



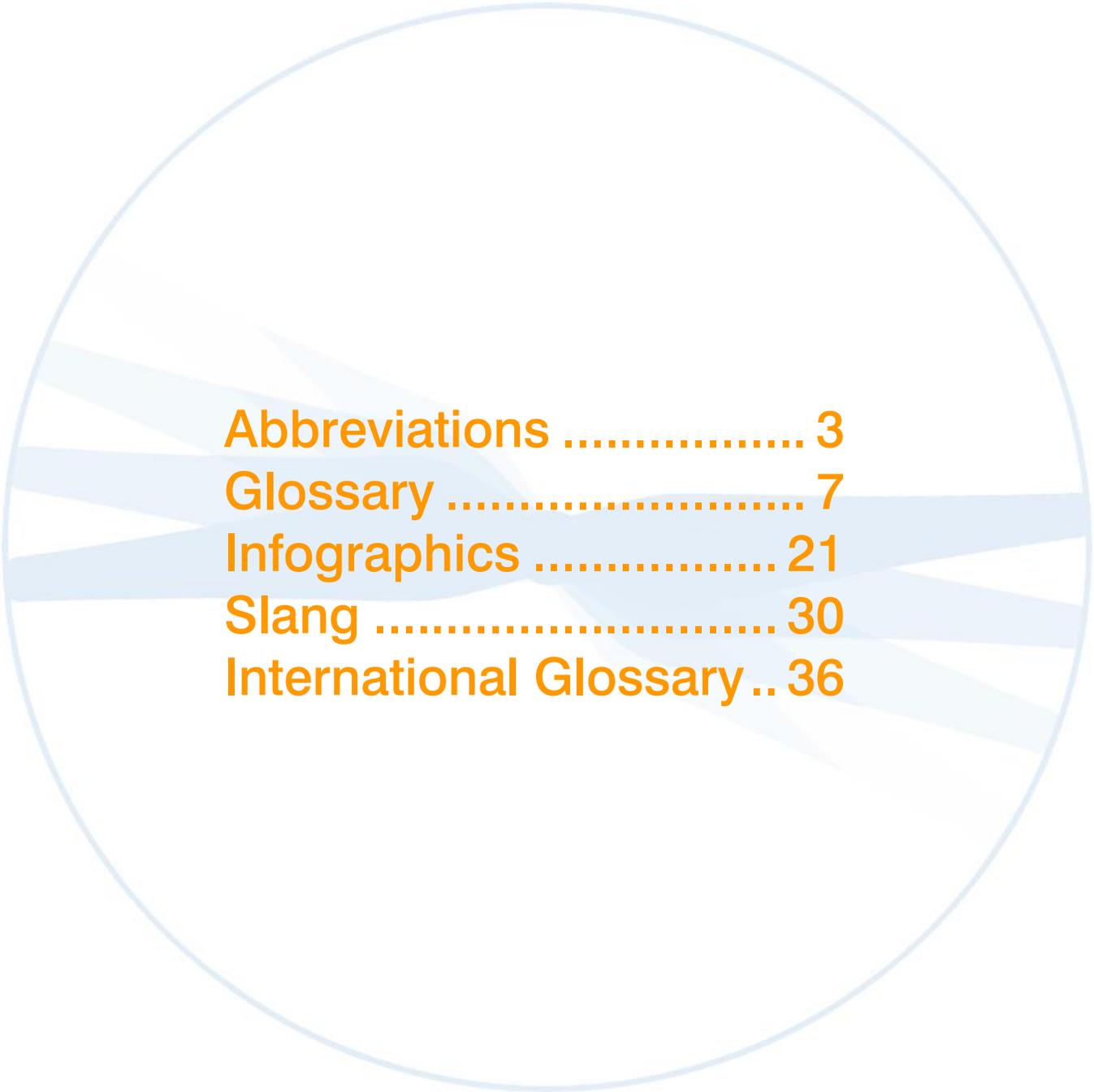
Drone Dictionary

A glossary of terms, abbreviations, acronyms and slang related to drones,
remotely piloted aircraft, unmanned aircraft systems, and
urban air mobility

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AAM Advanced Aerial/Air Mobility	ATM Air Traffic Management	CFI Certified Flight Instructor
AC FAA Advisory Circular [US]	ATTI Altitude.	CFR Code of Federal Regulations
ACR Airman Certification Representative	AUVSI Association for Unmanned Vehicle Systems International	CL Connectionless
ADS-B Automatic Dependent Surveillance—Broadcast	BCI Brain-Computer Interface	COA Certificate of Authorization [also <i>Certificate of Waiver</i>]
AGL Above Ground Level	BLOS Beyond Line of Sight	COTS Commercial off the Shelf
AGV autonomous ground vehicle	BNF Bind and Fly	CS Control Station
ALFUS Autonomy Levels For Unmanned Systems	BRLOS Beyond Radio Line of Sight	CTOL Conventional Take-off and Landing
ALT Vertical distance from ground.	BVLOS Beyond Visual Line of Sight	D&A / DAA Detect and Avoid
AP Aerial Photography	BVR Beyond Visual Range	DPE Designated Pilot Examiner
ARF Almost Ready to Fly [also <i>ARTF</i>]	C-UAS Counter Unmanned Aircraft Systems	DSA Detect, Sense and Avoid
ASTM AC377 F38 ASTM International Advisory Committee on Unmanned Aircraft Systems	C2 Command and Control	EASA European Aviation Safety Agency
ATC Air Traffic Control	C2 Range Command and Control Range	ELOS Electronic Line of Sight
	CAP 722 Operational Guidance [UK]	EO/IR Electro-Optic / Infrared
	CF carbon fiber	

EP

External Pilot

ESC

Electronic Speed Controller

eVTOL

Electric Vertical Take-Off and Landing aircraft

EC

Environment Complexity

FAA

Federal Aviation Administration [US]

FAR

Federal Aviation Regulations

FC

Flight controller

FFF

Fast Forward Flight

FLIR

Forward Looking Infrared

FMRA

FAA Modernization and Reform Act of 2012

FOV

Field of View

FP

Flight Plan

FPV

First Person View

FSDO

Flight Standards District Office

GA

General Aviation

GCS

Ground Control Station

GPS

Global Positioning System

HC

Hexacopter

Hexa

Hexacopter

HI

Human Independence

HL

Hand Launched

IACRA

Integrated Airmen Certification and/or Rating Application

ICAO

International Civil Aviation Organization

IMU

Inertial Measurement Unit

IOC

Intelligent Orientation Control

ISR

Intelligence Surveillance Reconnaissance

Kp-Index

Global geomagnetic activity

KTC

Knowledge Testing Center

L&R, L/R

Launch and Recovery

LAANC

Low Altitude Authorization Notification Capability

LIDAR

Light Detection and Ranging

LOS

Line of Sight

LRPAS

Light Remotely Piloted Aircraft System

LZ

Landing Zone

MAAS

Mobile Aircraft Arresting System

MAV

Micro Air Vehicle / Mini Air Vehicle

MC

Mission Complexity

MOC

Mobile Operations Center

MOSAIC

Modernization of Special Airworthiness Certification

MSA Minimum Safe Altitude	Quad Quadcopter	RTL Return to Launch
MSL Mean Sea Level	RAM Rural/Regional Air Mobility	Rx Receiver
NAS National Airspace System	RC Radio Controlled / Remote Controlled [also R/C]	SA Situational Awareness
Naza Autopilot system (Registered trademark of DJI Innovations)	RID Remote Identification	SAA Sense and Avoid
NMAC Near Mid Air Collision	RLOS Radio Line of Sight	STOL Short Take-Off and Landing
NOTAM Notice to Airmen	ROA Remotely Operated Aircraft	SUA Small Unmanned Aircraft
OC Octocopter	RocDocs Recent domestic drone crashes	sUAS small Unmanned Aircraft Systems
Octo Octocopter	ROI Region of Interest	SUSA Small Unmanned Surveillance Aircraft
ODM On-Demand Mobility	RP Route Plan / Remote Pilot	TLOF TouchDown and LiftOff
OEM Original Equipment Manufacturer	RPA Remotely Piloted Aircraft	TO, T/O Take-Off
OPV Optionally Piloted Vehicle	RPAS Remotely Piloted Aircraft System	Tri Tricopter
PIC Pilot in Command	RPS Remote Pilot Station	Tx Transmitter / radio controller
POI Point of Interest	RTF Ready to Fly	UA Unmanned Aircraft
QC Quadcopter	RTH Return to Home	UAM Urban Air Mobility

UAS

Unmanned Aircraft System

UAV

Unmanned Aerial Vehicle /
Uninhabited Aerial Vehicle

UCAV

Unmanned Combat Aerial
Vehicle

UTM

UAS Traffic Management
System

VLOS

Visual Line of Sight

VO

Visual Observer

VRS

Vortex Ring State

VTOL

Vertical Take-Off and Landing
aircraft

VTx

Video Transmitter

WP

Waypoint

4th Industrial Revolution

A way of describing the blurring of boundaries between the physical, digital, and biological worlds. A fusion of advances in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing, and other technologies.

above ground level (AGL)

[see *altitude*]

absolute altitude

[see *altitude*]

air ambulance

[see *air first response*]

air first response

Urban air mobility specific to paramedic (air ambulance and air evac), fire and police.

air metro

Urban air mobility similar to current public transit options with pre-determined routes, regular schedules, and set stops in high traffic areas throughout each city. [see *vertiports*]

air shuttle

Urban air mobility with a defined route between specific sites such as metropolitan areas and airports.

air taxi

An urban air mobility service with on-demand, door-to-door ride-sharing or ride-hailing VTOLs where consumers specify their desired pick-up locations and drop-off destinations at rooftops throughout a given city.

aircraft

Any contrivance invented, used, or designed to navigate, or fly in, the air.

aircraft principle axes

An aircraft in flight is free to rotate in three dimensions: *pitch*, forward (nose) up or down about an axis running from left to right, *yaw*, forward (nose) left or right about an axis running up and down; and *roll*, rotation about an axis running from front to back (nose to tail). [see [graphic](#)]

airfoil

[see [graphic](#)]

altitude (ATTI)

The height measured from directly above ground (AGL) is the *absolute altitude*. The height measured from mean sea level (MSL) is the *true altitude*.

