Advanced Air Mobility Dictionary

A glossary of terms, abbreviations, acronyms, infographics and slang related to eVTOL, UAM, and UAS aviation

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AAM
Advanced Aerial/Air Mobility

AAV
autonomous aerial vehicle

ABSAA
airborne sense and avoid

AC
Advisory Circular [FAA and ICAO]

ACAS
airborne collision avoidance system

ACR
Airman Certification Representative

ACS
Airman Certification Standards

ADS-B
Automatic Dependent Surveillance—Broadcast

ADM
aeronautical decision making

AE
associated elements

AFM
aircraft flight manual

AFR
Automated Flight Rule

AGL
above ground level

AGV
autonomous ground vehicle

AHJ
authority having jurisdiction

AIP
aeronautical information publication

AIRAC
aeronautical information regulation and control

AIS
1) abbreviated injury scale 2) aeronautical information service

AIXM
aeronautical information exchange model

ALFUS
Autonomy Levels For Unmanned Systems

ALT
altitude

ANS
air navigation service

ANSP
air navigation service provider

AP
aerial photography

API
application programming interface

ARC
Aviation Rulemaking Committee (US)

ARF
almost ready to fly [also *ARTF*]

ASM
airspace management

ASOS
Automated surface Observing System

ASRS
Aviation Safety Reporting System [FAA]

ASTM AC377 F38
ASTM International Advisory Committee on Unmanned Aircraft Systems

ATC
air traffic control

ATM
air traffic management

ATS
Air Traffic Service

AUVSI
Association for Uncrewed Vehicle Systems International

AWOS
Automated Weather Observing System

BASH
bird aircraft strike hazard

Baughman's
Baughman's Aviation Dictionary and Reference Guide [archaic]

BCI
brain-computer interface

BLOS
beyond line of sight

BNF
bind and fly

BRLOS
beyond radio line of sight

BVLOS
beyond visual line of sight

BVR
beyond visual range

C2
Command and Control

C3
command, control and communication

C-UAS
counter unmanned aircraft systems

CA
Cooperative Area

CAA
Civil Aviation Authority (GBR)

CAAC
Civil Aviation Administration of China

CANSO
Civil Air Navigation Services Organization

CAP 722
Operational Guidance [GBR]

CASA
Civil Aviation Safety Agency {AUS)

CAT
commercial air transport

CBI
Confidential Business Information

CBR
community-based rule / community business rule

CEP
Corridor Entry/Exit Point

CF
carbon fiber

CFI
certified flight instructor

CFM
cooperative flow management

CFR
Code of Federal Regulations [USA]

CL
Connectionless

CMSA
Conformance Monitoring for Situational Awareness

CNPC
control and non-payload communications

CNS
communications, navigation and surveillance

CNSI
communication, navigation, surveillance, information

COA
Certificate of Authorization [also *Certificate of Waiver*]

COMAT
Company Materials

COP
cooperative operating practice

ConOps
concept of operations

COPs
Cooperative Operating Practices

COS
continued operational safety

COTS
commercial off-the-shelf

CPLA
close proximity low altitude

CRM
crew resource management

CS
control station

CTOL
conventional take-off and landing

C-UAS
counter unmanned aircraft systems

D
Controlling dimension

D&A / DAA
detect and avoid

DARPA
Defense Advanced Research Projects Agency

DARPA ALIAS
Defense Advanced Research Projects Agency Aircrew Labor In-Cockpit Automation System

DCA
downwash/outwash caution area

DCB
demand-capacity balancing

DEP
distributed electric propulsion

DoC
Declaration of Compliance

DOT
Department of Transportation [USA]

DPE
designated pilot examiner

DSA
detect, sense, and avoid

DSS
discover and synchronization service

DST
decision support tool

DTI
detect, track, identify

DWOW
downwash/outwash

EASA
European Union Aviation Safety Agency

EC
environment complexity/ conspicuity

eCTOL
electric conventional take-off and landing (aircraft)

EDCT
expect departure clearance time

EFB
Electronic Flight Bag

E-ID
electronic identification

EIS
entry into service

ELOS
electronic line of sight

EMI
electromagnetic interference

EO/IR
electro-optic / infrared

EP
external pilot

ESC
electronic speed controller

eSTOL
electric short takeoff and landing (aircraft)

ETA
estimated time of arrival

ETM
upper class E traffic management

EV
electric vehicle

EVLOS
extended visual line-of-sight

eVTOL
electric vertical take-off and landing (aircraft)

FAA
Federal Aviation Administration [USA]

FAASTeam
Federal Aviation Administration Safety Team

FAR
Federal Aviation Regulations

FATO
final approach and takeoff area

FC
flight controller/crew, failure condition

FCC
flight control computer

FFF
fast forward flight

FIMS
flight information management system

FIS
flight information service

FL
flight level

FLIR
forward looking infrared

FMRA
FAA Modernization and Reform Act of 2012 [US]

F/O
first officer

FOD
foreign object debris

FOQA
flight operational quality assurance

FOR
field of regard

FOV
field of view

FP
flight plan

FPV
first person view

FR
Federal Register

FRIA
FAA-recognized identification area [USA]

FSDO
Flight Standards District Office [FAA]

FSS
fixed satellite service

FTN
FAA Tracking Number

GA
general aviation

GBSAA
ground based sense and avoid

GCS
ground control station

G/G
ground-to-ground

GIS
geographic information system

GNSS
global navigation satellite system

GPS
Global Positioning System

HAZMAT
hazardous materials

HC
Hexacopter

HEC
high-end computing

Hexa
Hexacopter

HF
human factors

HFC
hydrogen fuel cell

HI
human independence

HIRF
high intensity radiated field

HITL
human in the loop

HL
hand launched

HME
hazardous material endorsement

HMI
human machine interface

HMR
hazardous materials regulations

HOGE
hover out of ground effect

HOTL
human-on-the-loop

HOVTL
human-over-the-loop

HSI
human systems integration

hVTOL
hybrid vertical takeoff and landing

HWTL
human-within-the-loop

I28
Innovate 28

IACRA
Integrated Airmen Certification and/or Rating Application

IAM
Innovative Air Mobility

IAW
in accordance with

IBR
incorporation by reference

ICAO
International Civil Aviation Organization

IFR
instrument flight rules

ILS
instrument landing system

IMC
instrument meteorological conditions

IMU
inertial measurement unit

IOC
intelligent orientation control

IoT
Internet of Things

IoT-A
Internet of Things-architecture

IR
infrared

IRFA
Initial Regulatory Flexibility Analysis

ISO
International Organization for Standardization

ISR
Intelligence, surveillance, reconnaissance

IUEI
intentional unauthorized electronic interaction

JARUS
Joint Authorities for Rulemaking on Unmanned Systems [USA]

KERS
kinetic energy recovery system

Kp-Index
Global geomagnetic activity

KTC
Knowledge Testing Center

L&R, L/R
launch and recovery

LAANC
Low Altitude Authorization Notification Capability

LAP
landing area proposal

LIDAR
light detection and ranging

LOA
letter of agreement / level of automation

LOC
localizer

LOS
line of sight

LRPAS
light remotely-piloted aircraft system

LSA
light sports aircraft

LZ
landing zone

M&S
modelling and simulation

MAAS
mobile aircraft arresting system

MAIS
Maximum Abbreviated Injury Scale

MAV
micro/mini air vehicle

MC
mission Complexity

METAR
meteorological aerodrome report

MOA
memorandum of agreement

MOC
mobile operations center / means of compliance

MOPS
minimum operational performance standards

MOQA
maintenance operational quality assurance

MOSAIC
Modernization of Special Airworthiness Certification [FAA]

MRO
maintenance, repair, and overhaul

MSA
minimum safe altitude

MSL
mean sea level

MTOW
maximum take-off weight

NAICS
North American Industry Classificiation System [USA]

NAS
National Airspace System

NASA
National Aeronautics and Space Administration [US]

NATO
North Atlantic Treaty Organization

Naza
Autopilot system (Registered trademark of DJI Innovations)

NIST
National Institute of Standards and Technology

nm
nautical miles

NMAC
near mid-air collision

NOTAM
Notice to Air Missions (formerly Notice to Airmen)

NPRM
Notice of Proposed Rulemaking

NTSB
National Transportation Safety Board [USA]

NWS
National Weather Service [USA]

OC
Octocopter

Octo
Octocopter

ODM
on-demand mobility

OEM
original equipment manufacturer

OFA
object free area

OM
operations manual

OMB
Office of Management and Budget [USA]

OOP
operations over people

OPS
air operations

OpSpecs
Operation Specifications

OPV
optionally piloted vehicle

ORA
operational risk assessment

OSD
on screen display

OST
Office of the Secretary of Transportation [USA]

OV
operational view

PAO
public aircraft operation

PAX
Passenger, passengers.

PBN
performance-based navigation

PIC
pilot in command

PNT
positioning, navigation, and timing

POI
point of interest / Principal Operations Inspector

PSU
provider of services for UAM

QC
Quadcopter

QE
qualified entity

Quad
Quadcopter

RAM
rural/regional air mobility

RC
radio/remote controlled

RCP
required communication performance

RD
rotor diameter

RF
radio frequency

RFA
Regulatory Flexibility Act [USA]

RFI
radio frequency interference / request for information

RFID
radio frequency identification

RID
remote identification

RLOS
radio line of sight

RNAV
area navigation

RNP
required navigation performance

ROA
remotely operated aircraft

ROC
RPAS Operator Certificate

RocDocs
recent domestic aircraft crashes

ROI
region of interest

RP
route plan, remote pilot]

RPA
Remotely Piloted Aircraft / Rule of Particular Applicability

RPAS
remotely piloted aircraft system

RPIC
remote pilot in command

RPS
remote pilot station

RSP
required surveillance performance

RTF
ready to fly

RTH
return to home

RTL
return to launch

Rx
Receiver

S&A
see and avoid / sense and avoid

SA
situational awareness

SAA
special activity airspace / sense and avoid

SAC
Special Airwworthiness Certificate [FAA]

SACAA
South African Civil Aviation Authority

SAR
search and rescue

SARPS
standards and recommended practices

SATCOM
satellite communications

SDO
standards development organization

SDSP
supplemental data service provider

SMS
safety management system

SOH
State of Health

SOP
standard operating procedures

SORA
Specific Operations Risk Assessment

STOL
short take-off and landing

SPSO
Service Provider Standard Order

SRA
safety risk assessment

STA
security threat assessment

STANAG
Standardization Agreement [NATO]

