

# Cobham Antenna Systems

## Microwave Antennas

**COBHAM**

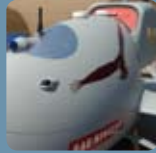
### Unmanned Systems Antennas

Airborne Platforms, UAVs, Ground Vehicles, Robots

The most important thing we build is trust



Designed  
to the highest  
specification



Critical  
and efficient  
communications



Control  
links and  
robotics



Antennas used  
worldwide on all  
types of unmanned  
airborne vehicles and  
target drones



## Unmanned Systems Antennas

Airborne Platforms, UAVs, Ground Vehicles, Robots

### Blade, Omni, Directional and Sector Antennas

Unmanned helicopter



### Unmanned Vehicle Antennas

**Unmanned Systems (UMS) are providing an increasing number of operational functions including airborne and remote ground surveillance, video transmission, border patrol and tactical systems. Uninterrupted communication to the control centre is vital.**

As the demand for Unmanned Systems increases, so does the need for a wider range of antennas for payloads, data communications systems, command and control.

Performance requirements and cost criteria are an important consideration when selecting the antenna. Cobham Antenna Systems (Microwave Antennas) has a range of standard cost-effective, entry-level, high performance antenna designs that are already used on Unmanned Systems.

As frequencies increase from L-band to Ku-band to provide wider bandwidths enabling higher data rates, the antenna selection is critical to ensure system performance, battery-life and transmission range.

### Ground Control Centre Antennas

Cobham Antenna Systems (Microwave Antennas) provides antennas for both control centre and remote platform.

The control centre antenna usually provides the higher gain part of the link and may be a medium to high gain omni, medium gain sector or a high gain directional antenna.

A directional antenna is likely to require a two-axis steering system. A less complex but compact multi-sector antenna array provides intermediate range coverage for communicating with a UAV. This type of arrangement can be used for quick deployment, tactical applications.

Cobham Antenna Systems (Microwave Antennas) has a range of multi-sector and multi-omni arrays. See separate brochure.

### Cranfield Aerospace Prototype Boeing X-48B Blended Wing Body UAV



Cranfield Aerospace built two complete working prototypes of the X-48B BWB, an unmanned airborne scale model, which is a joint venture between Boeing Research & Technology, NASA and the US Air Force Research Laboratory.

After 80 flights, the X-48B is demonstrating that the BWB can be designed to overcome the challenges of low speed flight.

The blade antennas weigh less than 20 grams, are robust, weatherproof and measure 105x30x2mm. Mounted on a cross spar, each antenna covers a different frequency and is part of the telecommand, telemetry and AV systems.

SBA-1480/1297	SBA-1790/1298	SBA-2295/1299
1.43 - 1.52 GHz	1.75 - 1.82 GHz	2.20 - 2.39 GHz



- High gain, vertically polarised omni antennas are installed in aerodynamic foil structures
- Common Data Link (CDL) Ku-band omni antennas have circular polarisation and up to 4dBiC gain
- Directional antennas for communications between an airborne towed target and the towing aircraft
- Radar cross-section enhancement and radar detection
- Pattern data is available for all antennas
- Development projects undertaken

### Swedish Space Corporation science gondola and balloon

The scientific instrument MIPAS/B-Tellis was launched from the Esrange Space Center in northern Sweden, reached a height of 34km and landed after 14 hours in eastern Finland. The rugged antenna EVD2-1450/124 mounted beneath the gondola and completely exposed, helped provide scientists with the data required.

EVD2-1450/124  
(page 4)



## Remote UAV or UGV Platforms

### Omni and Blade Antennas

Predator UAV



## Unmanned Vehicle Antennas

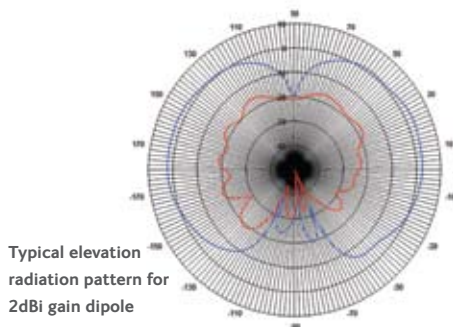
The antennas that are used on unmanned vehicles are, in general, rugged, flexible dipole or blade antennas with omni-directional coverage. Directional blade antennas have been developed for specialist applications. Standard flange mounting arrangements are available,

however special mounting arrangements can be designed. Durable and robust, every effort is made to ensure the antenna meets the required specification to avoid link breakdown. See page 7 for information on polarisation mismatch.