ATTI mode

Flight mode where the altitude is set, but lateral movement is not stabilized when the controls are released. [see *flight modes*]

Automatic Dependent Surveillance—Broadcast (ADS-B)

Surveillance technology in which an aircraft determines its position via satellite navigation and periodically broadcasts it, enabling it to be tracked.

autonomous aircraft

An aircraft that does not require pilot intervention in flight operations. [see [graphic](#)]

autopilot

The component of an aircraft that is capable of guiding movement of the aircraft without real-time human guidance

avionics

The science and technology of electrical and electronic devices in flight. [see graphic]

binding

The receiver needs to be 'bound' to the transmitter before it can receive signals from it. The process involves the receiver (Rx) identifying a unique code being emitted from the transceiver (Tx), and then the two components lock together on an available frequency.

Brain-computer interface (BCI)

Device that creates a pathway between the brain and an external device, such as a drone, computer or prosthetic limb.

carbon fiber (CF)

Carbon fiber is a material consisting of extremely small fibers. The properties of carbon fibers, such as high stiffness, high tensile strength, low weight, high chemical resistance, high temperature tolerance and low thermal expansion, make them very popular in remotely piloted aircraft. [also *graphite fiber* and *carbon graphite*]

ceiling

Height above ground or water of the base of the lowest layer of cloud below 20,000 feet [~6000 meters] which covers more than half of the sky.

Certificate of Waiver or Authorization (COA)

The terms “certificate of waiver” and “certificate of authorization” mean a Federal Aviation Administration grant of approval for a specific flight operation. [FAA]

collision avoidance

Action taken to prevent flying into a fixed object or another aircraft. [see *detect and avoid* and *flight modes*]

command and control (C2)

The exercise of authority and direction by the pilot.

command and control link

Spectrum and associated equipment used to fly the aircraft from the control station.

command and control range

Distance between ground control station and aircraft at which positive control of the aircraft can be maintained.

commercial operation

An aircraft operation conducted for business purposes (mapping, security surveillance, wildlife survey, aerial application, etc.) other than commercial air transport, for remuneration or hire.

connectivity aircraft

A drone outfitted with networking equipment that enables it to provide internet access or other communications to the area over which it flies.

control station (CS)

An interface used by the remote pilot or the person manipulating the controls to control the flight path of the small UA. [FAA]

corrective lenses

Spectacles or contact lenses. [FAA]

counter-UAS

Counter-UAS, counter-drone technology, C-UAS, or counter-UAV technology, refers to systems that are used to detect and/or intercept unmanned aircraft.

course lock

[see *intelligent orientation control and flight modes*]

creative pattern

[see *formation*]

detect, sense and avoid (DSA)

DSA can be defined as: Detect-is something there? Sense-is it a threat/target? Avoid-maneuver to miss. [also *detect and avoid D&A/DAA*, and *sense and avoid SAA*]

disorientation

When the orientation and direction of the aircraft cannot be determined because of distance, obstruction or low light levels.

drone

Unmanned aircraft. Also:

- ✂ *bird (slang)*
- ✂ *craft (slang)*
- ✂ *eye in the sky / spy in the sky (slang)*
[surveillance drone]
- ✂ *flying machine*

✂ *flying robot*

✂ *micro aerial vehicle (MAV)*

✂ *mini aerial vehicle*

✂ *remotely operated aerial vehicle (ROAV)*

✂ *remotely operated aircraft (ROA)*

✂ *remotely piloted aerial vehicle (RPAV)*

✂ *remotely piloted aircraft (RPA)*

✂ ***remotely piloted aircraft system (RPAS)***
[EASA]

✂ *remotely piloted vehicle (RPV)*

✂ *small unmanned aircraft (SUA)*

✂ *small unmanned aircraft system (sUAS)*

✂ *small unmanned surveillance aircraft (SUSA)*

✂ *uncrewed aerial vehicle (UAV)*

✂ *uninhabited aerial vehicle (UAV)*

✂ *unmanned aerial system (UAS)*

✂ *unmanned aerial vehicle (UAV)*

✂ *unmanned aircraft (UA)*

✂ ***unmanned aircraft system (UAS)*** [FAA & ICAO]

✂ *unmanned flying machine*

drone park

Large area dedicated to UAS recreation and/or research and open to the public for free or a usage fee.

electronic speed controller (ESC)

An electronic device that takes the power from the battery pack and the signal from the receiver and measures a certain amount of power to the motor.

envelope

The maximum performance parameters of an aircraft.

eVTOL

An electric vertical take-off and landing aircraft.

failsafe function

If a lost link occurs, the aircraft enters failsafe mode in it either returns to launch or lands autonomously.

Federal Aviation Administration (FAA)

The division of the United States Department of Transportation that inspects and rates civilian aircraft and pilots, enforces the rules of air safety, and installs and maintains air-navigation and traffic-control facilities.

firmware

Firmware is the control program for the aircraft. ‘Software for hardware.’

first person view (FPV)

A technique that enables an operator to assume a cockpit view using a display screen or video goggles, with a wireless, real-time connection to an on-board video camera.

FPV mode

The *first person view mode* setting “freezes” the gimbal so the camera tilts with the aircraft rather than stabilizing horizontally. It creates more of the sensation of flying. [see *flight modes*]

fixed-wing aircraft

An aircraft capable of flight using forward motion that generates lift as the wing moves

through the air. [also *airplane*, *aeroplane* or *plane*. See *rotary-wing aircraft*] [see [graphic](#)]

flight modes

Flight modes [also *stabilization modes*] include:

- ✂ aerobic, acro, agility, manual, rate (non-self-leveling)
- ✂ air mode (zero throttle)
- ✂ altitude hold, ATTI mode, baro (barometric altitude mode) (non-GPS)
- ✂ auto mode, autonomous flight, programmed flight, waypoints
- ✂ collision avoidance & brake mode
- ✂ course lock
- ✂ first person view (FPV)
- ✂ follow me
- ✂ geofencing & safe circle
- ✂ GPS hold, loiter mode
- ✂ home lock, carefree, head free, headless, heads-up, simple, smart mode [see *headless mode*]
- ✂ horizon, stable mode (aerobatic with self-leveling)
- ✂ hover mode [see *hover mode*]
- ✂ magnetic (mag) mode
- ✂ sport mode (rate controlled stabilize plus altitude hold)
- ✂ standard, angle, free flight, normal, self-level, stabilize mode (GPS or non-GPS)
- ✂ point of Interest, orbit, circle mode
- ✂ return to home (RTH), auto return, GPS home, return-to-launch (RTL)
- ✂ throw mode [see *failsafe function*]

[see [graphic](#)]

flight plan (FP)

The operator's plan for the safe conduct of the flight based on considerations of aircraft performance, other operating limitations and relevant expected conditions on the route to be followed. [also *operational flight plan*]

flyaway

Unintended flight outside of operational boundaries (altitude/airspeed/lateral) as the result of a failure of the control element or onboard systems, or both. Flyaways do not have or do not initiate failsafe mode to return to launch [also *fly away*]

flyaway protection system

A system that will return the aircraft safely to the surface, or keep the aircraft within the intended operational area when the command and control link between the pilot and the aircraft is lost. [see *failsafe function*]

formation

Flying several drones or *swarm* that form a shape or pattern. When flown close together, this is a *tight formation*. [also *creative pattern*]

frangible

Designed to break, distort or yield on impact so as to present minimum hazard.

geofence

A virtual perimeter for a real-world geographic area. A geo-fence could be dynamically generated—as in a radius around a point location, or a geo-fence can be a predefined set of boundaries (such as school zones or neighborhood boundaries). [see *flight modes*]

gimbal

A mechanism, typically consisting of rings pivoted at right angles (3-axial stabilized), for

keeping a camera or other instrument horizontal during flight.

Global Positioning System (GPS)

A global system of U.S. navigational satellites developed to provide precise positional and velocity data and global time synchronization for air, sea, and land travel.

GPS mode

Flight mode where the craft will remain in the altitude, position and orientation that it is in when the controls are released. [Also necessary for automatic return to home] [see *flight modes*]

grades

Drones are generally graded according to their size and use.