STOL
short take-off and landing (aircraft)

STEM
science, technology, engineering, and mathematics

SUA
small unmanned aircraft. [also *special use airspace*]

sUAS
small unmanned aircraft system

SUI
simplified user interaction

SUSA
small unmanned surveillance aircraft

SWaP
size, weight, and power

SWIM
system wide information management

sXu
System X for sUAS

TA
traffic advisory

TAF
Terminal Area Forecast

TBO
trajectory-based operations

TC
Type Certificate

TFM
traffic flow management

TFR
Temporary Flight Restriction

TLOA
touchdown and lift-off area

TLOF
touchdown and lift-off

TLS
target level of safety

TO, T/O
take-off

TRACON
terminal radar approach control

Tri
Tricopter

TSA
Transportation Security Agency [USA]

TSO
technical standards order

Tx
transmitter / radio controller

UA
unmanned/uncrewed/ uninhabited aircraft

UAG
Unmanned Aircraft General (initial knowledge FAA knowledge test for certification)

UAM
urban air mobility

UAS
unmanned/uncrewed/ uninhabited aircraft system

UAS-AG
unmanned aircraft systems advisory group

UAT
universal access transceiver

UAV
unmanned/uncrewed/ uninhabited aerial vehicle

UCAT
UAM Coordination and Assessment Team

UCAV
unmanned combat aerial vehicle

UFT
Unmanned Aircraft System Traffic Management Field Test

UML
UAM Maturity Level

UOC
Unmanned Aircraft System Operator's Certificate [ICAO]

UOE
UAM operating environment

UPP
Unmanned Aircraft System Traffic Management Pilot Program

USP
UTM service provider

USS
UAS service supplier

USSP
U-Space Service Provider

UTM
UAS traffic management / universal traffic management

V2V
vehicle-to-vehicle

VEMS
VTOL emergency medical services

VFR
visual flight rules

VLOS
visual line-of-sight

VMC
visual meteorological conditions

VO
visual observer

VPT
vertiport

VRS
vortex ring state

VSL
Value of Statistical Life

VTOL
vertical take-off and landing aircraft

VTx
video transmitter

WP
Waypoint

xTM
extensible traffic management

4th Industrial Revolution (4IR)

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. [see graphic]

5th Industrial Revolution (5IR)

The integration or synthesis of mechanical and biological systems. Biomimetics and biomimicry are current examples. The technological singularity is the point in time when machine intelligence intersects and surpasses human intelligence. Mid 21st century? [see graphic]

Abbreviated Injury Scale (AIS)

An anatomical-based, consensus derived, global severity scoring system that classifies each injury by body region according to its relative importance on a 6-point ordinal scale (1=minor and 6=maximal). [FAA]

above ground level (AGL)

[see *altitude*]

absolute altitude

[see *altitude*]

accident

A mishap that resulted in a serious injury, loss of conscience, or $500 in damage to property other than the UAS. [FAA]

active surveillance

Surveillance that requires signal transmission from the surveillance equipment. [NATO]

advanced air mobility (AAM)

1) Safe, sustainable, affordable, and accessible aviation for transformational local and intraregional missions. AAM includes UAM as well as many other missions, including different forms of passenger transport, cargo transport, and aerial work missions. These missions may be performed with many types of aircraft (e.g., manned or unmanned; conventional takeoff and landing (CTOL), short takeoff and landing (STOL), or VTOL), over/between many different locations (e.g., urban, rural, suburban), and to/from far more locations than typical commercial aviation (e.g., novel UAM aerodromes, existing underutilized small/regional airports). Local and intraregional missions are likely less than approximately 75 nautical miles and 300 nautical miles, respectively, though these ranges are not strict upper limits. [NASA] 2) Advanced Air Mobility (AAM) builds upon the UAM concept by incorporating use cases not specific to operations in urban environments, such as: commercial inter-city (longer range/ thin haul), cargo delivery, public services, and private / recreational vehicles. [FAA] 3) An air transport system concept that integrates new, transformational aircraft designs and flight technologies into existing and modified airspace operations. [BAE] [see *Innovative Air Mobility*] 4) AAM is a transportation system that moves people and property by air between two points in the United States (U.S.) using aircraft with advanced technologies, including electric aircraft, or electric vertical takeoff and landing (eVTOL) aircraft, in both controlled and uncontrolled airspace. [AAM Coordination and Leadership Act, 2022]

Advisory Circular (AC)

An FAA document that provides recommendations, best practices, or sample means of compliance for various aspects of aviation safety. [FAA]

aerial blockchain networks

Decentralized data-sharing platforms using blockchain to enhance security and transparency in unmanned aircraft operations, including maintenance records, flight plans, and compliance.

aerial work

Aircraft operation in which an aircraft is used for specialized services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, etc. [ICAO, ISO]

aerodrome (ADRM)

A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft. [ICAO, EASA]

aerodrome pilot

Remote pilot familiar with a defined aerodrome or landing site, which transfers responsibility to another pilot a few minutes after take-off or accepts responsibility for approach, landing and possibly taxing and parking. [ISO]

aerodyne

Archaic technical term for any type of heavier-than-air aircraft. [See *aerostat*]

aeronaut

The pilot of an aerostat.

aeronautical information publication (AIP)

A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation. [ICAO]

aeronautical information service (AIS)

A service established within the defined area of coverage responsible for the provision of aeronautical data and aeronautical information necessary for the safety, regularity and efficiency of air navigation. [ICAO]

aeronautics

A general term applied to everything associated with or used in any way in the study or design, construction and operation of an aircraft. [Baughman's]

aerophobia

[see *aviophobia*]

aeroplane

A power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight. [ISO]

aerostat

1) A generic for aircraft whose support is chiefly due to buoyancy derived from aerostatic forces. The classification includes lighter-than-air craft, i.e., airships and balloons. 2) Lighter than air aircraft. [ISO] [See *aerodyne*]

aerotourism

Visiting an airport, heliport, or vertiport as a touristic destination.

aerotropolis

A metropolitan subregion whose infrastructure, land use, and economy are centered on an airport. It fuses the terms "aero" (aviation) and "metropolis".

air ambulance

[see *air first response* and *VEMS*]

air first response

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

air metro

Advanced 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 *vertiport*]

air mobility ecosystem

An air mobility ecosystem refers to a comprehensive network of interconnected elements that facilitate the efficient and safe operation of air transportation systems. This concept is closely associated with the development of Urban Air Mobility (UAM) and Advanced Air Mobility (AAM) technologies.

air pooling

A largely on-demand service where multiple individual users are aggregated ("pooled") into a single aircraft for flights. Flight departure times and/or origin-destination pairs may be set by a single user with other users fitting into that schedule, or the operator may adjust all users' desired schedules to enable passenger aggregation.

air shuttle

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

air taxi

1) Used both to refer to on-demand air carriers and as a synonym for "hover taxi." (See *hover taxi*). [FAA] 2) An advanced 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.

air taxi operator

A U.S. aircraft company that operates under FAR Part 135. [FAA]

air traffic control service

A service provided for the purpose of: a) preventing collisions:1) between aircraft, and2) on the maneuvering area between aircraft and obstructions, and b) expediting and maintaining an orderly flow of air traffic. [ICAO, NATO]

air traffic management (ATM)

1) Dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management, safely, economically and efficiently, through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions. [ISO] 2) The dynamic, integrated management of air traffic and airspace — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties. [ICAO]

air traffic management system (ATMS)

A system that provides ATM through the collaborative integration of humans, information, technology, facilities and services, supported by air and ground- and/or space-based communications, navigation and surveillance. [ICAO]

air traffic service (ATS)

Generic term that can refer to flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service). [ICAO, ISO]

air vehicle control station (AVCS)

1) A site configured to allow a pilot in command of an ROA to operate and monitor all ROA operations conducted under his or her authority. 2) The subsystem designed to plan and control a UAS mission, including sensor employment and connectivity with the appropriate airspace controlling authority. (NATO)

airborne collision avoidance system (ACAS)

Aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircrafts that are equipped with SSR transponders. [ISO]

aircraft

1) Any contrivance invented, used, or designed to navigate, or fly in, the air. 2) Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the Earth's surface. [ICAO, ISO]

aircraft category

Classification of aircraft according to specified basic characteristics. [ISO]

aircraft crew

A human or humans partially responsible for the safe flight of the aircraft who share this responsibility with some automated system(s). An aircraft crew member is not a traditional pilot, but rather performs the role of aircraft operator, multi-aircraft operator, or aircraft steward. An aircraft operator may be either onboard or off-board, a multi-aircraft operator is located off the aircraft, and an aircraft steward is located onboard. One aircraft crew member is designated the PIC (or RPIC) at a time, though the PIC or RPIC may change during flight. Typically, the aircraft crew work on behalf of the fleet operator to support UAM operations. A fleet operator can utilize a traditional pilot, a single aircraft crew member, or a combination of aircraft crew members as required for safety in light of their particular business model. For example, the use of an onboard aircraft crew may bolster public acceptance by providing human interaction throughout the UAM experience. [NASA]

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]

airframe

The airfoil surfaces (including rotors but excluding propellers and rotating airfoils or engines) booms, cowlings, fairings, fuselage, nacelles, and landing gear of an aircraft and their accessories and controls.