### Omni - Rugged Dipole

Rugged dipoles typically have N-type (F) connectors.

Monopole and dipole antennas have a 360° coverage in azimuth and typically 80° coverage in elevation.



### Omni - Slim Flexible Dipole

Traditional dipole antennas have omni-directional coverage, being either slim, rugged, or flexible. Monopole and dipole antennas have a 360° coverage in azimuth and typically 80° coverage in elevation.

- Dipole Antennas
- Omni coverage
- Vertical polarisation
- Gain 2dBi with elevation HPBW 80°
- Frequencies 300MHz to 12GHz
- SVD2 are slim and semi rigid, with an abrasion resistant rubberised coating; most have SMA connectors
- EVD2 rugged dipoles have rigid glass fibre radome; most have N-type connectors



### Blade - Omni Directional

- Blade antennas can be as little as 2mm thick
- Aerodynamic
- They may be housed in protective radomes
- Light weight
- Specification as for dipole antenna
- Coverage can be omni-directional or directional



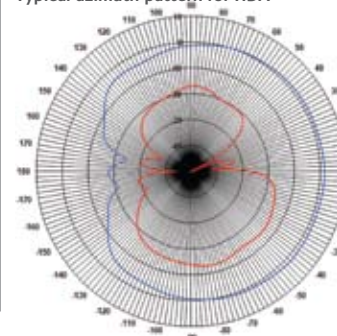
### Blade - Directional

Blade antennas suitable for integration into airborne systems.

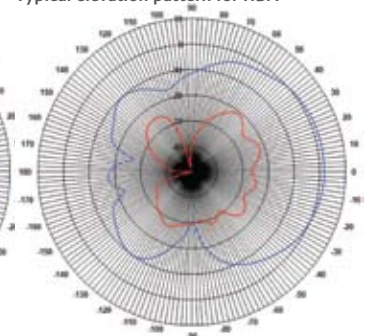
Wing-tip design for airborne comms  
HDA-1275/1148 (page 4)



Typical azimuth pattern for HDA



Typical elevation pattern for HDA



## Unmanned Vehicle Antennas

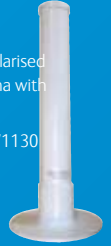
Talon at work



Omni antenna  
VOA4-918/052



Vertically polarised  
omni antenna with  
flange  
VOA4-1400/1130



## Remote UAV or UGV Platform

## Omni and Blade Antennas

Part Number	Frequency GHz	Gain dBi	Beamwidth Azimuth* Elevation*	Polarisation	Dimensions mm	Connector	Photo ▲
<b>Antennas - Omni less than 1GHz</b>							
EVD2-320/116	0.31 - 0.32	2	360 80	Vertical	584x25 Ø	N(F)	
SBA-0.4V/1469	0.41 - 0.43	2	360 80	Vertical	40x40x171	SMA(F)	
SVD2-915/432	0.87 - 0.96	2	360 80	Vertical	155x12 Ø	SMA(M)	
EVD2-915/260	0.87 - 0.96	2	360 80	Vertical	248x25 Ø	N(F)	
VOA4-918/052	0.87 - 0.96	4	360 40	Vertical	705x57 Ø	N(F)	above
VOA4-918/1318	0.87 - 0.96	4	360 40	Vertical	705x57 Ø	N(F)	
SBA-900/1249	0.90 - 0.93	2	360 100	Vertical	98x77x44 Ø	TNC(F)	page 3

