communication with the aerial robot:

Level 1:

Sending direct motor commands. You can use all IMU data (raw and calculated) to run your own flight control software and send motor commands to the system. The high level processor on-board is used for this application. Communication is done on-board.

Level 2:

Sending angles. You are using our data fusion (calculated IMU data) and/or the IMU raw data and your position control. For commanding the system you send angles, e.g. "5° in roll". An external computer is used for this task. Communication is done via serial interface.

Level 3:

Sending waypoints. Flight stabilization is done by our flight control software. You are only sending waypoints according to our protocol to the system. An external computer is used for this task. Communication is done via serial interface.

AscTec Hummingbird ResearchPilot:

The AscTec ResearchPilot electronic is able to communicate at Level 2.

Polling/Sending Data:

The user can select the desired data structures by sending a predefined string to the vehicle.

The data structures can be polled with a frequency up to approx. 100Hz (depending on the size of the polled package and the kind of data link used).

AscTec Hummingbird AutoPilot and AscTec Pelican:

The AscTec AutoPilot electronic is able to communicate at Level 1, Level 2 and Level 3.

Polling/Sending Data (the user can poll the all data structures only):

- If you run your own flight control software (Level 1 communication) on board of the High Level processor up date rates of 1000Hz can be used.
- If you run Level 2 or Level 3 communications by using a wireless data link, update rates of 10Hz to 15Hz can be utilized. Due to the size of the data structure the maximum up date rate is about 10Hz to 15Hz.
- If you run Level 2 or Level 3 communications on board of the Atom processor board mounted at the AscTec Pelican, update rates of 100Hz can be realized. Due to the size of the data structure the maximum up date rate is about 100Hz.

Available data packages from / to the UAV:

IMU RAWDATA

Pressure sensor value;
Gyro readings;
Magnetic field sensor readings;
Accelerometer readings,
Temperature;

IMU CALCULATED DATA

Angles (integration of gyro outputs);
Drift compensated by data fusion;
Angular velocities;
Raw values;
Horizontal / vertical accelerations;
Reference angles (by accelerations only);
Total acceleration;
Magnetic field sensor output (calibrated);
Compass reading (reference for yaw angle);
Pseudo speed (integrated accelerations);
Height (after data fusion);
Height (by pressure sensor);
Diff. height (after data fusion);
Diff. height (by pressure sensor);

GPS DATA (AscTec AutoPilot platform only)

Latitude/longitude;
GPS height;
Speed in x and y;
GPS heading;
Accuracy estimates in mm and mm/s;
Number of satellites;
GPS status information;

WAYPOINT (AscTec AutoPilot platform only)

Absolute coordinates;
Max. speed to travel to waypoint in %;
Time to stay at a waypoint;
Position accuracy;
Checksum;
Waypoint ;
Yaw;
Height over 0;

Commands for the waypoint navigation

"Goto waypoint";
"Launch / Set Home";
"End flight => land at current position";
"Come home";

GENERAL & TECHNICAL DATA

	ASCTEC HUMMINGBIRD		AscTec Pelican
	ResearchPilot	AutoPilot	
Sensor board (platform)	ResearchPilot V1	AutoPilot V2	AutoPilot V2
Chassis design	Hummingbird	Hummingbird	Pelican
Dimensions (cm)	40x40x10	40x40x10	50x50x20
Weight of vehicle (g) Ready to fly incl. standard battery.	500	550	750
Number of propellers	4	4	4
Propeller size (inches)	8	8	10
Max. payload (g) With standard battery.	200	200	500
Max. flight time	20 min	20 min	25 min
Max. flight time at max. payload With standard battery.	10-12 min	10-12 min	12-15 min
Battery type Standard for each system.	LiPo 11.1 V 2100 mAh	LiPo 11.1 V 2100 mAh	LiPo 11.1 V 6000 mAh
Communication at level See also "communication".	Level 2	Level 1, 2, 3	Level 1, 2, 3
Serial port interface See also "communication".	□	□	□
Programmable ARM7 processor (60 MHz) via JTAG Module.	-	□	□
GPS	-	□	□
Compass	o	□	□
Capable to receive waypoints	-	□	□
Safe landing mode If radio control link is lost.	-	□	□