Airman Certification Standards (ACS)

Aeronautical knowledge and risk management knowledge testing standards to obtain an unmanned aircraft systems remote pilot operating certificate with a small rating. [FAA]

airship

Power-driven lighter-than-air aircraft. [ISO]

airspace

(see *National Airspace System*)

airspace management (ASM)

Planning function with the primary objective of maximizing the utilization of available airspace by dynamic time-sharing and, at times, the segregation of airspace among various categories of users based on short-term needs, while securing aviation safety. [ISO]

altitude

1) The height measured from directly above ground (AGL) is the *absolute altitude*. The height measured from mean sea level (MSL) is the *true altitude*. 2) Vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL). [ISO]

amateur-built unmanned aircraft system

[see *home-built unmanned aircraft system*. FAA]

approach/departure path

The approach/departure path is the flight track that VTOL aircraft follow when landing at or departing from a vertiport. [FAA]

approved UA area

A defined area as approved under 101.9. [ICAO]

associated elements

Those elements that are not directly affixed to an unmanned aircraft and are necessary to interact with the unmanned aircraft for safe flight during all normal, abnormal, or emergency flight operations. [FAA]

ATS communication link

Digital or analogue communication link to transfer voice or data between remote crew members, ATS, airspace users and other airspace users. [ISO]

ATTI mode

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

authorized services

Those services a certificated automated data service provider is authorized to provide under part 146. FAA DRAFT459 anticipates that authorized services could include but are not limited to: strategic deconfliction services for identifying flight path conflicts before takeoff and managing collision risk between UA; conformance monitoring to provide time-sensitive alerts so that the UAS operator maintains their flight path; DAA services, which provide surveillance information or avoidance maneuvering instructions to operators; or micro-weather forecasting services that are not available from conventional NAS weather sources. [FAA]

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.

autogyro

A type of rotorcraft that uses an unpowered rotor in free autorotation to develop lift. Forward thrust is provided independently, by an engine-driven propeller. While similar to a helicopter rotor in appearance, the autogyro's rotor must have air flowing across the rotor disc to generate rotation, and the air flows upwards through the rotor disc rather than down.

automated data service provider

A person using a distributed computational system to provide automated data services that support aircraft operations. Automated data service providers would encompass persons who provide their own services for their own operations (often referred to as vertically integrated companies) as well as persons who provide distributed services as a third-party provider. [FAA]

Automated Flight Rules (AFRs)

Refers to rules, applied within UAM Corridors, which reflect the evolution of the current regulatory regime (e.g., VFR/IFR) and take into account advancing technologies and procedures (e.g., Vehicle-to-Vehicle [V2V] and data exchanges). Under defined conditions, the systems/automation may be allocated the role of the "predetermined separator". [FAA]

automatic

1) Automatic systems will follow pre-defined, finite, and thus predictable, deterministic sequences of tasks. Automatic systems may be interrupted by operators and will require operator initiation and direct supervision. 2) Pertaining to a process or equipment that, under specified conditions, functions without human intervention. [NATO]

autonomic

1) Flight mode requiring no command inputs from a UAV pilot. Also, systems that function without specific operator commands. 2) Autonomic systems will select from a pre-defined, finite set of tasks to achieve a given objective or regulate subsystems conditionally, but without the need for direct supervision. Autonomic systems may involve operator intervention.

autonomous

Autonomous systems will independently decide their own course of tasks to achieve a given objective without the possibility of operator intervention.

autonomous aircraft

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

autonomous operation

Operations that do not require direct pilot control.

autonomous system

System that, perceiving its environment and determining if this affects its goals, takes action to ensure as far as practicable that its goals will be safely achieved. [ISO] [see graphic]

autopilot

The component of an aircraft that is capable of guiding movement of the aircraft without real-time human guidance. [Formerly *automatic pilot*, *gyropilot*, *mechanical pilot*, *robot pilot*] [See *George* in Slang]

aviator

1) The pilot of an aircraft. 2) Gender-neutral replacement term for “airman”. [FAA Drone Advisory Committee] 3) U.S. Navy pilot.

aviatrix

Archaic term for female pilot. [also *aviatress*]

avionics

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

aviophobia

The fear of flying. [also *aerophobia*]

barrier

Challenge(s) across the entire UAM ecosystem that must be addressed to enable the UAM vision. Barriers include, but are not limited to, challenges that have no currently known solution pathway.

beyond visual line of sight (BVLOS)

Operation of a UAS other than VLOS or EVLOS. [ICO]

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.

biomimetic, biomimic aircraft

Biomimetic or biomimic aircraft emulate models, systems, and elements of nature such as bird or insect flight.

bird strike

A bird strike—sometimes called birdstrike, bird ingestion (for an engine), bird hit, or bird aircraft strike hazard (BASH)—is a collision between an airborne animal (usually a bird or bat) and an aircraft. [also *wildlife strike*] [see *snarge* in Slang] [see graphic]

brain-computer interface (BCI)

Device that creates a pathway between the brain and aircraft.

broadcast

To send information from an unmanned aircraft using radio frequency spectrum. [FAA]

C2 link

The data link between the remotely piloted aircraft and the remote pilot station for the purposes of managing the flight.

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*]

casualty

An Abbreviated Injury Scale (AIS) level 3 or greater injury. [FAA]

category basic

A certification category for VTOL-capable aircraft according to which the aircraft meets the requirements for controlled emergency

landing after a critical failure for performance (CFP). [EASA]

category enhanced

a certification category for VTOL-capable aircraft according to which the aircraft meets the requirements for continued safe flight and landing (CSFL) after a critical failure for performance (CFP). [EASA]

Caution Level Alert

An alert that requires immediate crew awareness and subsequent response. [ICAO]

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)

A Federal Aviation Administration grant of approval for a specific flight operation. [FAA]

charging facility

A charging station that supplies alternating current (AC) and/or direct current (DC) to an electric aircraft for recharging its batteries, including, if needed, the connection between charging station and electric aircraft (refer to the International Electrotechnical Commission (IEC)). [EASA]

chase aircraft

A manned aircraft flying in close proximity to UA (RPA) that carries a qualified observer and/or UA (RPA) pilot for the purpose of seeing and avoiding other aircraft and obstacles.

clearway

For VTOL-capable aircraft, means a defined area on the ground or water, selected and/or prepared as a suitable area over which a VTOL -capable aircraft that is certified in the enhanced category may accelerate and achieve a specified set of flight conditions. [EASA]

co-pilot

[see *first officer*]

collision avoidance

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

collision avoidance function

A function used to provide alerts to indicate the need to take immediate action, and optionally by generating a recommended manoeuvre, to limit the risk of collision with all threats. [ICAO]

collision avoidance threshold

Boundary around the unmanned aircraft at which the collision avoidance function declares that action is necessary to avoid a collision, by preventing the threat from penetrating the collision volume. [ISO]

collision boundary

Closest point of approach or minimum distance to be achieved between two aircrafts to ensure that a collision is avoided taking account of any inaccuracies in the system. [ISO]

command and control (C2)

The exercise of authority and direction by the pilot.

command and control link

1) Spectrum and associated equipment used to fly the aircraft from the control station. 2) Data link between the remotely-piloted aircraft and the remote pilot station for the purposes of managing the flight. [ISO] 3) The data link between an unmanned aircraft and a remote pilot station or control station that is used in the management of a flight. [ICAO] 4) The command and control data link which connects the unmanned aircraft and the ground control station for the purposes of managing the flight. [FAA] [also *control and non-payload communications* (CNPC)] 5) command and control data link: A data transmission used for control of the UA that transmits UA crew commands from the UCS to the UA (uplink) and UA status data from the UA to the UCS (downlink). [NATO]

command and control link service

A communication service supplied by a third party, providing command and control the data link between the unmanned aircraft and the CU for the purpose of managing the flight. [EASA]

command and control range

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

command unit

The equipment or items of equipment to control unmanned aircraft remotely, as defined in Article 3(32) of Regulation (EU) 2018/1139, which ensures the control or monitoring of unmanned aircraft during any phase of flight; the command unit does not include any ground-, air- or space-based equipment or items of equipment that support (s) the command and control (C2) link service. [EASA]

commercial air transport operation (CAT)

Aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire. [ISO, EASA]

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.

congested area

In relation to a city, town, or settlement, any area that is substantially used for residential, commercial, or recreational purposes. [EASA]

conjoint analysis

Trade-off survey method to evaluate relevance and extent of decision factors. [EASA]

connectivity aircraft

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

concept of operations (ConOps)

A user-oriented document that describes systems characteristics for a proposed system from a user's perspective. A ConOps also describes the user organization, mission, and objectives from an integrated systems point of view and is used to communicate overall quantitative and qualitative system characteristics to stakeholders. [JARUS]

conflict

Any situation involving aircraft and hazards in which the applicable separation minima may be compromised. [FAA, ICAO]

conflict management

The function to limit, to an acceptable level, the risk of collision between aircraft and hazards. [ICAO]

conformance monitoring

The real-time ability to determine whether an unmanned aircraft is flying in accordance with its operational intent, and to share situational awareness data with relevant airspace users when off-nominal or contingent situations occur. [FAA]

constraint

An impact to the capacity or use of a resource preferred by an operator, defined with time and geographically specified airspace information. A constraint may restrict access to airspace for operations or may be advisory in nature. [FAA]

contact flight

Flight in which the altitude of the aircraft and its flight path can at all times be controlled by means of visual reference to the ground or water. [see *pilotage*, *visual line of sight*]

continued safe flight and landing (CSFL)

In relation to a VTOL-capable aircraft, that the aircraft is capable of continued controlled flight and landing at a vertiport, possibly using emergency procedures, without requiring exceptional piloting skill or strength. [EASA]

control and non-payload communications (CNPC)

[see *command and control*]

control station (CS)

1) An interface used by the remote pilot or the person manipulating the controls to control the flight path of the small unmanned aircraft. [FAA] 2) Defined location containing one or more controls. [ISO] 3) The equipment used to maintain control, communicate, guide, or otherwise pilot an unmanned aircraft. 4) Apparatus for hosting the remote pilot and her/his device to operate the UAS. [ASTM] [also *transmitter* and *ground control station*]

controller

[see *control station*]

controlling dimension (D)

The diameter of the smallest circle enclosing the entire VTOL aircraft projection on a horizontal plane, including all possible configurations with rotors/propellers turning, if applicable. . [FAA] (see Vertiport graphic)

Cooperative Area (CA)

An airspace volume (e.g., UAM Corridor) within which cooperatively managed operations can occur. ATC ensures separation of non-participating aircraft from the cooperative operations and/or CA. [FAA]

cooperative aircraft

Aircraft that contain operable equipment for the purposes of identification—e.g., transponder, ADS-B. [NATO]

Cooperative Operating Practices (COPs)

Industry-defined, FAA-approved practices that address how operators cooperatively manage their operations within the CA (i.e., UAM Corridor), including conflict management, equity of airspace usage, and Demand-Capacity Balancing (DCB). [FAA]

cooperative separation

Separation based on shared flight intent and data exchanges between operators, stakeholders, and service providers. Cooperative separation is supported by defined COPs as well as applicable rules, regulations, and policies

cooperative traffic

Traffic that broadcasts position or other information, which assists in detecting and assessing conflict potential.

Cooperative Operation

A term used to describe an operation making use of cooperative services (e.g., separation, flow management) and is sharing/exchanging Operational Intent and other information in compliance with applicable regulations and COPs within a CA. [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.