## Antennas - Omni 1GHz to 2GHz

HDA-1275/1148	1.20 - 1.35	4	75 175	Horizontal	120x74x1	SMA(M) 90°	page 3
VOA4-1270/037	1.22 - 1.32	4	360 40	Vertical	658x57 Ø	N(F)	
SVD2-1270/074	1.24 - 1.30	2	360 80	Vertical	212x19 Ø	N(M)	
EVD2-1300/018	1.24 - 1.34	2	360 80	Vertical	241x25 Ø	N(F)	
EVD2-1300-N(M)/1214	1.24 - 1.34	2	360 80	Vertical	240x14 Ø	N(M)	
EVD2-1300-short/019	1.24 - 1.38	2	360 80	Vertical	170x25 Ø	N(F)	
EVD2-1300/1395	1.27 - 1.35	2	360 70	Vertical	220x45 Ø	N(F)	▲
SVD2-1.4V/1396	1.29 - 1.41	2	360 80	Vertical	174x11 Ø	SMA(M)	
VOA7-1373/361	1.33 - 1.41	7	360 20	Vertical	905x57 Ø	N(F)	
EVD2-1400-NM/1264	1.35 - 1.43	2	360 80	Vertical	222x26 Ø	N(M)	
SVD2-1304-SMA(M)/1307	1.35 - 1.43	2	360 80	Vertical	190x11 Ø	SMA(M)	
EVD2-1400/1340	1.35 - 1.45	2	360 80	Vertical	207x29 Ø	N(F)	▲
EVD2-1400/329	1.35 - 1.45	2	360 80	Vertical	258x13 Ø	N(F)	▲
SVD2-1.4V/1443	1.35 - 1.45	2	360 80	Vertical	200x21 Ø	N(M)	
EVD2-1400-D1/1248	1.35 - 1.45	2	360 80	Vertical	220x45 Ø	N(F)	▲
OA4-1.4V/1483	1.36 - 1.55	5	360 40	Vertical	525x57 Ø	N(F)	▲
VOA4-1400/1130	1.37 - 1.40	3	360 50	Vertical	360x150 Ø	N(F)	above

EVD2-1300/1395



EVD2-1400/1340



EVD2-1400/329



EVD2-1400-D1/1248



OA4-1.4V/1483



EVD2-1.5V/1646



EVD2-1450/124	1.40 - 1.50	2	360 60	Vertical	258x14 Ø	N(F)	page 2
EVD2-1.5V/1646	1.40 - 1.525	2	360 70	Vertical	205x45 Ø	N(F)	▲
EVD2-1.5/1432	1.42 - 1.52	2	360 80	Vertical	205x14 Ø	N(F)	
SVD2-1.5V/1657	1.43 - 1.52	2	360 80	Vertical	163x11 Ø	SMA(M)	
SBA-1480/1297	1.43 - 1.52	2	360 80	Vertical	120x22x2	SMA(F)	page 2
SBA-1500-502/445	1.45 - 1.55	2	360 80	Vertical	72x14x126	SMA(F)	▲
SVD2-1800-SMA(M)/841	1.70 - 1.88	2	360 80	Vertical	110x6 Ø	SMA(M)	
EVD2-1800/595	1.70 - 1.88	2	360 60	Vertical	191x25 Ø	N(M)	
VOA4-1800/131	1.70 - 1.90	4	360 40	Vertical	405x36 Ø	N(F)	▲
VOA4-1800/1319	1.70 - 1.90	4	360 40	Vertical	445x36 Ø	N(F)	▲
SBA-1790/1298	1.75 - 1.82	2	360 80	Vertical	105x30x2	SMA(F)	page 2

SBA-1500-502/445



VOA4-1800/131



VOA4-1800/1319





## Remote UAV or UGV Platform Omni and Blade Antennas

Robust, high  
gain, omni  
antenna  
OA5-3.3L/1402



Robust, omni  
antenna  
EVD2-3.2/1401



Part Number	Frequency	Gain dBi	Beamwidth		Polarisation	Dimensions mm	Connector	Photo ▲
	GHz		Azimuth*	Elevation*				