□ = included in standard model
o = optionally available
- = not available

ASCTEC PELICAN & ACCESSORIES

Accessories	Weight for payload calculation	€ excl. VAT	Order no.
AscTec Pelican standard model Incl. serial port interface, programmable ARM7 processor, GPS, 3D compass, waypoint capability, safe landing mode.	n/a	Please ask for our prices by writing an email at team@asctec.de	#10063
LiPo battery TP 8000 mAh Weight: approx. 500 grams.	120 grams		#10042
LiPo battery TP 6000 mAh Weight: approx. 380 grams.	0 grams		#10043
LiPo battery TF 4500 mAh Weight: approx. 380 grams.	0 grams		#10037
Atom Processor Board 1.6 GHz incl. breakout board	90 grams		#10065
LVDS display for Atom Processor Board Mandatory with Atom Processor Board (1pcs. per customer). 12,1" LVDS display. Resolution: 1024 x 768.	n/a		#10066
WLAN module for Atom Processor Board Recommended, Mini PCI Express WLAN Card. Atheros AR9280 chipset, supporting 802.11n. Antennas included.	10 grams		#10067
Hokuyo laser scanner UTM 30LX *) 30 m range Incl. laser scanner link set and laser scanner mount (#10118).	310 grams		#10075
Hokuyo laser scanner URG 04LX *) 4 m range Incl. laser scanner link set and laser scanner mount (#10118).	190 grams		#10076
Laser scanner mount Fits both laser scanners. Hardware only.	50 grams		#10118
Feet extensions Required for camera mounted underneath the system with active camera mount.	50 grams		#10086
Extra carbon fiber top plate Unmachined; for mounting your own sensors.	5 grams		#10087
Extra carbon fiber bottom plate Unmachined; for mounting your own sensors.	7 grams		#10090
Propeller protection 'small'	50 grams		#10078
Propeller protection 'large'	130 grams		#10079
Maximum payload of AscTec Pelican	500 grams		

n/a = not applicable

*) = Atom Processor Board essential

ASCTEC PELICAN CAMERA OPTIONS

CAMERA MOUNT

Option	Description	Weight for payload calculation	Price	Order no.
1	<ul style="list-style-type: none"> For one camera. Fixed mount. Camera is to be mounted on top of system. Camera faces forward. Camera's tilt angle is adjustable. 	10 grams	Please ask for our prices by writing an email at team@asctec.de	#10135
2	<ul style="list-style-type: none"> For two or three cameras. Fixed mount on a boom. Cameras are to be mounted on top of system. Distance between cameras: 13-23 cm Cameras face forward. Camera's tilt angle is adjustable. 	40 grams		#10136
3	<ul style="list-style-type: none"> For one camera. Fixed mount. Camera is to be mounted below the system. Camera faces downwards. 	55 grams		#10137
4	<ul style="list-style-type: none"> For one camera. Active mount. Camera is to be mounted below the system. Camera's tilt angle is remotely switchable. 	105 grams		#10138

*) including feet extensions.

Fixed mount = Camera is fix mounted to the UAV. The vertical angle can be adjusted manually. The movement of the UAV is not compensated.

Active mount = Camera mount actively compensates movements of the UAV in nick and roll axis. The camera mount can be remotely controlled. E.g. switch between facing downwards and facing forwards.

CAMERA	LENS		COMBINATION OF CAMERA AND LENS		
	Camera specs.	Field of view diag. x hor. x vert.	Focal length	Weight for payload calculation	Price
1/3" CMOS camera 752 x 480 pixel 87 fps 8 bit monochrome Global shutter USB 2.0	45° x 35° x 26°	8 mm	35 grams	Please ask for our prices by writing an email at team@asctec.de	#10133
	60° x 48° x 34°	6 mm			
	89° x 71° x 49° *)	4.2 mm			
	Other lenses on request		Includes one camera one lens and USB cable.		