Detection Systems

Passive Detection Systems detect and locate UAVs, and in some cases also identify the pilot's position, by scanning for emissions from UAV or their controllers. Active Detection Systems detect the presence of any moving object generated when the object encounters and reflects signals emitted by the detector, e.g. RADAR. Multi-Sensor Detection Systems use a combination of library-based and/or radar systems with electro-optical or electrooptical/infrared cameras, which identify UAVs based on their visual signature, and/or acoustic sensors, which recognize the unique sounds produced by different types and models of UAVs.

Countermeasures

Cooperative countermeasures rely on the drone to behave as designed. Examples include breaking the command datalink, and the drone landing or returning home as it has been programmed to do.

Non-cooperative countermeasures do not rely on the drone design; instead, they physically force the drone to behave in a desired manner. Examples of noncooperative countermeasures include kinetic destruction and net capture. [INTERPOL] [see jamming and spoofing]

course lock

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

creative pattern

[see *formation*]

crewmember (sUAS)

A person(s) who is designated by the Remote Pilot in Command (Remote PIC) to assist the Remote PIC and the person manipulating the flight controls of the sUAS in the safe and efficient conduct of the UAS operation. This may include visual observer (VO), launch or recovery personnel and the like. [FAA]

D

1) Helicopters—The overall length of the helicopter, which is the dimension from the tip of the main or forward rotor to the tip of the tail rotor, fin, or other rear-most point of the helicopter. This value is with the rotors at their maximum extension. [FAA] 2) Helicopters—the largest overall dimension of the helicopter, when rotor(s) are turning, measured from the most forward position of the main rotor tip path plane to the most rearward position of the tail rotor tip path plane or helicopter structure. (EASA) 2) VTOL aircraft—the diameter of the smallest circle enclosing the VTOL aircraft projection on a horizontal plane, while the aircraft is in the take-off or landing configuration, with rotor(s) turning. Note: If the VTOL aircraft changes dimensions during taxiing or parking (e.g. folding wings), a corresponding $D_{taxiing}$ or $D_{parking}$ should also be provided. [EASA]

D-value

A limiting dimension, in terms of D, for a vertiport, or for a defined area within a vertiport. [EASA]

data link (UAS)

A wireless communication channel between one or more UCS and one or more UA, or between multiple UA. UAS data link data exchange may include but is not limited to exchange of command and control or payload data between UA and UCS. A UAS data link may consist of: (1) Uplink – Transmittal of UA crew commands from the UCS to the UA. (2) Downlink – Transmittal of UA status data from the UA to the UCS. [NATO]

Declaration of Compliance (DoC)

A record submitted to the FAA that certifies the sUAS conforms to the Category 2 or Category 3 requirements under subpart D or part 107. [FAA]

Defense Advanced Research Projects Agency (DARPA) Aircrew Labor In-Cockpit Automation System (ALIAS)

The Defense Advanced Research Projects Agency (DARPA) created the Aircrew Labor In -Cockpit Automation System (ALIAS) program. ALIAS envisions a tailorable, drop-in, removable kit that would promote the addition of high levels of automation into existing aircraft, enabling operation with reduced onboard crew.

degraded mode

State of the UAS that reflects a loss of accuracy, capability, or performance in response to a failure of a component or system. [NATO]

demand-capacity balancing (DCB)

Strategic evaluation of system-wide traffic flows and aerodrome capacities to allow airspace users to determine when, where, and how they operate, while mitigating conflicting needs for airspace and aerodrome capacity. This collaborative process allows for the efficient management of air traffic flow through the use of information on system-wide air traffic flows, weather, and assets. [FAA]

design D

The D of the design VTOL-capable aircraft. [EASA]

design VTOL-capable aircraft

The VTOL-capable aircraft type that the vertiport is intended to serve, which has the largest set of dimensions, the greatest maximum take-off mass (MTOM), and the most critical obstacle avoidance criteria. Those attributes may not reside in the same VTOL-capable aircraft capability. [EASA]

design VTOL aircraft

The Design VTOL aircraft is the largest VTOL aircraft with three or more propulsive units that is expected to operate at a vertiport. This Design VTOL aircraft is used to size the TLOF, FATO and Safety Area. [FAA]

detect and avoid (DAA)

1) The capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action. [ICAO] 2) Capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action. [ISO] 3) Systems that provide situational awareness to an aircraft that enable the identification of other air traffic or hazards and the ability to take appropriate action to mitigate collision risk. DAA systems are typically categorized as onboard or ground-based depending on where the hardware of the system is located. [NASA] 4) The ability for an unmanned aircraft system to see, sense, or detect aircraft or other hazards and to make a flight adjustment to avoid a collision hazard. [FAA]

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*, *sense and avoid SAA*, and *detect, see and avoid*]

disorientation

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

distributed computational system

A system that relies on one or multiple piece(s) of software, running simultaneously on one or multiple computer(s), to provide a set of functions. Automated data services would be provided through these systems to support aircraft operations. [FAA]

down link

direct or indirect data link from the unmanned aircraft. [ISO]

downwash/outwash

The downward and outward movement of air caused by the action of rotating rotor blade, propeller, or ducted fan. When this air strikes the ground or some other surface, it causes a turbulent outflow of air from the aircraft. [FAA]

Downwash/Outwash Caution Area (DCA)

An operational area that is identified to protect persons and property from downwash and outwash (including jet blast or propwash) that may meet or exceed 34.5 mph (55.5 kph). [FAA] (see graphic)

drone

1) Unmanned aircraft. [FAA] 2) Unmanned system which is remotely or autonomously operated. [ISO] 3) Term used by the general

public to refer to an "unmanned aircraft." [EASA] Also:

- *bird (slang)*
- *craft (slang)*
- *crewless, radio-controlled airplane (1946)*
- *drone (1946)*
- *Equipment (commercial aviation)*
- *eye in the sky / spy in the sky (slang)* [surveillance drone]
- *flying machine*
- *flying robot*
- *micro aerial vehicle (MAV)*
- *mini aerial vehicle*
- *platform*
- *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)*
- *uncrewed aircraft system (UAS)* [FAA Drone Advisory Committee]
- *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 landing pad

Type of 'mat' from which UAV can be launched or landed. Typically an orange circle with a white letter H (N America) or a blue circle with a white letter H (Europe). Also, *helipad*.

drone park

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

drone swarming

The coordinated operation of multiple unmanned aerial vehicles (UAVs) using autonomous or semi-autonomous algorithms for tasks like surveillance, search and rescue, light displays, or delivery.

droneport

Any aerodrome including vertiports exclusively dedicated to landing, ground-handling and take-off of unmanned aircrafts. [ISO]

DROTAM

[see *Notice to Airmen*]

dual instruction time

Time during which a person is receiving instruction from a properly authorized remote pilot at the controls of the remote pilot station. [ISO]

dual-use AAM

Advanced Air Mobility aircraft built for both civilian and military missions. A single platform might carry passengers in one scenario and surveillance gear in another, blending commercial and defense applications.

effective transitional lift (ETL)

The pronounced increase in *translational lift* during transition to forward flight due to the rotor/propeller experiencing a significantly decreased induced airflow. [FAA]

electromagnetic environment (EME)

The totality of electromagnetic phenomena existing at a given location. [NATO]

electromagnetic interference (EMI)

1) A disturbance in radio frequency by an external source that disrupts the operation of electronic devices. 2) Any electromagnetic disturbance, whether intentional or not, which interrupts, obstructs, or otherwise degrades or limits the effective performance of electronic or electrical equipment. [NATO]

electromagnetic vulnerability (EMV)

The characteristics of a system that cause it to suffer degradation in performance of, or inability to perform, its specified task as a result of electro-magnetic interference. [NATO]

electronic flight bag (EFB)

An electronic information management device that helps flight crews perform flight management tasks more easily and efficiently with less paper providing the reference material often found in the pilot's carry-on flight bag, including the flight-crew operating manual, navigational charts, etc.

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.

elevated vertiport

A vertiport is considered elevated if it is located on a rooftop or other elevated structure where the TLOF and FATO are at least 30 inches (0.8 m) above the surrounding surface (a ground-level vertiport with the TLOF on a mound is not an elevated vertiport). [FAA] [see *vertiport*]

emergency recovery capability

Procedure that is implemented through UA crew command or through design means in order to mitigate the effects of critical failures with the intent of minimising the risk to third parties. This may include automatic pre-programmed course of action to reach a predefined and unpopulated forced landing or recovery area. [NATO]

en route area

The airspace where aircraft can cruise during flight that is away from the terminal areas. [NASA]

envelope

The maximum performance parameters of an aircraft.

error

An omission or incorrect action by the UAS crew or ground staff, or a mistake in requirements, design, or implementation. [NATO]

eVTOL

An electric vertical take-off and landing aircraft.

extended visual line-of-sight (EVLOS)

Operation beyond the unaided visual range of the remote pilot, but where the remote pilot is supported by vision systems or one or more visual observers. [ISO]

failsafe function

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

failure

An occurrence, which affects the operation of a component, part, or element such that it can no longer function as intended, (this includes both loss of function and malfunction).Note: Errors may cause failures or be the result of failures, but are not considered to be failures. [NATO]

failure condition (FC)

1) Failure condition is one or more failures, which affects the aircraft's ability to generate lift or thrust and results in a consequential state that has an impact for a given flight phase. [FAA] 2) A condition having an effect on the UAS, UAS crew, ground staff or third parties, either direct or consequential, which is caused or contributed to by one or more failures or errors considering flight phase and relevant adverse operational or environmental conditions or external events. [NATO]

Catastrophic—Failure conditions that are expected to result in at least uncontrolled flight (including flight outside of pre-planned or contingency flight profiles/areas) and/or uncontrolled crash.OrFailure conditions may result in a fatality to UA crew, ground staff, or third parties. [NATO]

Hazardous—Failure conditions that either by themselves or in conjunction with increased crew workload, are expected to result in a controlled trajectory termination or forced landing potentially leading to the loss of the UA where it can be reasonably expected that a fatality will not occur. Or, Failure conditions for which it can be reasonably expected that a fatality to UAS crew, ground staff, or third parties will not occur. [NATO]

Major—Failure conditions that either by themselves or in conjunction with increased crew workload, are expected to result in an emergency landing of the UA on a predefined site where it can be reasonably expected that a serious injury will not occur.OrFailure conditions which may result in injury to UAS crew, ground staff, or third parties. [NATO]

Minor—Failure conditions that do not significantly reduce UAS safety and involve UAS crew actions that are well within their capabilities. These conditions may include a slight reduction in safety margins or functional capabilities, and a slight increase in UAS crew workload. [NATO]

FAA-Recognized Identification Area (FRIA)

A FRIA is a defined geographic area where drones can be flown without Remote ID equipment. [FAA]

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.