### Antennas - Omni 2GHz to 3GHz

SVD2-2100/868	2.00 - 2.19	2	360	80	Vertical	106x6 Ø	SMA(M)	▲
VOA4-2150/1335	2.00 - 2.25	4	360	40	Vertical	329x36 Ø	N(F)	
SBA-2.3V/1470	2.00 - 2.50	2	360	50	Vertical	89x40x3	SMA(F)	page 3
EVD2-2200/295	2.10 - 2.30	2	360	80	Vertical	175x25 Ø	N(F)	
SBA-2295/1299	2.20 - 2.39	2	360	80	Vertical	90x30x2	SMA(F)	page 2
EVD2-2.3/1406	2.20 - 2.40	2	360	80	Vertical	175x25 Ø	N(F)	▲
SVD2-2300/1204	2.20 - 2.40	2	360	80	Vertical	110x10 Ø	SMA(M)	▲
VOA10-2340/459	2.28 - 2.38	10	360	10	Vertical	1008x57 Ø	N(F)	
RCO5-2400/195	2.30 - 2.50	5	360	40	Right Circular	344x104 Ø	N(F)	
SVD2-2400/786	2.35 - 2.45	2	360	80	Vertical	109x7 Ø	SMA(M)	
EVD2-2450-D2/631	2.35 - 2.55	2	360	80	Vertical	150x14 Ø	N(F)	▲
EVD2-2460-NM/740	2.35 - 2.55	2	360	80	Vertical	170x25 Ø	N(M)	
EVD2-2460/086	2.35 - 2.55	2	360	80	Vertical	170x25 Ø	N(F)	
VOA4-2450-HEL/817	2.40 - 2.50	4	360	40	Vertical	250x70 Ø	N(F)	▲
VOA4-2450/184	2.40 - 2.50	4	360	40	Vertical	290x36 Ø	N(F)	
RCO5-2450/156	2.40 - 2.55	5	360	40	Right Circular	346x104 Ø	N(F)	

SVD2-2100/868



EVD2-2.3/1406



SVD2-2300/1204



EVD2-2450-D2/631



VOA4-2450-HEL/817



With helicopter mount for  
video transmission

EVD2-3.2/1398



### Antennas - Omni 3GHz to 4GHz

EVD2-3.2/1398	3.10 - 3.35	2	360	80	Vertical	123x45 Ø	N(F)	▲
EVD2-3.2/1401	3.10 - 3.35	2	360	80	Vertical	150x26 Ø	N(F)	above
OA4-3.2V/1399	3.10 - 3.35	4	360	43	Vertical	300x36 Ø	N(F)	
OA5-3.3L/1402	3.25 - 3.35	5	360	38.5	Left Circular	318x79 Ø	N(F)	above
RCO5-3450-H1/494	3.30 - 3.55	4	360	40	Right Circular	380x104 Ø	N(F)	▲
RCO5-3450-MO1/518	3.35 - 3.55	4	360	40	Right Circular	200x140 Ø	N(F)	▲
RCO10-3450/487	3.35 - 3.55	8	360	12	Right Circular	717x79 Ø	N(F)	
EVD2-3.5/1433	3.40 - 3.50	2	360	80	Vertical	174x13 Ø	N(F)	▲
EVD2-3450/225	3.40 - 3.50	2	360	80	Vertical	178x14 Ø	N(F)	▲
RCO10-3500/931	3.40 - 3.60	9	360	12	Right Circular	647x79 Ø	N(F)	▲
SVD2-3450/426	3.40 - 3.65	2	360	80	Vertical	75x7 Ø	SMA(M)	page 3
VOA4-3450-HEL/237	3.40 - 3.80	4	360	40	Vertical	189x70 Ø	N(F)	
SBA-38/919	3.80 - 4.00	4	360	60	Vertical	112x25x3	SMA(F)	▲

RCO5-3450-H1/494



RCO5-3450-MO1/518



EVD2-3.5/1433



EVD2-3450/225



RCO10-3500/931



SBA-38/919



With helicopter mount

## Remote UAV or UGV Platform

### Omni and Blade Antennas

Control and  
data links  
for robotics  
applications



Part Number	Frequency GHz	Gain dBi	Beamwidth Azimuth* Elevation*		Polarisation	Dimensions mm	Connector	Photo ▲
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#### Antennas - Omni 4GHz to 6GHz