Toy grade—Small (mini/nano) and inexpensive UAVs primarily for novice, indoor flyers. These are typically less than \$100.

Hobby grade—Mid-size UAVs with some additional features (e.g. camera) primarily for novice, indoor and outdoor flyers. These are typically less than \$500. This grade includes **racing drones** that are small, fast, agile and designed for first person view (FPV) racing, and **selfie drones** that are easily portable and have a programmable camera.

Consumer or commercial grade—Commercial (non-model) drones have sophisticated avionics, programmability and equipment, and can cost thousands of dollars depending on size and equipment. They are typically less than \$10,000 with an average price of around \$2,500. Consumer grade drones dominant the non-model sector with approximately a 95 percent share.

Professional grade—Drones used primarily for government agencies or large corporations.

These are for specific applications such as disaster response, border security, and military. Professional grade drones are typically more than \$10,000 with an average price of \$25,000.

ground control station (GCS)

[see *ground station* and *remote pilot station*]

ground effect

Described as an increase of performance near the ground. Which means, near the ground your blades produce more lift.

gyro

A device used to help stabilize the yaw of a helicopter or multi-rotor.

headless mode

When you take off with the drone pointing in the front, algorithms inside of the drone's micro-controller ensure that any directional change is compensated. In other words, even when you turn your drone 90 degrees to the left, it'll still go forward when you push the rudder forward (on a non-headless mode drone, this would make the drone go left). [see *flight modes*]

hexacopter

An aircraft with six (6) main rotors. [see [graphic](#)]

hobbyist

Non-commercial, recreational model aircraft pilot. [also *aeromodeller*]

home lock

[see *intelligent orientation control* and *flight modes*]

homing

[see *failsafe function*, *flyaway protection system*, *return to launch*, and *flight modes*]

hoverbike, hovercycle

A vehicle that can hover, but that otherwise resembles a motorbike.

hover mode

An aircraft maintaining a specified altitude and position via GPS. Hover mode is often related to a point of interest. [see *flight modes*]

hybrid

An aircraft made by combining two different elements. Common hybrid drones combine VTOL with fixed wing; or electric and gas engines.

hybrid VTOL

Combined multi-rotor and fixed-wing aircraft that transition between the two modes during flight.

inertial measurement unit (IMU)

An electronic device that measures and reports on a craft's velocity, orientation, and gravitational forces, using a combination of accelerometers and gyroscopes, sometimes also magnetometers.

International Civil Aviation Organization (ICAO)

The International Civil Aviation Organization (ICAO) is a United Nations specialized agency that works with 191 nations, global industries and aviation organizations to develop international *Standards and Recommended Practices* which are then used by the nations

when they develop their legally-binding national civil aviation regulations.

incident

An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

intelligent orientation control (IOC)

Usually, the forward direction of a flying multi-rotor is the same as the nose direction. By using intelligent orientation control, wherever the nose points, the forward direction has nothing to do with nose direction: In *course lock* flying, the forward direction is the same as a recorded nose direction. In *home lock* flying, the forward direction is the same as the direction from home point to the multi-rotor.

lasing

Directing a laser or another bright light at a moving aircraft.

last-mile delivery

The movement of goods from a transportation hub to the final delivery destination. The final delivery destination is typically a personal residence. The focus of last mile logistics is to deliver items to the end user as fast as possible.

LIDAR

Light Detection and Ranging, is a remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth.

lift and cruise eVTOL

Completely independent thrusters used for cruise vs. for lift without any thrust vectoring.

light remotely piloted aircraft

Remote piloted aircraft with a mass less than 150 kilograms [330 pounds].

line of sight (LOS)

Many small aircraft are line-of-sight machines, meaning the person controlling the device must be in direct sight of the aircraft so that radio signals can be transmitted back and forth. Most larger aircraft are not line-of-sight aircraft because the radio signals that control them are bounced off of satellites or manned aircraft.

line of sight command and control link

Aircraft system operating within visual/radio range.

lost link

Loss of command and control link contact with the remotely piloted aircraft such that the remote pilot can no longer manage the aircraft's flight.

Low Altitude Authorization Notification Capability (LAANC)

LAANC is the Low Altitude Authorization and Notification Capability, a collaboration between FAA and Industry. It directly supports UAS integration into the airspace.

micro air vehicle (MAV)

An aircraft weighing less than 2 pounds [1 kilogram]. [also *micro UAV*]

minimum safe altitude (MSA)

The public domain for airspace starts at the minimum safe altitude (MSA). In general, people's property ends at the highest of the

underlying land's trees, buildings, fences, or how high the owner can use the airspace in connection with the land.

mission plan

The route planning, payload planning, data link planning, and aircraft emergency recovery planning for a flight.

model aircraft

An unmanned aircraft that is:

- ⊗ Capable of sustained flight in the atmosphere
- ⊗ Flown within VLOS of the person operating the aircraft; and
- ⊗ Flown for hobby or recreational purposes [FAA]

multi-rotor, multi-copter

An aircraft with two or more main rotors. [see [graphic](#)]

National Airspace System (NAS)

The common network of U.S. airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and manpower and material.

No Fly Zone

Areas where drones are prohibited by government regulation.

non-collaborative things

Moving and stationary objects in the air (such as balloons and birds) and on the ground that are not electronically communicating with the aircraft for collision avoidance.

octocopter

An aircraft with eight (8) main rotors. [see [graphic](#)]

omnithopter

A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on planes to which a flapping motion is imparted.

operational control

The exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of safety of the aircraft and the regularity and efficiency of the flight.

optionally piloted vehicle (OPV)

A hybrid between a conventional *piloted* aircraft and an unmanned aerial *vehicle* (UAV).

payload

All elements of a remotely piloted aircraft that are not necessary for flight but are carried for the purpose of fulfilling specific mission objectives.

permanent areas

The term “permanent areas” means areas on land or water that provide for launch, recovery, and operation of small unmanned aircraft. [FAA]

permanent deformation

A condition whereby an aircraft structure is altered such that it does not return to the shape required for normal flight.

person manipulating the controls

A person other than the remote pilot in command (PIC) who is controlling the flight of

an sUAS under the supervision of the remote PIC. [FAA]

pilot

The person in direct control of the aircraft. [also *remote pilot*]

pilot-in-command (PIC)

An aircraft that is flying in a state of direct control by an aircraft operator (i.e. not in autonomous flight). In this instance, the operator can also be referred to as the Pilot in Command.

pitch

[see *aircraft principle axes*, see [graphic](#)]

point of interest (POI)

A target location for the capture of remotely sensed data by an aircraft's sensors (i.e. video, still or multi-spectral imagery). [also *region of interest*] [see *flight modes*]

prop guards

A light frame extending beyond the radius of the rotors as a protection measure.

propeller

A mechanical device for propelling the aircraft, consisting of a revolving shaft with two or more broad, angled blades attached to it. [see *rotor*]

public unmanned aircraft system

The term “public unmanned aircraft system” means an unmanned aircraft system that meets the qualifications and conditions required for operation of a public aircraft. [FAA]

quadcopter

An aerial vehicle with four (4) main rotors. [also *quadrocopter*, see [graphic](#)]

radio line of sight (RLOS)

A direct electronic point-to-point between a transmitter and receiver.

range extender

A communication device on the remote controller that links the aircraft to another device such as a smart-phone or tablet.

rate mode

[see *flight modes*]

recreational model aircraft hobbyist

[see *hobbyist*]

remote controlled aircraft

[also remote controlled airplane, remote controlled helicopter] [see *remotely piloted aircraft*]

remote controller

The handheld device used to operate the UAV and typically consisting of a radio transceiver, GPS and flight controls. Remote controllers may also include FPV screens and camera controls.

remote pilot (RP)

The person who manipulates the flight controls of a remotely-piloted aircraft during flight time.

remote pilot station (RPS)

[see *ground control station*]

remote Pilot in Command (remote PIC)

A person who holds a remote pilot certificate with an sUAS rating and has the final authority and responsibility for the operation and safety of an sUAS operation conducted under part 107. [FAA]

remotely operated aircraft (ROA)

[see *remotely piloted aircraft*]

remotely piloted aircraft (RPA)

An aircraft which is piloted from a remote pilot station. The term *remotely piloted aircraft* is preferred by the International Civil Aviation Organization over *unmanned aerial vehicle*. [see *unmanned aerial vehicle*]

remotely piloted aircraft system (RPAS)

A set of configurable elements consisting of a remotely-piloted aircraft, its associated remote pilot station(s), the required command and control links and any other system elements as may be required, at any point during flight operation. Remotely piloted aircraft systems weigh less than 150 kilograms [330 pounds].