Federal Aviation Administration Safety Team (FAASTeam)

An FAA office responsible for public engagement on various matters of aviation safety. (see FAASafety.gov)

Federal Aviation Administration Tracking Number (FTN)

A reference number of rht Integrated Airman Certification and/or Rating Application (IACDA).

federated

A group of systems and networks operating in a standard and connected environment. In the UAM ecosystem, a federated network leverages commercial services and enables a flexible and extensible construct that can adapt and evolve as the trade space changes and matures . [NASA]

Federated Service Network

A group of service providers sharing information within a federated network to support operating in a common, agreed manner consistent with the approved COPs. [FAA]

field of regard

The total angle where detections can be made by the system. [NATO]

final approach and takeoff (FATO) area

The FATO is a defined, load-bearing area over which the aircraft completes the final phase of the approach, to a hover or a landing, and from which the aircraft initiates takeoff. [FAA]

firmware

Firmware is the control program for the aircraft. 'Software for hardware.'

first officer F/O

In aviation, the first officer (FO) is the *second pilot* (also referred to as the *co-pilot*) of an aircraft. [see *second in command SIC*]

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.

first person view (FPV) device

A device that generates and transmits a streaming video image to a control station display or monitor that gives the pilot of a unmanned aircraft the illusion of flying the aircraft from an on-board pilot's perspective. [ICAO]

first person view (FPV) drone

Drone designed with a FPV camera used for recreation, racing, and videography. FPV drones are generally classified by propeller size. (see *toothpick*, *twig*, and *whoop* in Slang)

first person view (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]

fleet operator

The fleet operator of the aircraft who hires the aircraft crew (if the aircraft fleet operator is not also the aircraft crew) and in some instances performs dispatch duties. A fleet may consist of one aircraft. [NASA]

flight control system

The flight control system comprises sensors, actuators, computers and all those elements of the UAS, necessary to control the attitude, speed and flightpath of the UA. [NATO]

flight controller

[see *control station*]

flight coordinator

An individual who monitors an unmanned aircraft system operating under this part and that can control, initiate emergency actions, or issue commands to the unmanned aircraft during flight. [FAA]

flight duty period

Period which commences when the first remote crew member (3.61) reports for duty that includes a flight or a series of flights and which finishes when the last remote crew member's duty ends. [ISO]

flight envelope protection

A system that prevents the UA from exceeding its designed operating limits. [NATO]

flight geography

Spatially and temporally defined volume of airspace in which the UAS operator plans to conduct the operation under normal procedures; the projection of such volume on the surface of the Earth constitutes the 'flight geography area'. [EASA]

flight information management system (FIMS)

An interface for data exchange between FAA systems and UTM/UAM participants. FIMS enables exchange of airspace constraint data between the FAA and the PSU Network. The FAA also uses this interface as an access point for information on active UAM operations. FIMS also provides a means for approved FAA stakeholders to query and receive post-hoc/ archived data on UAM operations for the purposes of compliance audits and/or incident or accident investigation. FIMS is managed by the FAA and is a part of the UAM ecosystem . [NASA]

flight level

Surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013,2 hPa, and is separated from other such surfaces by specific pressure intervals. [ISO]

flight manual

Manual, acceptable by the local aviation authority, containing the order of actions in normal, abnormal and emergency procedures, checklists, limitations, performance information, details of the aircraft systems. [ISO]

flight modes

Flight modes [also *stabilization modes*] include:

- aerobatic, acro, agility, manual, rate (non-self-leveling)
- air mode (zero throttle)
- altitude hold, ATTI mode, baro, a mode, barometric altitude mode (non-GPS)

- auto mode, autonomous flight, programmed flight, waypoints
- collision avoidance & brake mode
- course lock
- first person view (FPV)
- follow me—mode of operation of a UAS where the unmanned aircraft constantly follows the remote pilot within a predetermined radius [EASA]
- geofencing & safe circle
- GPS hold, loiter mode
- home lock, carefree, head free, headless, heads-up, simple, smart mode [see *headless mode* and *intelligent orientation control*]
- horizon, stable mode (aerobatic with self-leveling)
- hover mode [see *hover mode*]
- magnetic (mag) mode
- positioning mode, p-mode (all sensors activated)
- "quick shot" programmed flight mode (i.e. asteroid, dronie, boomerang, circle/point of interest/orbit, rocket, etc.)
- sport mode, s 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*]

flight recorder

Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation. [ISO]

flight termination system

1) A system that when activated, terminates the flight of an unmanned aircraft. [ICAO] 2) Means and/or procedure triggered manually or automatically to initiate a pre-programmed action or a set of actions designed to terminate UA flight, minimizing risks to third parties. [ISO] 3) A system to immediately terminate UA flight. [NATO]

flight time

Total time from the moment the on-board systems are activated with the intent to perform a flight, until the moment the on-board systems are de-activated. [ISO]

flyaway

1) 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. 2) In respect to a remotely piloted aircraft, an interruption or loss of the C2 link such that the remote pilot is no longer controlling the aircraft and the unmanned aircraft is not flying its preprogramed procedures in the predicted manner. [ICAO] [also *fly away, 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*]

forced landing

A condition resulting from one or a combination of failure conditions that prevents the UA from normal landing on its planned main landing site, although the flight control system is still able to maintain the UA as controllable and manoeuvrable. [NATO]

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.

fully integrated information environment

Information environment and key attributes necessary to effectively deliver services and facilitate information exchange between stakeholders. [FAA]

function

Intended behavior of the UAS based on a defined set of requirements regardless of implementation. It may be further broken down to the lowest defined level of a specific action of a system, equipment, and UA crew that, by itself, provides a completely recognizable operational capability (e.g. an airplane heading is a function). One or more systems may contain a specific function or one system may contain multiple functions. [FAA, NATO]

gender-neutral language

Current → Gender-Neutral

airman/airmen → aircrew, aviator(s)

cockpit → flightdeck

manmade obstacles → structural obstacles

manned aviation → traditional aviation

notices to airmen (NOTAM) → notam, notice to all missions, notice for American airspace, notice to all aviators (NOTAV)

small unmanned aerial system (sUAS) → small uncrewed aerial system, small drone system

unmanned aviation → uncrewed aviation, drone aviation

unmanned aerial system (UAS) → uncrewed aerial system

unmanned aerial vehicle (UAV) → uncrewed aerial vehicle, drone

[FAA Drone Advisory Committee] [see *unmanned*]

general aviation

All civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire. [ICAO]

general aviation operation

Operation of a manned aircraft other than a *commercial air transport operation* or an *aerial work operation*. [ISO]

geo-fence

1) 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). 2) A two-dimensional virtual boundary defined by geographical coordinates that divides a real world volume in two parts. An automatic limitation of the airspace a UA can enter.

[JARUS] 3) A virtual three-dimensional perimeter around a geographic point, either fixed or moving, that can be predefined or dynamically generated and that enables software to trigger a response when a device approaches the perimeter (also referred to as geoawareness or geocaging). [see *flight modes*]

geo-limitation

1) Process of creating boundaries to contain or exclude UAS operations. [ISO] 2) Any limitation applied to a UAS to constrain the unmanned aircraft access to or exit from a defined zone or airspace volume ("geo-limited zone"). [EASA]

geo-limited zone

A geographically limited zone is any zone or airspace volume where a geo-limitation is defined in accordance with the "sensitivity" classification of that zone. (The zones under consideration are "restricted" and "prohibited.") [EASA]

geographic information system (GIS)

System for collection, storage, transformation, analysis, management and display of spatial or geographic data.

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. GPS mode is 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 USD. 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 USD with an average price of around 2,500 USD. 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 USD with an average price of 25,000 USD.

ground control station (GCS)

The associated element that communicates with and controls the unmanned aircraft.

[FAA] [see *control station* and *remote pilot station*]

ground effect

A condition of usually improved performance encountered when the aircraft is operating very close to the ground or a surface. It results from a reduction in upwash, downwash, and/or blade tip vortices, which provide a corresponding decrease in induced drag. [FAA] [also *floating*, *cushioning*]

ground effect zone

The area where proximity to the ground affects an aircraft's performance. For fixed wing, it is half the distance of the wingspan (or less). For 'rotor-craft', it depends on rotor and propeller type and configuration, but the effect is generally low for recreational UAV. The 'suckdown' and 'fountain' currents near the ground can cause a variation in hovering ability, and increased thrust.

gyro

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

gyrocopter / gyroplane

[see *autogyro*]

handover

The act of passing piloting control from one remote pilot station to another. [ICAO, ISO]

hard-locked geo-limitation

Geo-limitation that the automatic function (geo-limitation function) does not allow to be disabled (un-locked) or only by authorized personnel. [EASA]

hazardous material (hazmat)

A material as defined in 49 U.S.C. 5102(2) and 49 CFR 171.8. [FAA]

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 will 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*]

height

Vertical distance of a level, a point or an object considered as a point, measured from a specified datum. [ISO]

helicopter

A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more up to two power-driven rotors on substantially vertical axes. [EASA]

heliport

1) The area of land, water, or a structure used or intended to be used for the landing and takeoff of helicopters, together with appurtenant buildings and facilities. [FAA] 2) An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure, and surface movement of helicopters. [EASA]

helistop

A minimally developed heliport for boarding and discharging passengers or cargo.

hexacopter

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

high-altitude platforms

An unmanned or manned aircraft, airship, or balloon operating in the stratosphere (typically 60,000–100,000 feet), used for telecommunications, surveillance, or environmental monitoring over wide areas.

high-density route

An area of the UOE that is designated for high-density traffic. What differentiates these routes from other parts of the UOE is that they may be limited to aircraft that meet certain performance characteristics in other to enable safe, seamless high-density operation. [NASA]

hobbyist

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

home lock

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

home-built unmanned aircraft system

An unmanned aircraft that an individual built solely for education or recreation. [FAA]

homing

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

hover

An aircraft that is airborne and remaining in one place at a given altitude over a fixed geographical point regardless of wind. [FAA]

Tail-in hover is with the drone tail towards the remote pilot so the flight controls are oriented to the remote pilot's point of view. *Nose-in hover* is with the aircraft front towards the remote pilot, and *side-in hover* is with the aircraft front to either side of the remote pilot.