LCO6-4600-D1/908	4.40 - 4.80	6	360	22	Left Circular	342x109 Ø	N(F)	
EVD2-4.7/1471	4.40 - 5.00	2	360	80	Vertical	110x45 Ø	N(F)	
EVD2-47-TNC/1181	4.40 - 5.00	2	360	80	Vertical	120x14 Ø	TNC(F)	
EVD2-4700/1174	4.40 - 5.00	2	360	80	Vertical	120x29 Ø	N(F)	▲
EVD2-4700/1334	4.40 - 5.00	2	360	80	Vertical	120x25 Ø	N(M)	
OA6-4.7V/1481	4.40 - 5.00	6	360	23	Vertical	329x38 Ø	TNC(F)	▲
VOA6-4.7V/1489	4.40 - 5.00	6	360	24	Vertical	226x32 Ø	N(M)	▲
VOA6-47/914	4.40 - 5.00	6	360	23	Vertical	224x31 Ø	N(F)	▲
VOA8-47/1170	4.40 - 5.00	8	360	17	Vertical	375x70 Ø	N(F)	▲
EVD2-5300/1285	5.15 - 5.45	2	360	80	Vertical	122x26 Ø	N(M)	

EVD2-4700/1174



OA6-4.7V/1481



VOA6-4.7V/1489



VOA6-47/914



VOA8-47/1170



#### Antennas - Ultra Wideband Omni

XPO3V-500-1300-LP/586	0.50 - 1.30	2	360	80	Vertical	283x80 Ø	N(F)	
XPO2V-880-2175/1060	0.88 - 2.17	2	360	50	Vertical	221x31 Ø	N(F)	▲
XPO2V-1680-2280/140	1.65 - 2.50	2	360	80	Vertical	253x25 Ø	N(F)	
XPO2V-1.0-6.0/1442	1.00 - 6.00	2	360	70	Vertical	134x59 Ø	N(F)	▲
XPO2V-2.0-18.0/1397	2.00 - 18.00	2	360	70	Vertical	104x39 Ø	N(F)	▲
RCO4-149/1447	14.40 - 15.35	4	360	30	Right Circular	74x69 Ø	TNC(F)	▲
RCO4-149/1385	14.40 - 15.35	4	360	30	Right Circular	74x69 Ø	SMA(F)	
RCO4-149/1389	14.40 - 15.40	4	360	40	Right Circular	74x69 Ø	N(F)	

XPO2V-880-2175/1060



XPO2V-1.0-6.0/1442



XPO2V-2.0-18.0/1397



RCO4-149/1447



Ku-band, Common Data Link  
circular polarised omni

#### Antennas - Ultra Wideband Directional Planar Spiral

PSA0218L/1084	2.00 - 18.00	-3(2-4) 2(4-18)	75	75	Left Circular	65x68 Ø	SMA(F)	▲
PSA0818L/1045	8.00 - 18.00	4	90	90	Left Circular	21x24 Ø	SMA(F)	▲

PSA0218L/1084



PSA0818L/1045



Planar spiral antenna to  
Mil-Spec for helicopters

## Specification Criteria - Link to Ground Station

Antenna for data and telemetry mounted beneath scientific balloon gondola for Swedish Space Corporation



### Polarisation Mismatch

The most difficult challenge with a UAV/UGV (unmanned platform) link to a ground station is the polarisation as the link is dependent on the alignment of the unmanned platform.

With linear links, vertical to vertical, or horizontal to horizontal, as a plane banks the signal drops due to polarisation mismatch; it can drop by 25dB in each direction.

The best way to counteract this is to have a circular polarisation match at both ends (right circular to right circular, or left circular to left circular) so that the link budget is maintained irrespective of the position of the antennas.