*) Rotors might compromise the image in the borders depending on camera tilt angle.
Other cameras and lenses on request

ASCTEC HUMMINGBIRD & ACCESSORIES

	Weight for payload calculation	€ excl. VAT	Order no.
AscTec Hummingbird ResearchPilot standard model Incl. serial port interface.	n/a	Please ask for our prices by writing an email at team@ascotec.de	#10061
AscTec Hummingbird AutoPilot standard model Incl. serial port interface, programmable ARM7 processor, GPS, compass, waypoint capability, safe landing mode.	n/a		#10062
3D compass Compass module for AscTec Hummingbird ResearchPilot. With this option, the UAV keeps its orientation.	0 grams		#10093
LiPo battery TP 2100 mAh Weight: approx. 200 grams.	0 grams		#10044
Propeller protection 'small' Weight: approx. 60 grams.	60 grams		#10112
Propeller protection 'large' Weight: approx. 110 grams.	110 grams		#10113
Maximum payload of AscTec Hummingbird	200 grams		

n/a = not applicable

GENERAL ACCESSORIES

Accessories	€ excl. VAT	Order no.
Datalink XBee 2.4 GHz Pair of wireless link modules.	Please ask for our prices by writing an email at team@asctec.de	#10064
JTAG Module (hardware) Programming/ debugging of ARM7 processor. Not available for AscTec Hummingbird ResearchPilot!		#10002
Battery charger Graupner Ultra Duo Plus 60 incl. TP battery cables , TP adaptors, configured. Ability to charge 2 batteries at once.		#10134
Battery charger Graupner Ultramat 16S incl. all TP cables and TP balancers.		#10147
Remote control Futaba FF-7 2,4 GHz transmitter and receiver, set up and ready to fly.		#10108
Transport case (large) 85cm x 73cm x 47cm Suitable for: 1 Pelican with propeller protection or 1 HB with propeller protection.		#10047
Transport case (medium) 58cm x 58cm x 54cm Suitable for: 1 HB w/o propeller protection or 1 Pelican w/o propeller protection.		#10051
Transport case (small) 52cm x 52cm x 49cm Suitable for: 1 HB w/o propeller protection. Not available for AscTec Pelican!		#10095

SPARE PARTS

Spare part kits for AscTec Pelican

€
excl. VAT

Order no.

Spare part kit mechanic

Including:

- 2 motor booms
- 1 column / feet
- 1 set of 4 propellers
- 1 set of small parts

#10080

Spare part kit electronic

Including:

- 1 brushless motor
- 1 brushless motor controller
- 1 set of 4 propellers
- 1 set of small parts

Please ask for our prices by
writing an email at
team@ascotec.de

#10081

Brushless motor controller

#10103

AscTec Pelican brushless motor

#10130

Set of 4 AscTec Pelican propellers Balanced

#10082

Spare part kits for AscTec Hummingbird

€
excl. VAT

Order no.

Spare part kit mechanic

Including:

- 2 motor booms
- 1 set of 4 propellers (without adaptors)
- 1 set of small parts

#10083

Spare part kit electronic

Including:

- 1 brushless motor
- 1 brushless motor controller
- 1 set of 4 propellers (without adaptors)
- 1 set of small parts

Please ask for our prices by
writing an email at
team@ascotec.de

#10084

Brushless motor controller

#10103

AscTec Hummingbird brushless motor

#10096

Set of 4 AscTec Hummingbird propellers

#10085

Set of 4 aluminium propeller adaptors

#10139

ORDERING

How to order

Quotations:

To order any of our products please read through our catalogue and select the products you require. When you send us an email with your requirements, you will receive an official quotation.

Ordering:

New customers: According to our ordering guidelines, we require verification of your association to an official institute/company (e.g. email address from university or company).

Previous customers: simply order by email or telephone.

It is not required to order via fax.

We prefer payment in advance by wire transfer. Unfortunately we cannot accept credit cards. All our quotations are in Euro.

VAT

If you are located within the European Union, but not in Germany, please make sure to tell us your Customer Tax ID.

Delivery time

Please be aware that our delivery dates can vary significantly by size of the order and degree of individual modifications.

Address

Ascending Technologies GmbH
Konrad-Zuse-Bogen 4
82152 Krailling
Germany

IMPORTANT

The price list is subject to change without notice. Please contact us for the most up-to-date information on available products and price before placing an order. All prices excluding VAT. Changes and errors excepted.