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*]

hover out of ground effect (HOGE)

The ability to achieve hover without the benefit of the ground or a surface. [FAA]

hover taxi

The movement of a wheeled or skid-equipped helicopter above the surface. Generally, this takes place at a wheel/skid height of 1 to 5 feet (0.3 to 1.5 m) and at a ground speed of less than 20 knots (37 km/h). For facility design purposes, assume a skid-equipped helicopter to hover-taxi. [FAA] (also *air taxi*)

hoverbike, hovercycle

A vehicle that can hover, but that otherwise resembles a motorbike. [see graphic]

Human-on-the-Loop (HOTL)

Human supervisory control of the automation (i.e., systems) where the human actively monitors the systems and can take full control when required or desired. [FAA]

Human-over-the-Loop (HOVTL)

Human informed, or engaged, by the automation (i.e., systems) to take actions. Human passively monitors the systems and is informed by automation if, and what, action is required. Human is engaged by the automation either for exceptions that are not reconcilable or as part of rule set escalation. [FAA]

Human-within-the-Loop (HWTL)

Human is always in direct control of the automation (systems). [FAA]

hybrid

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

hybrid airspace management

The integration of conventional and unmanned traffic within controlled and uncontrolled airspace, ensuring safety and efficiency using advanced algorithms and AI systems.

hybrid VTOL

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

identification

Identification is a means for a third party to positively identify an individual unmanned aircraft in flight without direct physical access to that aircraft; it requires that the unmanned aircraft be capable of interfacing with third party systems. [EASA]

imaginary surfaces

The imaginary planes defined in 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace, centered about the FATO and the approach/departure paths, which are used to identify the objects where notice to and evaluation by the FAA is required. [FAA]

incident

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

inclusion zone

A zone within which UAS operations are permitted and confined. [EASA]

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.

Innovate28 (I28)

Innovate28 (I28) is an FAA initiative that will culminate in integrated AAM operations with OEMs and/or operators flying between multiple origins and destinations at one or more locations in the U.S. by 2028.

innovative air mobility (IAM)

The safe, secure, and sustainable air mobility of passengers and cargo enabled by new-generation technologies integrated into a multimodal transportation system. Commercial and non-commercial operations with *VTOL-capable aircraft* in congested (urban) and non-congested areas. [EASA]

instrument flight time

Time during which a pilot is piloting an aircraft solely by reference to instruments and without external reference points. [ISO]

instrument meteorological conditions

Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions (VMC). [ICAO]

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. [see *flight modes*]

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.

intruder

1) Aircraft within the *surveillance volume* but outside the self-separation threshold. [ISO] 2) An aircraft within the surveillance volume for which a track has been established. [ICAO]

jamming

Jamming specifically refers to intentionally using a transmission-blocking signal to disrupt communications between a UAV and the remote pilot. Once a person jams a UAV, they can force it to do the following:

- Land on the spot, halting any further movement.
- Return to "home" location. This is a normal function of a UAV with GPS and a home location feature. [see counter-UAS]

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.

launch and recovery system

System from which or by means of which an unmanned aircraft is launched or by which it is recovered. [ISO]

leading edge

The foremost edge of an airfoil or propeller blade. (The *trailing edge* is the rearmost edge of an airfoil or propeller blade.)

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.

Life-limited part

Any part for which a mandatory replacement limit is specified by the manufacturer of the unmanned aircraft and is documented in the maintenance instructions. [FAA]

lift and cruise eVTOL

Completely independent thrusters used for cruise vs. for lift without any thrust vectoring. [see graphic]

light remotely piloted aircraft

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

line-of-sight (LOS)

1) 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. 2) A visually unobstructed straight line through space between the transmitter and receiver. In communications, a direct propagation path that does not go below the radio horizon. [NATO]

line-of-sight command and control link

Aircraft system operating within visual/radio range.

loss of control

An unintended departure of an aircraft from controlled flight. It includes control reversal or an undue loss of longitudinal, lateral, and directional stability and control. It also includes an upset or entry into an unscheduled or uncommanded attitude with high potential for uncontrolled impact with terrain. A loss of control means spin, loss of control authority, loss of aerodynamic stability, divergent flight characteristics, or similar occurrence, which could generally lead to crash. [FAA]

loss of flight

A UA's inability to complete its flight as planned, up to and through its originally planned landing. Loss of flight includes scenarios where the UA experiences controlled flight into terrain, obstacles, or any other collision, or a loss of altitude that is severe or non-reversible. [FAA]

lost link

Loss of command and control link contact with the unmanned aircraft such that the remote pilot can no longer manage the flight of the UA. [ISO]

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.

Low-altitude Economy

The emerging market ecosystem enabled by aerial operations below 5,000 feet, including drones, air taxis, and logistics services, driving innovation in urban transport, infrastructure, and data services.

maintenance programme

Document which describes the specific scheduled maintenance tasks and their frequency of completion and related procedures, necessary for the safe operation of the UAS. [ISO]

malfunction

Failure of a system, subsystem, unit, or part to operate in the normal or usual manner. The occurrence of a condition whereby the operation is outside specified limits. [NATO]

manned aircraft

Aircraft which is intended or designed to be operated with at least one human pilot on board. [ISO]

Mayday

The ultimate international radio distress call, indicating imminent danger to the life of the occupants onboard and requiring immediate assistance.

maximum take-off mass (MTOM)

Maximum UA mass, including payload and fuel, as defined by the manufacturer or the builder, at which the UA can be operated. (EASA)

meaconing

[see spoofing]

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.

mode 1, mode 2

[see *stick*]

model aircraft

1) 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, ANSI]

2) UA that is capable of sustained flight in the atmosphere and that is used exclusively for leisure flights, air displays, sport or competition activities. [ISO]

modular/swappable battery system

A design where battery units can be quickly removed and replaced with charged ones, enabling minimal downtime for electric aircraft or vehicles. This supports efficient operations, particularly in high-frequency environments like UAM.

monitoring

Process of observing on a regular basis over a period of time. [ISO]

multicopter, multi-copter, multi-rotor

1) An aircraft with two or more main rotors. 2) Rotorcraft lifted by more than two power driven rotors on substantially vertical axis. [ISO] [see graphic]

nadir

The point of the celestial sphere which is directly beneath an observer, i.e., opposite zenith. [see *orthographic*]

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.

Class A Airspace—18,000 feet up to and including flight level (FL) 600.

Class B Airspace—Typically surface to 10,000 feet above airport elevation surrounding the nation's busiest airports in terms of airport operations or passenger enplanements.

Class C Airspace—Surface to 4,000 feet above airport elevation surrounding those airports that have an operational control tower, are served by a radar approach control, and have a certain number of IFR operations or passenger enplanements.

Class D Airspace—Surface to 2,500 feet above airport elevation surrounding those airports that have an operational control tower.

Class E Airspace—Controlled airspace that is not Class A, B, C, or D.

Class G Airspace—Uncontrolled airspace—that which is not subject to air traffic control. Uncontrolled Airspace does not mean it is unregulated airspace. [FAA]

network

"Network," "network-based requirement," "network solution," "network framework," and "network transmission" typically refer to the transmission of remote identification message elements through an Internet connection to a Remote ID USS.

night

Period between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise as may be prescribed by an aviation authority. [ISO]

No Drone Zone

[see *No Fly Zone*]

No Fly Zone

Areas where aircraft are prohibited by government regulation. [see *Prohibited Zone*]

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.

non-cooperative aircraft

Aircraft that do not have an electronic means of conspicuity (i.e., a transponder) aboard or not operating such equipment due to malfunction or deliberate action. [ISO] Aircraft that do not contain operable equipment for the purposes of identification. [NATO]

nose-in hover

[see *hover*]

Notice to Air Missions (NOTAM)

[Formerly Notice to AirMen] A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. [ICAO] [Notices to Air Missions for drones are DROTAMs]

oblique aerial photo

Photograph taken at any angle other than vertical. [see *orthophoto*]

obstacle

All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that: are

located on an area intended for the surface movement of VTOL-capable aircraft; extend above a defined surface intended to protect VTOL-capable aircraft in flight; or stand outside those defined surfaces but, nonetheless, are assessed as a hazard to air navigation. [EASA]

obstruction to air navigation

Any fixed or mobile object, including a parked aircraft, of greater height than any of the heights or surfaces presented in subpart C of 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace. [FAA]

octocopter

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

one-way attack drone (OWA-UAV)

A loitering munition (also known as a suicide drone or kamikaze drone) is an aerial weapon system category in which the munition can loiter (wait passively) around the target area for some time and attacks only once a target is located.

operational control

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. [ISO]

operational envelope

Defines boundaries in terms of speed, altitude and load factor within which the UAS must be capable of operating in order to accomplish its missions. [NATO]

operational intent

1) A volume-based representation of airspace encapsulating the intended flight path for an unmanned aircraft operation, comprising one or more overlapping or contiguous 3-dimensional volumes of airspace combined with a beginning and ending time for each volume. [FAA] 2) Also referred to as operation intent, the future operational position information, consisting of spatial and temporal elements, that is exchanged between xTM operators to support cooperative traffic management. [FAA]

operational volume

Volume of airspace in which the aircraft is proposed to operate, defined by points on the ground and altitudes. [ISO]

operating manual

Publication issued by the manufacturer which contains detailed data and instructions related to the design, installation, operation and maintenance of equipment. [ISO]

operational risk management

Continual cyclic process which includes risk assessment, risk decision making and implementation of risk controls, which results in acceptance, mitigation, or avoidance of risk. [ISO]

operational tempo

The density, frequency, and complexity of operations. Tempo evolves from a small number of low complexity operations to a high density and high rate of complex operations . [FAA]

operations manual

Publication issued by the operator under its responsibility, containing procedures, instructions and guidance for use by operational personnel in the execution of their duties. [ISO]

operations personnel

A person who is performing a safety function employed by, or used by, an operator. [FAA]

operations specification

Authorization, condition and limitation associated with the RPAS *operator* certificate and subject to the conditions in the *operations manual*. [ISO]

operator

1) Person, organization or enterprise engaged in or offering to engage in an operation of an unmanned aircraft system. [ISO] Note—In the context of remotely piloted aircraft, an aircraft operation includes the remotely piloted aircraft system. [ICAO] 2) A person that conducts operations. [FAA]

optionally piloted aircraft

Aircraft that may be operated by an on-board pilot or by a remote pilot. [ISO] [also *optionally piloted vehicle OPV*]

optionally piloted vehicle (OPV)

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

ornithopter

A form of aircraft heavier-than-air, deriving its chief support and propelling force from flapping wings.