Note: The term remotely piloted aircraft system and all associated terms are recommended by the International Civil Aviation Organization over unmanned aircraft systems and related terms. [see *unmanned aircraft system*]

return to home

[see *return to launch* and *flight modes*]

return to launch (RTL)

The return of an aircraft to its original launch location. Also known as *homing* and often performed as a safety procedure in the event of a technical malfunction or emergency. [also *return to home*] [see *flight modes*]

roll

[see *aircraft principle axes*, see [graphic](#)]

rotary-wing aircraft

A heavier-than-air flying machine that uses lift generated by wings, called rotor blades, that revolve around a mast. [see *fixed-wing aircraft*]

rotor

A hub with a number of radiating airfoils (blades) that is rotated in an approximately horizontal plane to provide the lift for a rotary-wing aircraft. [see *propeller*]

rotorcraft

[see *rotary-wing aircraft*]

route plan (RP)

A set of waypoints for the aircraft to follow.

rural air mobility (RAM)

A safe, efficient, accessible, quiet and multi-use air transportation system for passenger mobility, cargo delivery, and emergency management within or traversing rural and exurban areas. RAM can include both on-board/ground-piloted and autonomous operations. RAM can include a combination of commercial and non-commercial operations such as: 1) business-to-consumer (B2C) service, 2) fractional and shared ownership models, 3) peer-to-peer (P2P) service, and 4) personally owned aircraft.

sense and avoid capability

The term “sense and avoid capability” means the capability of an unmanned aircraft to remain a safe distance from and to avoid collisions with other airborne aircraft. [FAA] [see *detect, sense and avoid*]

settling with power

[see *vortex ring state*] [see [graphic](#)]

situational awareness (SA)

An all-encompassing term for keeping track of what’s happening when flying.

skyport

[see *vertiport*]

small unmanned aircraft (UA)

An unmanned aircraft weighing less than 55 pounds, including everything that is onboard or otherwise attached to the aircraft, and can be flown without the possibility of direct human intervention from within or on the aircraft. [FAA]

small unmanned aircraft system (sUAS)

A small unmanned aircraft and its associated elements (including communication links and the components that control the small UA) that are required for the safe and efficient operation of the small UA in the National Air Space. [FAA]

small unmanned surveillance aircraft (SUSA)

[see *remotely piloted aircraft*]

sonar obstacle avoidance

Active sonar (sound navigation and ranging) uses acoustic measurement to detect and avoid obstacles such as trees and buildings.

spoke-hub distribution paradigm

Transport topology optimization in which traffic planners organize routes as a series of “spokes” that connect outlying points to a central “hub”. “Hubbing” involves “the arrangement of a transportation network as a hub-and-spoke model. [see *vertiports*]

stabilization mode

[see *flight modes*]

stick

A flight control feature on the remote controller. Typically there are two sticks to control throttle (power), orientation (left stick) and direction (right stick).

test range

The term “test range” means a defined geographic area where research and development are conducted. [FAA]

tip path

The path in space traced out by the tips of the rotor blades.

track

Actual flight path of aircraft above ground.

translational lift

Additional lift provided by lateral movement as opposed to hovering. Translational lift also helps prevent *vortex ring state*.

tricopter

An aircraft with three (3) main rotors. [see [graphic](#)]

true altitude

[see *altitude*]

unmanned aerial vehicle (UAV)

An unmanned aerial vehicle, commonly known as a drone and referred to as a remotely piloted aircraft by the International Civil Aviation Organization, is an aircraft without a human pilot aboard. Its flight is controlled either autonomously by onboard computers or by the remote control of a pilot on the ground or in another vehicle. The typical launch and recovery method of an aircraft is by the function of an automatic system or an external operator on the ground. Military versions are unmanned combat aerial vehicles (UCAVs).

unmanned aircraft (UA)

An aircraft operated without the possibility of direct human intervention from within or on the aircraft. [FAA]

unmanned aircraft system (UAS)

The term “unmanned aircraft system” means an aircraft and associated elements (including communication links and the components that control the aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system.

[FAA] [also *remotely piloted aircraft system*]

Note: *remotely piloted aircraft system* is the recommended term for the International Civil Aviation Organization.

Unmanned Aircraft System Traffic Management (UTM)

While incorporating lessons learned from the well-established Air Traffic Management (ATM) system, which grew from a mid-air collision over the Grand Canyon in the early days of commercial aviation, the UTM system would enable safe and efficient low-altitude airspace operations by providing services such as airspace design, corridors, dynamic geofencing, severe weather and wind avoidance, congestion management, terrain avoidance, route planning and re-routing, separation management, sequencing and spacing, and contingency management. [NASA]

urban air mobility (UAM)

A safe, efficient, accessible, quiet, and multi-use air transportation system for passenger mobility, cargo delivery, and emergency management within or traversing a metropolitan area. UAM can include both on-board/ground-piloted and autonomous operations. UAM can include a combination of commercial and non-commercial operations such as: 1) business-to-consumer (B2C) service, 2) fractional and shared ownership models, 3) peer-to-peer (P2P) service, and 4) personally owned aircraft.

vectored thrust eVTOL

An eVTOL aircraft that uses any of its thrusters for lift and cruise.

vertical take-off and landing (VTOL)

The capability of an aircraft to take off and land vertically, transferring to or from forward motion at heights required to clear surrounding obstacles. Generally applied to rotary-wing aircraft although also possible by

some fixed-wing aircraft. VTOL is also a noun for this type of aircraft. (STOL are short take-off and landing aircraft. CTOL are conventional take-off and landing aircraft.)

vertideck

The landing area on a vessel or offshore structure on which VTOL aircraft may land and take off.

vertihub

A large-scale urban air mobility facility connecting multiple destinations. [see *vertiport*]

vertipad

A small, designated area, usually with a prepared surface, on a vertiport, airport, landing/takeoff area, apron/ramp, or movement area used for takeoff, landing, or parking of VTOL aircraft. In other words, the touchdown and liftoff area (TLOF).

vertiport

Type of airport for aircraft which land and take off vertically. [also *skyport*] [see *vertical take-off and landing VTOL*]

vertistop

1) A minimally developed site for boarding and discharging UAM passengers or cargo. 2) A multi-use touchdown and liftoff (TLOF) site such as a parking lot, athletic field, rest area along the highway, and golf course. It has no support facilities such as fuel, hangaring or attendants.

visual line of sight (VLOS)

Unaided (corrective lenses and/or sunglasses excepted) visual contact between a pilot in command and an unmanned aircraft sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan

the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground. [see *graphic*]

visual observer (VO)

A person acting as a flight crew member who assists the small UA remote PIC and the person manipulating the controls to see and avoid other air traffic or objects aloft or on the ground. [FAA]

vortex ring state (VRS)

Air vortices can form around the main rotor of a helicopter, causing a dangerous condition known as vortex ring state (VRS) or "settling with power". In this condition, air that moves down through the rotor turns outward, then up, inward, and then down through the rotor again. This re-circulation of flow can negate much of the lifting force and cause a catastrophic loss of altitude. Applying more power (increasing collective pitch) serves to further accelerate the downwash through which the main-rotor is descending, exacerbating the condition. [also *settling with power, recirculation and wobble of death*] [see *graphic*]

waypoint (WP)

A specified geographical location used to define an area navigation route or the flight path of an aircraft employing area navigation. [see *flight modes*]

X8

Multicopter with eight (8) motors and shaped in an "X" with four (4) motors on top and four (4) motors on bottom. [see *graphic*]

Y6

Multicopter with six (6) motors and shaped in a "Y" with three (3) motors on top and three (3) motors on bottom. [see *graphic*]

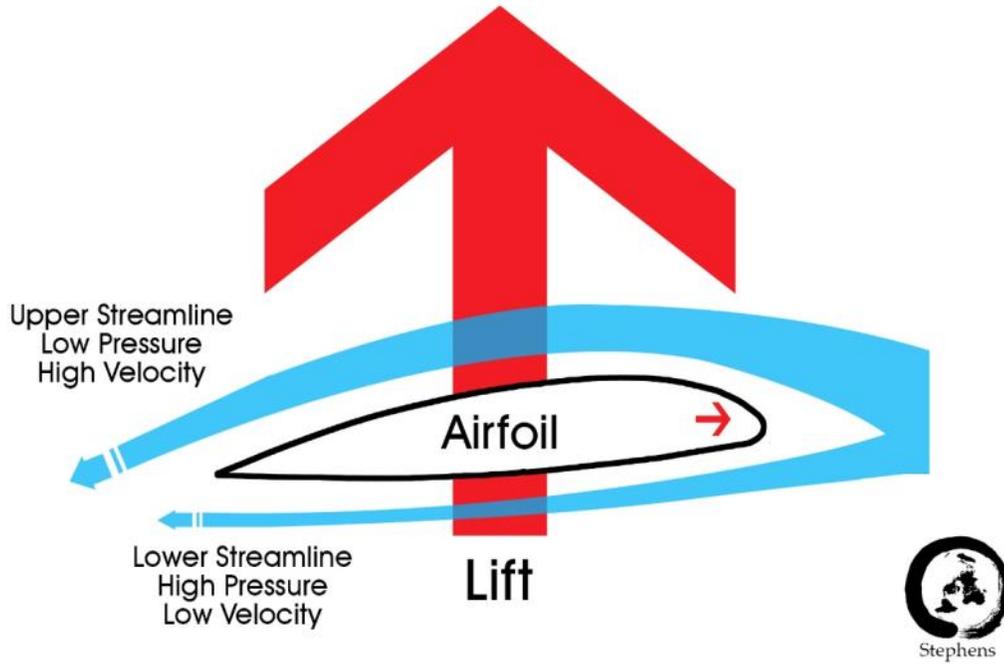
yaw

[see *aircraft principle axes*, see [graphic](#)]