Circular to circular will maintain the link, but the problem is that circular polarisation antennas can have a large diameter and are therefore difficult to mount on an unmanned platform because of weight, size, and lack of aerodynamics.

The best option is to have linear polarisation (usually vertical) on the unmanned platform for wide angle coverage, and circular polarisation on the ground. As long as a 3dB reduction is allowed for in the link budget in calculations to work out platform range, the orientation of the UAV becomes irrelevant as it will work at all angles.

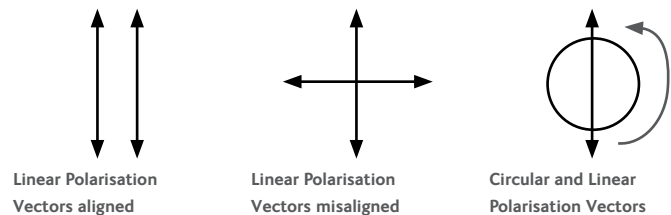
#### Typical Link Values

dB

Linear / Linear	-60
Linear Vertical / Mismatched Linear	-85
Right Circular / Right Circular	-60
Left Circular / Left Circular	-60
Linear / Circular	-63

#### “Circular to Linear”

The best option to avoid polarisation mismatch, i.e. poor links, use Linear Vertical Polarisation on the unmanned platform and Circular Polarisation on the ground.



### What is Polarisation

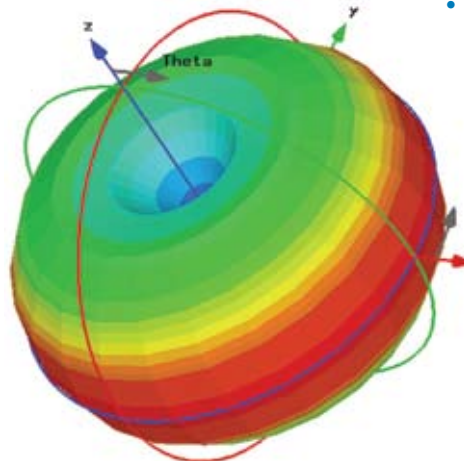
All electromagnetic radiation is polarised. The polarisation of an antenna describes the orientation of its electrical field and can be circular or linear.

Linear polarisation is usually vertical or horizontal.

Dual polar antennas can produce vertical and horizontal polarisation via separate ports.

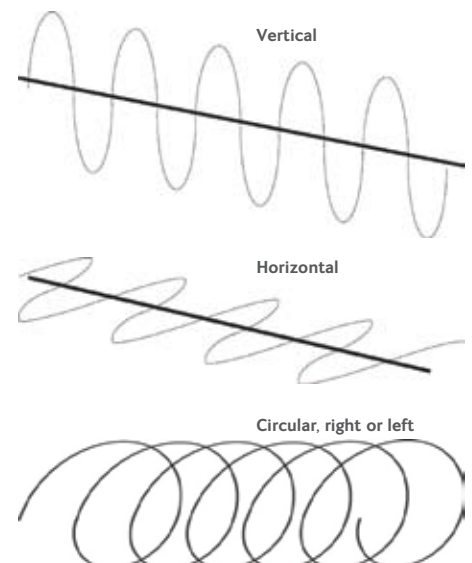
Dual slant antennas are essentially the same as dual vertical and horizontal antennas but with the polarisation rotated by 45°.

Circular polarisation is produced when the E-plane of the antenna spins and depending on the direction of the spin the polarisation is right or left.



3D pattern of dipole antenna

- Vertical
- Horizontal
- Dual Vertical & Horizontal
- Right Circular
- Left Circular
- Dual Circular
- Dual  $\pm 45^\circ$





## Other antenna brochures



Antenna Catalogue



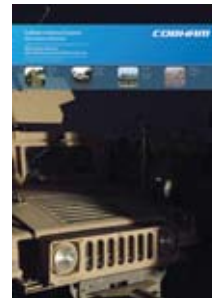
Commercial -  
Vector and LTE



Defence -  
C-Band



Defence -  
Link16



Defence -  
IED Countermeasures



Defence -  
UMS Ground Stations

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