orthophoto

An aerial photograph or satellite imagery geometrically corrected ("orthorectified") such that the scale is uniform: the photo or image follows a given map projection. [also *orthophotograph*, *orthoimage*] [see *oblique aerial photograph*]

over-the-horizon

The condition where the control station and the ROA [drone] are beyond the line-of-site from each other.

package delivery

The delivery of goods, materials, or supplies from a business or commercial location to a residential or business end user. [FAA]

Part 101

U.S. Code of Federal Regulations 14 Aeronautics and Space, Part 101 regulates moored balloons, kites, amateur rockets, unmanned free balloons, and certain model aircraft. [FAA]

Part 107

U.S. Code of Federal Regulations 14 Aeronautics and Space, Part 107 regulates small unmanned aircraft systems. [FAA]

Part 135

U.S. Code of Federal Regulations 14 Aeronautics and Space, Part 135 regulates commercial operations of on-demand and commuter aircraft, including air taxis and charters, focusing on safety, pilot certification,

maintenance, and operational standards for smaller-scale aviation services. [FAA]

passive surveillance

Surveillance that does not employ signal transmission from the surveillance equipment. [NATO]

pax

Passenger or passengers. A person who travels in a vehicle but bears little or no responsibility for the tasks required for that vehicle to arrive at its destination or otherwise operate the vehicle.

payload

1) All elements of an unmanned aircraft that are not necessary for flight but are carried for the purpose of fulfilling specific mission objectives. [ISO] 2) That part of the useful load from which revenue is derived, viz. passengers and freight. 3) Any instrument, mechanism, equipment, part, apparatus, appurtenance, or accessory, including communications equipment, that is installed in or attached to the aircraft, and is not used or intended to be used in operating or controlling an aircraft in flight, and is not part of an airframe, engine, or propeller. [EASA]

payload link

Data link for up-linking command instructions to the unmanned aircraft *payload* and *down-linking* payload data, which is not critical to the safe operation of the unmanned aircraft system. [ISO]

performance authorization

An FAA regulatory approval for fleet operators to perform a specific UAM operation. A performance authorization substantiates the fleet operator's ability to meet performance capabilities in their intended area of operation. The FAA grants a performance authorization when a fleet operator's proposed assets (including potentially both ground and air assets) are sufficient to meet an established level of performance in the airspace in which they intend to operate. Performance authorization requests must be submitted by the fleet operator, not a PSU or other entity, regardless of whether the PSU or SDSP will provide services or capability/technology packages to support the fleet operator's ability to meet the performance requirements. [NASA]

performance limitation

A constraint applied to a UAS operational capability. Such limitations can, for example, relate to height, speed, endurance or distance from the operator. [EASA]

permanent areas

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 Pilot in Command (PIC). [FAA]

phonetic alphabet

Codewords assigned acrophonically to the letters of the English alphabet, so that letters and numbers would have distinct names that would be most easily understood by those who exchange voice messages by radio or

telephone, regardless of language differences or the quality of the communication channel. [ICAO] [also *alpha code*, *NATO Phonetic Alphabet*] [see graphic]

pillar

The integration of UAM into the NAS is complex; NASA has broken down the challenges into five areas, termed "pillars," where technical progress needs to be made.

pilot

1) *noun* The person in direct control of the aircraft. 2) *verb* Manipulate the flight controls of an aircraft during *flight time*. [ISO] [see *aviator*]

pilot-in-command (PIC)

1) 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. 2) An individual, human person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC by the fleet operator, and holds the appropriate licenses and qualifications to conduct the flight. A PIC may be on or off-board the aircraft. [NASA] 3) A designated crewmember who is responsible for the safe operation of a small unmanned aircraft system and has final authority over than operation. [FAA]

pilotage

Determining course and position by reference to visible landmarks. [see *contact flight*]

pinching

Drone flight control using forefingers and thumbs to operate the sticks. [see graphic]

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*]

positive flight control (PFC)

A situation where the pilot is always assured of having line-of-sight or over-the-horizon command and control communication capability.

powered life

A heavier-than-air aircraft capable of vertical takeoff, vertical landing, and low speed flight that depends principally on engine-driven lift devices or engine thrust for lift during these flight regimes and on nonrotating airfoil(s) for lift during horizontal flight. [FAA]

pre-flight inspection

The inspection carried out before flight to ensure that the UA is fit for the intended flight. [EASA]

privately built UAS

A UAS assembled or manufactured for the builder's own use, not including UAS assembled from a set of parts placed on the market by the manufacturer as a single ready-to-assemble kit. [see home-built UAS]

prohibited area/zone

Airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is prohibited. [ICAO/EASA] [also *no fly zone* and *no drone zone*]

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*]

propeller wash

Back blast from aircraft *propellers*. [also *prop wash*] [see *downwash, rotorwash, slipstream, wake*]

prosumer

Drones commonly used for recreational flying as well as commercial flight operations.

provider of services for UAM (PSU)

1) An entity that assists UAM operators with meeting UAM operational requirements to enable safe and efficient use of UAM Corridors and vertiports. This service provider shares operational data with stakeholders and confirms flight intent. [FAA] 2) Public or private (e.g., third-party) entities that provide ATC and flight safety services under rules and regulations established by the FAA. Services provided by PSUs include routing, traffic deconfliction, operational constraints, modifications, notifications, and information. A PSU is analogous to a USS in the UTM paradigm and is contracted by the fleet operator (i.e., airspace user). [NASA]

Provider of Services to UAM (PSU) network

The amalgamation of PSUs connected to each other and exchanging information. Each PSU is required to share certain information with the other PSUs to provide a complete operating picture and situational awareness.

public unmanned aircraft system

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, quadricopter* see graphic]

qualified entity (QE)

Accredited legal or natural person which is authorized to execute certain certification or oversight tasks by and under the control and the responsibility of an aviation authority. [ISO]

quiet rotor technology

Engineering the sound of silence. Quiet rotor designs reduce noise pollution from drones and eVTOLs, helping urban skies stay livable and communities more accepting of new aircraft.

radio line of sight (RLOS)

1) A direct electronic point-to-point between a transmitter and receiver. 2) Direct electronic contact through radio waves between a transmitter and a receiver, when both are under the control of an UAS *operator*. [ISO]

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*]

reference aircraft

A VTOL aircraft that integrates certain design characteristics of emerging aircraft currently in development and performance characteristics of three currently in development and made available for testing. [FAA]

registration

A means for a third party to positively identify an individual unmanned aircraft and its owner by direct physical inspection of the aircraft; it does not require capability to be built into the UAS. [EASA]

Regional Air Mobility

The longer distance version of AAM. RAM focuses on air travel over distances of 150–800 km, using small aircraft (5–50 passengers or cargo equivalents) and regional airports to improve connectivity. [see *Rural Air Mobility*, *Urban Air Mobility*]

remain-well-clear

1) The ability to detect, analyze and maneuver in order to ensure that a UA is not being operated in such proximity to other aircraft as to create a collision hazard. 2) A function used to alert the pilot of the need to take action, as approved by ATC if subject to an ATC clearance, and optionally by generating one or more recommended manoeuvres, to pass well clear. [ICAO]

remote co-pilot

Remote pilot serving in any piloting capacity other than as a remote *PIC* but excluding a remote pilot who is an operating crew member for the sole purpose of receiving flight instruction. [ISO]

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 crew

The remote pilot in control of the UA and any other personnel actively involved in the operation of the UA. [EASA]

remote crew member

Crew member charged with duties essential to the operation of an unmanned aircraft (3.79), during *flight time*. [ISO]

remote cruise relief pilot

Remote crew member who is assigned to perform remote pilot tasks during cruise flight, to allow the *remote pilot-in-command* to obtain planned rest. [ISO]

remote ID

Remote ID is the ability of a drone in flight to provide identification and location information that can be received by other parties. [FAA]

remote identification system

A system that ensures the local broadcast of information about a UAS in operation, including the marking of the UAS, so that this information can be obtained without physical access to the UAS. [German Federal Ministry for Digital and Transport]

remote pilot (RP)

1) The person who manipulates the flight controls of a remotely-piloted aircraft during flight time. [ISO] 2) A person charged by the operator with duties essential to the operation of an unmanned aircraft and who manipulates the flight controls, as appropriate, during flight time. [ICAO] 3) A natural person responsible for safely conducting the flight of a UA by operating its flight controls, either manually or, when the UA flies automatically, by monitoring its course and remaining able to intervene and change its course at any time. [EASA] [also remote pilot-in-command RPIC]

remote pilot competence

Combination of skills, knowledge and attitudes required to perform a task to the prescribed standard. [EASA]

remote Pilot in Command (RPIC)

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] 2) The remote pilot designated by the operator as being in command and charged with the safe conduct of a flight. [ICAO, ISO] 3) Person who is directly responsible for and is the final authority as to the operation of the UAS; has been designated as remote pilot in command before or during the flight of a UAS; and holds the appropriate CAA certificate for the conduct of the flight. [ASTM]

remote pilot station (RPS)

1) Station at which the remote pilot manages the flight of an unmanned aircraft. [ISO] 2) The component of the remotely piloted aircraft system containing the equipment used to pilot the remotely piloted aircraft. [ICAO] [see control station]

remotely operated aircraft (ROA)

[see *remotely piloted aircraft*]

remotely piloted

Controlled from a pilot station which is not on board the aircraft. [ISO]

remotely piloted aircraft (RPA)

1. An aircraft which is piloted from a remote pilot station. [ICAO, ISO, EASA] 2. An unmanned aircraft that is controlled from a remote pilot station by a pilot who has been trained and certified to the same standards as a pilot of a manned aircraft. [NATO] [see *unmanned aerial vehicle*]

remotely piloted aircraft (RPA) observer

Remote crew member who, by visual observation of the unmanned aircraft, assists the remote pilot in the safe conduct of the flight. [ISO] [see *visual observer VO*]

remotely piloted aircraft system (RPAS) operator certificate [ROC]

Certificate authorizing an *operator* to carry out specified RPAS operations. [ISO]

remotely piloted aircraft system (RPAS)

1) 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. [ISO] Remotely piloted aircraft systems weigh less than 150 kilograms [330 pounds]. 2) A remotely piloted aircraft (RPA), its associated remote pilot stations (RPS), the required command and control (C2) links and any other components as specified in the type design. [ICAO, EASA] [see *unmanned aircraft system*]

resolution maneuver

Any maneuver to remain well clear from or avoid collision with another airspace traffic. [NATO]

restricted area/zone

Airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions. [ICAO]