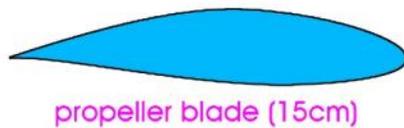
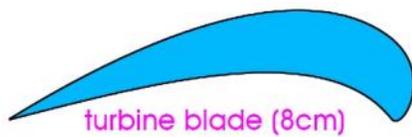
First published August 17, 2014

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Airfoil and Lift

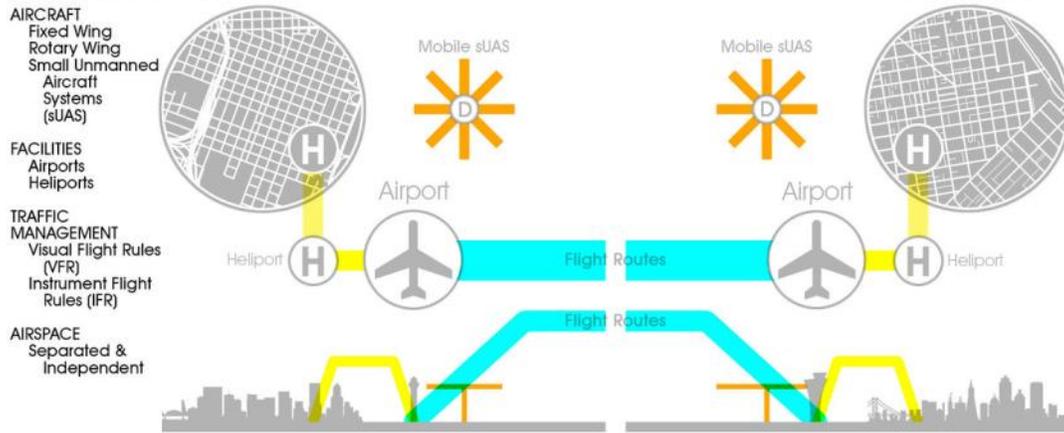


Airfoils

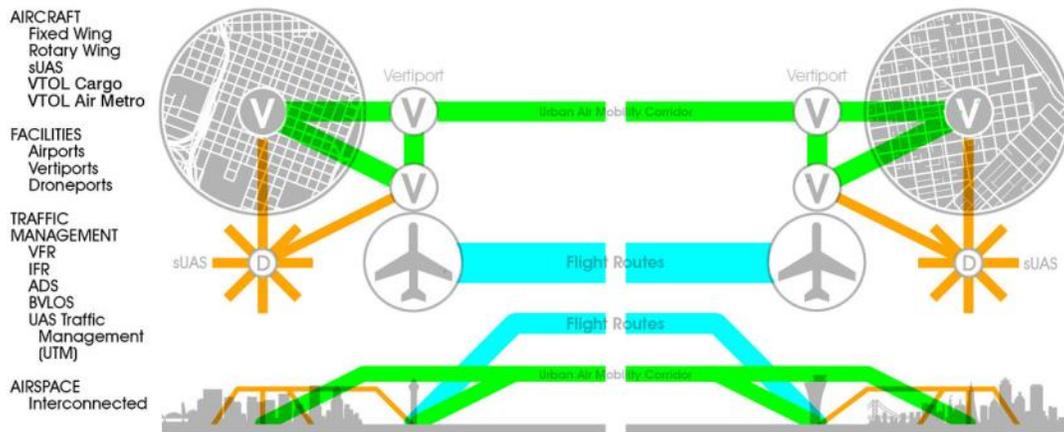


Autonomous Aviation Scenarios

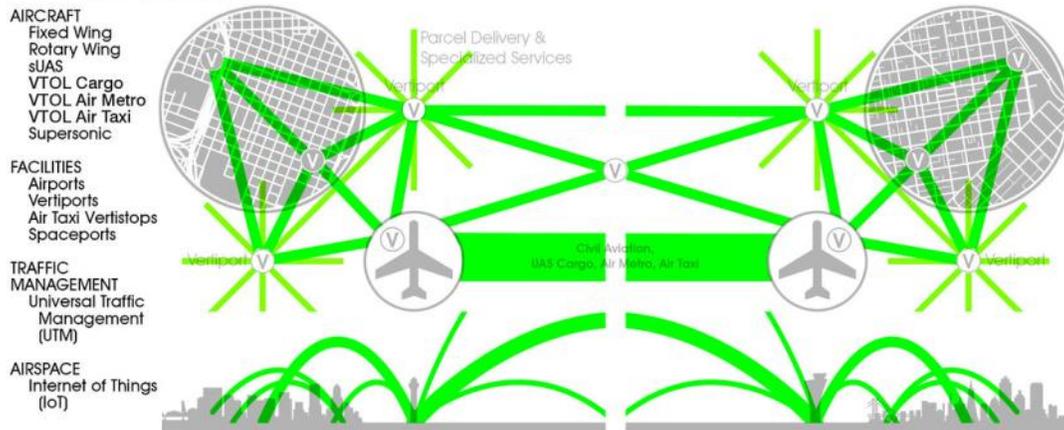
Multimodal



Intermodal



Intramodal



ADS Automatic Dependent Surveillance
BVLOS Beyond Visual Line of Sight
IFR/VFR Instrument/Visual Flight Rules

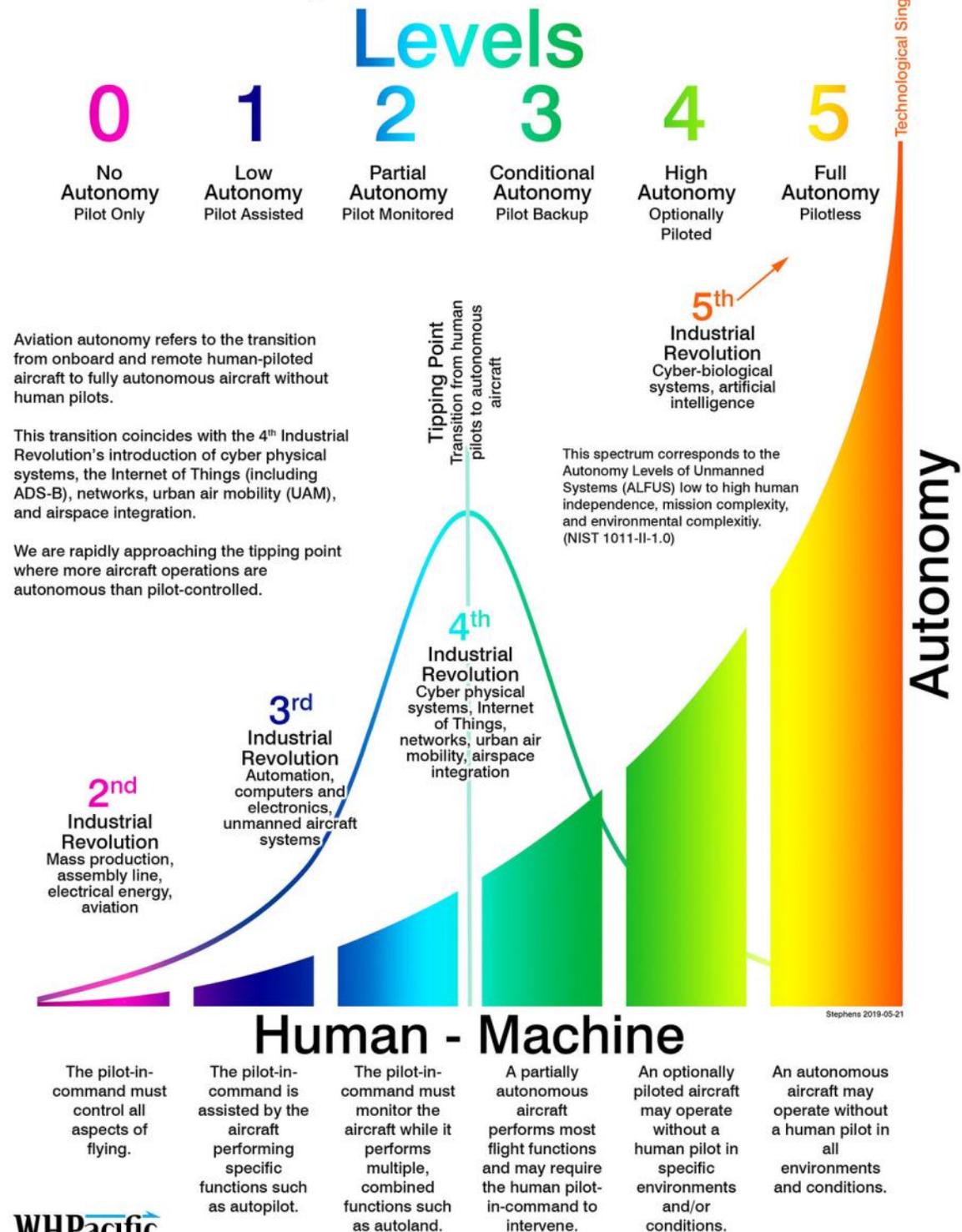
IoT Internet of Things
sUAS small Unmanned Aircraft System
UAM Urban Air Mobility

UAS Unmanned Aircraft System
UTM UAS/Universal Traffic Management
VTOL vertical Takeoff and Landing



December 24, 2019

Aviation Autonomy Spectrum



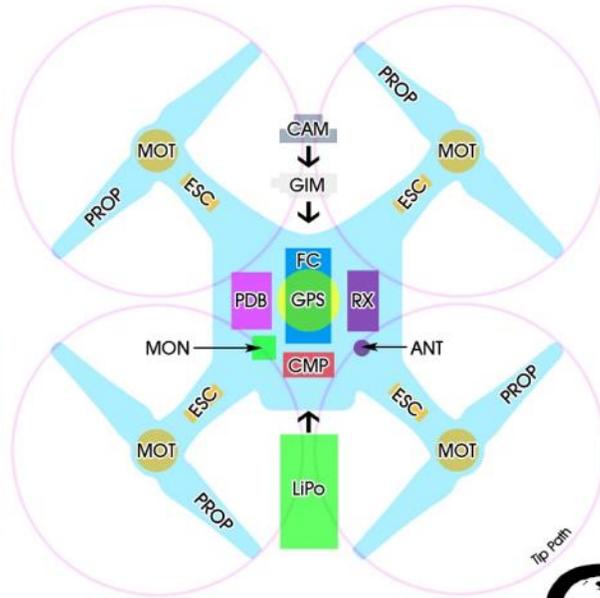
Drone Avionics

- ANT antenna
- LiPo lithium polymer battery
- CAM camera
- ESC electronic speed control

- FC flight controller / control board / autopilot
- ACC accelerometer sensor
- BAR barometric pressure sensor
- CMP compass
- GPS global positioning system module
- GYRO gyroscope sensor
- IMU inertia measurement unit
- MAG magnetometer
- PDB power distribution board
- TEL telemetry

- GIM gimbal
- MON battery monitor/alarm
- MOT brushless motor
- PROP propeller
- REX range extender
- RX receiver
- TX transmitter / remote controller / ground control station

Remote Controller



Unmanned Aerial Vehicle



Drone Flight Modes

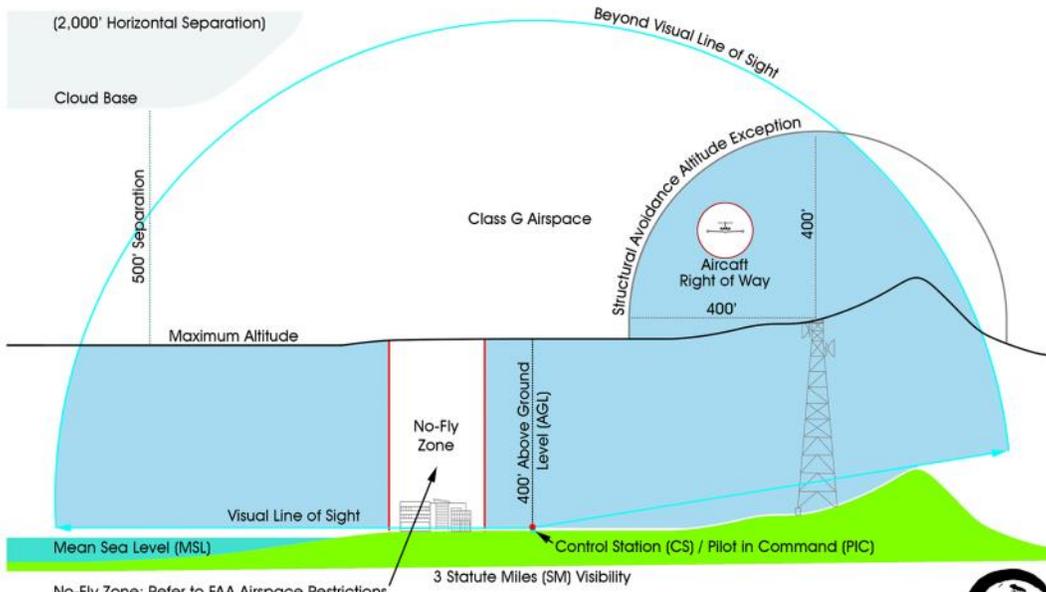
	Acro Aerobatic, Agility, Manual, Rate		Drift		Home Lock Carefree, Headless, Simple		Return to Home Auto Return, Return to Launch, RTL
	Active Track		First Person View FPV		Hover Hold Position, Loiter		Tap Fly
	Altitude Hold A-mode, ATTI		Follow Me		Normal Angle, Horizon, Position, Standard		Terrain Follow
	Auto Land One Touch Down		Geo-fencing Safe Circle		Obstacle Avoidance		Tripod Beginner
	Course Lock		Gesture		Point of Interest Circle, Orbit		Wayfind Guided, Programmed

Primary Modes
 Smart Modes
 Advanced Modes

There are many other specialized modes



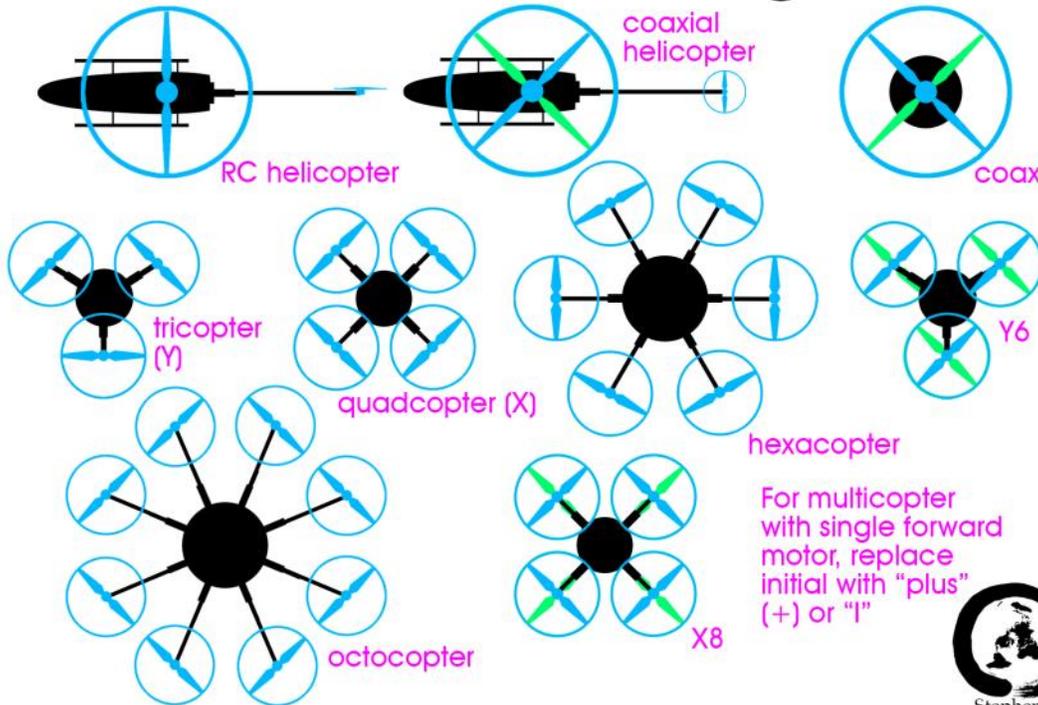
Drone Airspace



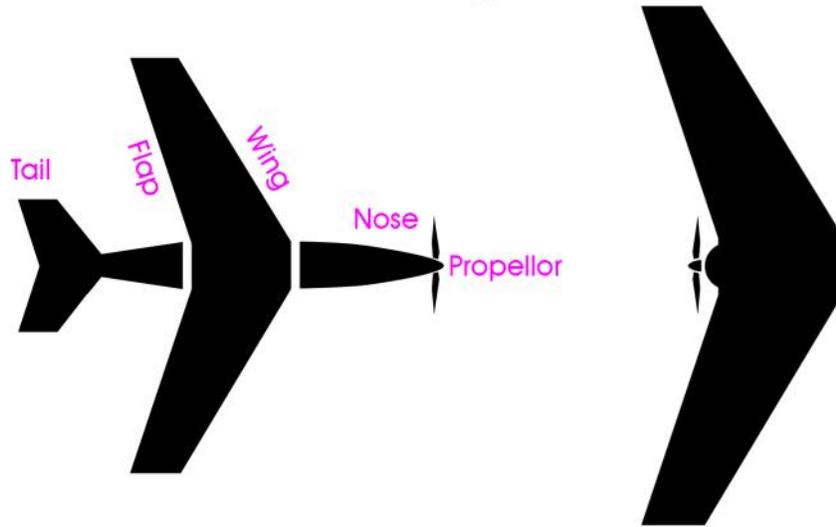
No-Fly Zone: Refer to FAA Airspace Restrictions
 Waivers/Authorizations: Airspace restrictions may be exceeded with approved operational or controlled airspace requests
 Visual Line of Sight (VLOS): ~1,000' [2' diameter object & 20/20 vision]



Drone Typology



Fixed Wing Drones

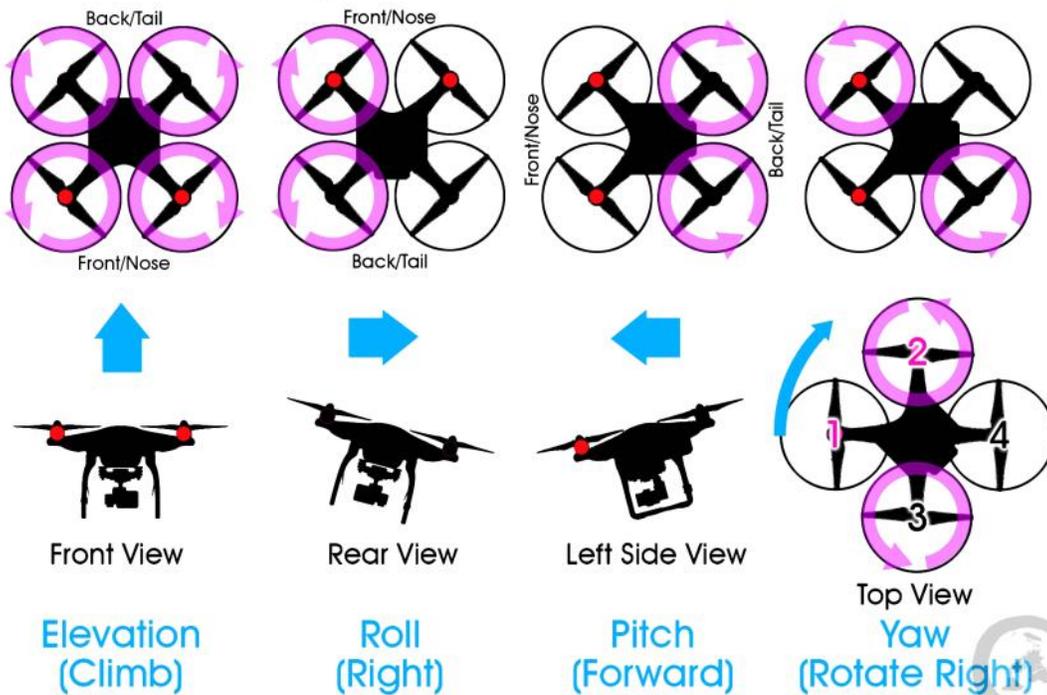


“Airplane”

“Flying Wing”

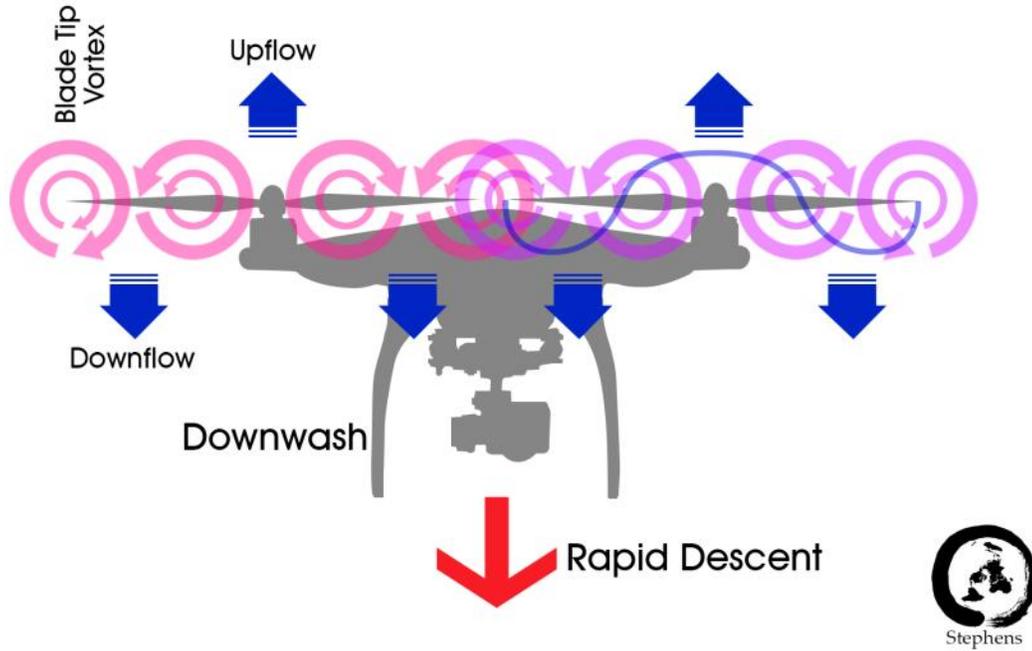


Quadcopter Axes & Motions

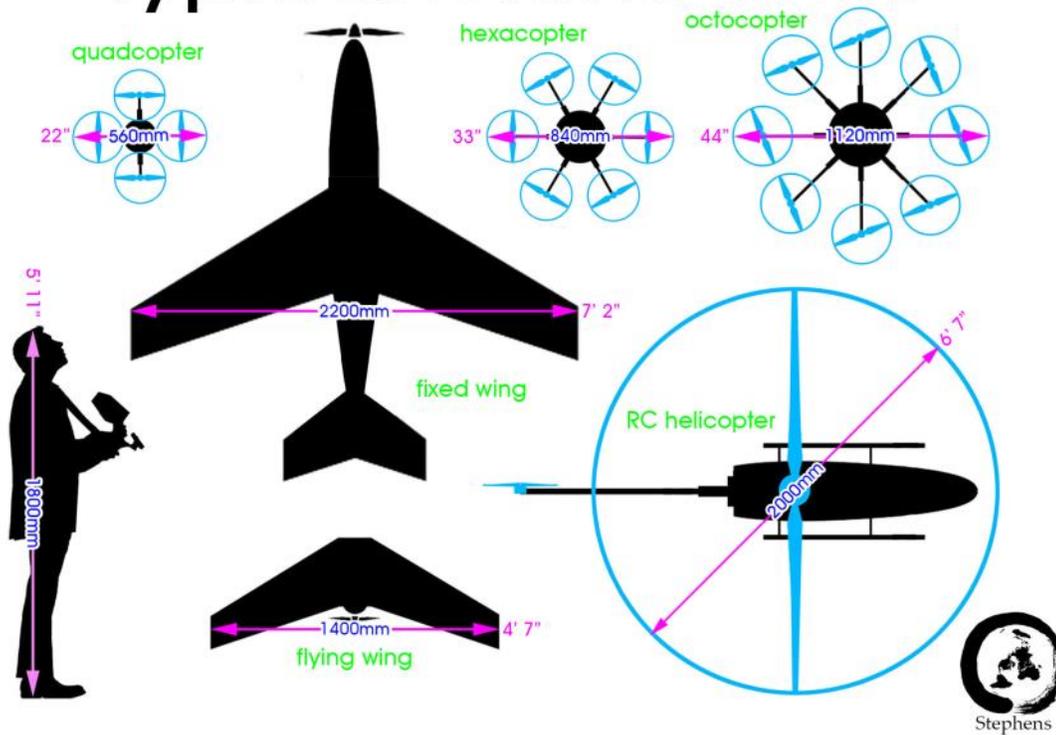


Quadcopter Vortex Ring State

Settling with Power



Typical Drone Sizes



Urban Air Mobility

Vertical Take-Off and Landing (VTOL) Aircraft Typology



Helicopter / Rotary Wing



2



Multicopter / Multi-Rotor



4



Multicopter/Airplane Hybrid Lift and Cruise



6



Multicopter/Airplane Hybrid Vectored Thrust



8



9

Hoverbikes / Hovercycles



10



11

Flying Cars / Roadable Aircraft



12

- 1 Airbus H160
- 2 Uber Helicopter
- 3 eHang 216

- 4 VoloCity
- 5 Kittyhawk Cora
- 6 Uber eCRM 003

- 7 Lillium Jet
- 8 A³ Vahana
- 9 Colin Furze Hoverbike

- 10 HoverSurf Scorpion
- 11 Terrafugia TF-X
- 12 Audi Pop.Up Next



acro mode

Acrobatic mode [see *flight modes* in glossary]

air pocket

Transient jolt of turbulence.

ARC

Almost Ready to Crash. An aircraft that knows something that the pilot is just about to find out. [from *ARF Almost Ready to Fly*]

barnstormer

Reckless, low-level, stunt pilot.

BASH

Bird/Animal Strike Hazard

bending plastic

Crash.

bent

Damaged, broken, or inoperative.

bingo

Minimum battery charge for a safe return to home.

bird

Unmanned aerial vehicle.

Boola-Boola

When an angry person knocks down or shoots down a remotely piloted aircraft (RPA).

brain fade

A mental condition where the person flying the aircraft, suddenly forgets which way to move the controls, or which control to move at all. This can happen for no apparent reason, even when you think you're comfortable at flying.

Bravo Zulu

Praise for a good job.

bringing the mail

Flying at high speed to return home. [also *carrying the mail*]

bubbas

Fellow pilots of the same aircraft.

build [noun]

Homebuilt drone.

bush pilot

A pilot flying in remote areas.

cameraship

A multicopter built with photography as a primary purpose.

CAVOK

Ceiling and Visibility OK. [see *CAVU* and *severe clear*]

CAVU

Ceiling and Visibility Unlimited: the best possible flying weather. [see *CAVOK* and *severe clear*]

Cherubs

Altitude under 1,000 feet, measured in hundreds of feet ("cherubs two" means 200 feet).

cleanup in aisle 5

Messy indoor crash.

colorful actions

Showing off, or otherwise ignoring safe procedures while flying. [see *flathatting*]

Centurion

A pilot with over 100 missions.

conversion

Severe crash. Converting an aircraft to pieces of plastic and metal.

corkscrew

Descending in a spiral to avoid ring vortex state.

craft

Aircraft.

cycle power to the panel

Turning the remote control off and on again to get it to function correctly.

dead stick

An emergency landing due to a power loss when a motor quits.

Delta Sierra

Phonetics for “dumb sh*t”: describes a stupid action, and erases all previous *Bravo Zulus* and *Sierra Hotels*.

departure

Departure from controlled flight. [see *flyaway* in Glossary]

ditching

The forced landing of aircraft on water.

driver

Pilot (e.g. *Phantom driver*).

Drone Ranger

Pilot who assists with anti-poaching and/or park monitoring.

dronejacking

The hijacking of a drone, either by physically capturing the device or by compromising its navigation system.

droneport

An airport or hub designed for or dedicated to drones.

Dronestagram

A photo or video shot from a drone.

dronie

[see *sky selfie*]

droning

Flying a drone or UAV (unmanned aerial vehicle) for recreational purposes.

drop in for lunch

Crash near people.

eye in the sky

Aircraft with camera.

feet dry / feet wet

Over land / over water.

field box

Container for equipment related to the remotely piloted aircraft system. [also *flight box*]

fisheye lens effect

The distortion caused by a very wide angle lens.

flathatting

Unauthorized low-level flying and stunting. [see *colorful actions*]

flock

[see *swarm*]

floor

Ground. [see *ceiling* in Glossary]

flying machine

One of the earliest names for aircraft originally used for the Wright Brothers patent in 1906. This outdated term is occasionally applied to UAVs in legislation and local government regulations.

flying phantograph

A drone that mimics the brush or pen strokes of an artist.

flying robot

Autonomous or remotely piloted aircraft. [also *aerial robot*]

FM

Abbreviation for “f*cking magic”: very high-tech; used to describe how something you don’t understand actually works. [Also *PFM Pure F*cking Magic*]

FOD

Foreign object damage. Typically when objects hit the rotor.

four fan trash can

Poorly designed quadcopter. [also *six fan trash can* hexacopter, *eight fan trash can* octocopter]

Fox 4

High-speed mid-air collision. Note: Fox 1, 2 and 3 are types of missiles.

Fox 5

High-speed crash. [see *Fox 4*]

garage queen

An aircraft that may look pretty, but never flies.

George

Auto-pilot.

Ginsu knives

Carbon fiber propellers.

gizmo

A piece of technical gear.

go for a spin

Recreational flying.

goo

Bad weather.

GPS/compass dance

Rotating the aircraft to locate satellites and determine magnetic north.

graveyard spiral

Maneuver that goes badly wrong and the aircraft spirals out of control. [see *vortex ring state* in glossary]

gripe

A mechanical problem with the aircraft.

grounded

Unable to fly.

high impedance air-gap

Unplugged.

hop

A mission or flight.

IFE

In Flight Emergency.

IFR

I follow roads. (from *instrument flight rules*)

jink

Drastic, violent maneuver to avoid a collision.

jail break software

Computer program that overrides drone geofencing.

jello

The visual effect of drone vibration on the video image.

jock

Pilot (e.g. Phantom jock).

kinetic disassembly

Exploded. [also *rapid unplanned disassembly*]

LIPO

Lithium polymer battery.

locals

Indigenous wildlife near operations.

loiter mode

[see *flight modes* in glossary]

mid-air

Mid-air collision.

mod

Modification to a drone.

NFG

Non-Functioning Gear. No ****ing Good.

no joy

Failure to make visual sighting or to establish radio communications.

ops

Operations.

organic grounding

Getting shocked / electrocuted.

pancake

To crash so hard as to flatten the aircraft.

park flyer

The general name given to any aircraft that can be safely flown in a public park / school yard / parking lot / sports field etc.

percussive maintenance

Repeatedly hitting the drone to get it to work.

personal protection drone

A weaponized drone that accompanies a person and can respond to attacks or threats.

pirouette

A maneuver described as a high yaw rate in which the aircraft spins.

plastic bag

The thing used to take home the pieces that was once your beloved aircraft, before you failed to keep it airborne at the wrong moment, or didn't manage to pull off the best of landings, or tried to perform an aerobatic maneuver too close to the ground...

plumber

An inept pilot.

Popeye

Pilot flying in bad weather or visibility.

prang

To bump, crunch or break an aircraft.

prop

Propeller.

prop wash

The air behind a running propeller or below a running rotor.

proximity event

Near collision.

puke

Someone who flies a different kind of aircraft than you.

pushing the envelope

Flying near the edge of disaster. [see *envelope* in Glossary]

quad

Quadcopter.

quick disassembly

Crash resulting in the aircraft being reduced to all its parts. [also *rapid unplanned disassembly*]

quick fix

Stop-gap measure to repair an aircraft quickly.

rotorcade

A procession of drones preceding an important person or event.

rotorhead

Multicopter pilot.

RTC

Ready to Crash. [from *RTF Ready to Fly*]

satellite/compass dance

Rotating the craft to detect satellites and/or compass orientation.

sats

GPS satellites.

scud

Low clouds or rain.

scud running

Flying at low altitude.

severe clear

No clouds and unlimited visibility. [see *CAVOK* and *CAVU*]

Sierra Hotel

Phonetic abbreviation for “sh*t hot,” high praise; the pilot’s favorite and all-purpose expression of approval.

sky selfie

Self photo taken by a drone. [Also “*dronie*”]

slop

Imprecision of a control system.

smash

Airspeed.

smoking hole

An aircraft crash site.

socked in

Grounded by bad weather.

soup

Overcast weather or thick fog. [also *pea soup*]

spaxel

Space pixel. A swarm of LED-equipped multi-copters that can fly in precise formation and thus “draw” three-dimensional images in midair.

speed of heat, warp one

Very, very fast.

spotter

Another term for *visual observer*.

spy in the sky

Remotely piloted aircraft used for surveillance by law enforcement.

stick-throttle interconnect

Mock-tech term for a pilot.

swap paint

Mid-air or ground collision with another man-made object.

swarm

Multiple drones flown in formation or used collectively to perform a task. [also *flock*]

sweet

Up and working.

Tally Ho

Aircraft in sight. [see *no joy*]

Tango Uniform

Polite phonetics for “t*ts up”; broken, not functioning.

thermally reconfigured

Melted.

tiger

An aggressive pilot.

toilet bowl effect

Condition where the drone spirals rather than hovers. This may be caused by a malfunctioning flybar or uncalibrated compass.

totaled

Complete wreck. [see *plastic bag*]

tree trimmer

Pilot or aircraft flying near trees or crashing in a tree. [see *weed wacker*]

tumbleweed

Pilot who is disoriented or who has lost situational awareness. [see *situational awareness* in glossary]

tweak

To fine tune or adjust.

uncontrolled landing

Crash landing.

Unmanned Aerial Veg-o-matic

In reference to the rotor blades: “It slices! It dices!” Especially for carbon fiber props.

VRS death plunge

[see *vortex ring state* in Glossary]

“Watch this!”

The two most dangerous words in aviation. (similar to “Hold my beer.”)

weed wacker

Pilot or aircraft flying extremely low or crashing in the weeds.

wobble of death

[see *vortex ring state* in Glossary]

WOT

Wide Open Throttle. Full power.

zebra striping

Pattern created in pilot underpants during a flyaway, collision or crash.

无人驾驶飞机

wú rén jiàoshǐ fēijī

CHINESE—unmanned aircraft.

onbemand luchtvaartuig
(drone)

DUTCH—unmanned aerial vehicle (drone).

miehittämättömiä ilma

FINNISH—unmanned aerial vehicle.

aéronef sans pilote (drone)

FRENCH—unmanned aircraft.

petit véhicule aérien sans
pilote (drone)

FRENCH—small unmanned aerial vehicle
(drone).

Drohne

GERMAN—drone.

ferngesteuertes Flugzeug

GERMAN—remotely piloted aircraft.

ferngesteuertes
Luftfahrtsystem

GERMAN—remotely piloted aircraft system.

unbemannte Luftfahrtzeuge

GERMAN—unmanned aircraft.

unbemanntes Fluggerät

GERMAN—unmanned aerial vehicle.

μη επανδρωμένα αεροσκάφη
mi epandroména aeroskáfi

GREEK—unmanned aircraft

aeromobili pilotaggio remoto
(APR)

ITALIAN—unmanned aerial vehicle (UAV).

drona

ITALIAN—drone.

無人機

mujin-ki

JAPANESE—unmanned aircraft.

무인 항공기 시스템

mu-in hang-gong-gi siseutem

KOREAN—unmanned aircraft systems.

ubemannede fly

NORWEGIAN—unmanned aerial vehicle.

bezzałogowego samolotu

POLISH—unmanned aerial vehicle.

беспилотные летательные
аппараты

bespilotnyye letatel'nyye
apparaty (BPLA)

RUSSIAN—unmanned aerial vehicle (UAV).

vehículo aéreo no tripulado
(VANT)

SPANISH—unmanned aerial vehicle (UAV).

obemannat luftfordon

SWEDISH—unmanned aerial vehicle.