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*]

risk mitigation

The process of incorporating defenses or preventive controls to lower the severity and/or likelihood of a hazard and the projected consequences. [ICAO]

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*] [see graphic]

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*]

rotor diameter (RD)

The largest length of all the rotors from tip to tip. It can be computed by finding the diameter of the smallest circle enclosing all the lift producing propulsion units, including their propellers, rotors, fans, etc., on a horizontal plane, while the aircraft is in the vertical takeoff or landing configuration, with rotors/propellers/fans turning, if applicable. The RD must also incorporate all landing gear and surface touch points. [FAA] (see Vertiports infographic)

rotorcraft

1) A heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors. 2) A power-driven, heavier-than-air aircraft that depends principally for its support in flight on the lift generated by up to two rotors. [EASA] [see *rotary-wing aircraft*]

rotorwash

Down blast from aircraft *rotors*. [see *propwash, slipstream, wake*]

route plan (RP)

A set of waypoints for the aircraft to follow.

rural air mobility (RAM)

1) 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, fractional and shared ownership models, peer-to-peer (P2P) service, and personally owned aircraft. 2) Illustrating the challenges associated with rural mobility, the US Department of Transportation's (DOT) Essential Air Service program (EAS) was established after the Airline Deregulation Act to guarantee small communities adequate access to transportation options by certificated air carriers. eVTOLs have the potential to provide rural-urban connectivity in a more efficient and cost effective way. [NATA] [see *regional air mobility*, *urban air mobility*]

safe distance

The minimum distance that is necessary to avoid a collision hazard with another aircraft. [FAA]

safety

The state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level. [ICAO]

safety area

1) Area is a defined area surrounding the FATO intended to reduce the risk of damage to aircraft accidentally diverging from the FATO. [FAA] 2) A defined area on a vertiport, which surrounds the final-approach and takeoff area (FATO) and is free of obstacles, other than those required for air navigation purposes, and which is intended to reduce the risk of damage to VTOL-capable aircraft accidentally diverging from the FATO. [EASA]

second in command (SIC)

A human onboard the aircraft with secondary and tertiary operational responsibility behind aircraft automated systems and the PIC. In instances where an onboard SIC exists, it is assumed that the PIC is operating in a remote capacity. The SIC has more responsibility than an aircraft steward and is fully trained and qualified for the assigned roles and responsibilities. A SIC does not require the same qualifications as a PIC. The SIC is a necessary role to build the safety case for a single PIC with operational control for more than one aircraft at a time. [NASA]

segregated airspace

Airspace of specified dimensions allocated for exclusive use to a specific user(s). [ICAO, ISO]

sense and avoid

Detect and Avoid of other aircraft in flight for unmanned aircraft systems. [NATO] [see *detect and avoid*]

sense and avoid capability

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*]

separation minima

The minimum displacements between an aircraft and a hazard which maintain the risk of collision at an acceptable level of safety. [ICAO]

separator

The agent responsible for separation provision for a conflict and can be either the airspace user or a separation provision service provider. [ICAO]

serious injury

An injury that qualifies as Level 3 or higher on the *Abbreviated Injury Scale* (AIS) of the Association for the Advancement of Automotive Medicine. An AIS Level 3 injury is one that is reversible, but usually involves overnight hospitalization. [FAA]

service environment(s)

Refers collectively to the distinct regulatory, procedural, and supporting automation mechanisms through which services (e.g., conflict management, flow management) are provided. In the future, the NAS is envisioned to include the current (i.e., traditional) ATS environment as well as incorporate a complementary, cooperative xTM services environment.

settling with power

[see *vortex ring state*] [see graphic]

shielded operation

An operation of an aircraft within 100 m of, and below the top of, a natural or man-made object. [ICAO]

shipboard vertiport

A vertiport located on a ship that may be purpose or non-purpose-built. A purpose-built shipboard vertiport is one designed specifically for VTOL aircraft operations. A non-purpose-built shipboard vertiport is one that utilizes an area of the ship that is capable of supporting a VTOL aircraft but not designed specifically for that task.

side-in hover

[see *hover*]

simplified vehicle operations (SVO)

A concept where a pilot onboard supervises flight operations and intervenes only as needed. Once the flying public becomes comfortable with automation, it will be possible to take the pilot offboard and put them in an operations center to supervise the aircraft remotely.

situational awareness (SA)

1) An all-encompassing term for keeping track of what's happening when flying. 2) The ability to keep track of the prioritized significant events and conditions in the environments of the subject. [ICAO]

skyport

[see *vertiport*]

slipstream

The stream of air driven astern by the propeller. [see *propeller wash*]

small unmanned aircraft (UA)

1) 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, ANSI] 2) Any unmanned aircraft with a maximum takeoff mass of less than 25 kg. [EASA]

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 airspace system. [FAA, ANSI]

small unmanned surveillance aircraft (SUSA)

[see *remotely piloted aircraft*]

soft locked geo-limitation

Geo-limitation that the automatic function (geo-limitation function) allows to be disabled (un-locked) by any user, under specific conditions. [EASA]

solo

To fly alone, or to be in complete command of an aircraft.

solo flight time

Flight time during which a student remote pilot is piloting the RPA without receiving RPA flight instruction. [ISO]

sonar obstacle avoidance

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

spinner

A streamlined fairing fitted over a propeller hub or at the center of a turbofan engine. [also *nose spinner*]

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*]

spoofing

Spoofing a UAS refers to a third party taking over the UAV remotely by impersonating the remote control. It involves emitting a signal that is supposed to confuse the drone so that it thinks the spoofing signal is legitimate (when in fact it isn't). Done correctly, spoofing allows a third party to do the following:

- Take over the UAV and direct the flight.
- Download data from the UAV or view its camera feed. [see counter-UAS]

Meaconing is a type of spoofing where GNSS signals are re-transmitted.

spotter

Flight crew member responsible for keeping drone in visual line of sight while operator uses first person view. [see *visual observer*]

stabilization mode

[see *flight modes*]

state aircraft

Aircraft when carrying out military, customs, police, search and rescue, firefighting, coastguard or similar activities or services under the control and responsibility of a State, undertaken in the public interest by a body vested with public authority powers. [ISO]

state safety programme (SSP)

An integrated set of regulations and activities aimed at improving safety. [ICAO]

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). Mode 1 transmitters: This throttle is located on the

right transmitter stick, and is most commonly found in the U.K. Mode 2 transmitters: This throttle is located on the left transmitter stick, and is most commonly found in the U.S.

strategic conflict detection

The process of identifying overlapping operational intents among unmanned aircraft. [FAA]

strategic conflict resolution

The process of resolving overlapping operational intents among unmanned aircraft. [FAA]

strategic deconfliction

1) The use of an interoperable strategic conflict detection and resolution capability to mitigate the risk of collision between participating unmanned aircraft. The process of arranging, negotiating, and prioritizing Operational Intent (e.g., volumes, routes, trajectories, time assignments) of aircraft to minimize the likelihood of airborne conflicts between operations. [FAA] 2) First-level conflict management to deconflict the intended routes of UAM operations to provide separation and avoid collision during flight. Strategic is used here as "in advance of tactical." Strategic deconfliction efforts typically prior to departure and will typically be provided by the PSU Network. [NASA]

supplemental data service provider (SDSP)

Data sources external to the PSUs that supplement the decision-making and information-sharing of the PSU and fleet operator. These can include weather sources and ground risk assessments, among others. PSUs can access SDSPs via the PSU Network for essential or enhanced services (e.g., terrain and obstacle data, specialized weather data, surveillance, constraint information). SDSPs may also provide information directly to PSUs or fleet operators through non-PSU Network sources (e.g., public or private internet sites). [NASA]

surveillance volume

Volume which describes the effective limits (e.g. range, elevation, azimuth) of the surveillance system. [ISO]

swarm

Two or more UA whose motion is mutually and automatically coordinated, while the remote pilot controls all of them through a single remote pilot station. [ISO] (see *drone swarming*)

switchover

Operation that consists of performing the transfer command and control from one data link channel to another channel with the same remote pilot station. [ISO]

tactical deconfliction

1) The process of executing one or more actions to avoid an airborne conflict in a timely manner when strategic deconfliction has failed or was not executed. [FAA] 2) Second-level conflict management to deconflict UAM operations during flight to maintain separation and avoid collisions. Whereas strategic deconfliction occurs prior to departure, tactical deconfliction occurs during flight. [NASA]

tail-in hover

[see *hover*]

target average conformance

The process of monitoring an operator's ability to fly in accordance with its operational intents over a defined period of time. [FAA]

terminal area

The immediate vicinity around a UAM aerodrome or airport where departures and landings occur.

test range

A defined geographic area where research and development are conducted. [FAA]

tethered unmanned aircraft

UA which can have power and/or signal supply from the ground, whose range of movement is limited by a rope, chain or other similar device fastened to a fixed object [ISO]

third party

An individual or organization other than the operator of the UAS. [EASA]

third-party vendor

An entity that provides a distributed software capability necessary for a certificated service provider to meet the requirements of this part but for which the certificated service provider does not have direct control over the personnel, software code, or organizational processes. Examples of third-party vendors, as defined by FAA in this part, would include cloud storage providers, cloud database infrastructure providers, and cloud-based network monitoring tools. When appropriate, certificated service providers may leverage third-party vendors to develop, deploy, update, or repair authorized services. [FAA]

thumbing

Drone flight control using thumbs to operate the sticks. [see graphic]

tiltrotor

An aircraft that combines the vertical lift capability of a helicopter with the speed of a turboprop plane. As the name implies, it uses tiltable (rotating) propellers, or proprotors, for lift and propulsion. For vertical flight the proprotors are angled to direct their thrust downwards, providing lift. In this mode of operation the craft is essentially identical to a helicopter. As the craft gains speed, the proprotors are slowly tilted forward, eventually becoming perpendicular to the ground. In this mode the wing provides the lift, and the wing's greater efficiency helps the tiltrotor achieve its high speed. In this mode, the craft is essentially a turboprop aircraft.

tip path

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

touchdown and liftoff (TLOF) area

The TLOF is a load bearing, generally paved area centered in the FATO, on which the aircraft performs a touchdown or liftoff. [FAA] [see *vertipad* and *VTOL-capable aircraft stand*.

track

Actual flight path of aircraft above ground.

tracking

The act of continuing identification of an UAS and following of its localization over a period of time. [EASA]

trailing edge

[see *leading edge*]

transferring remote pilot

Remote pilot who transfers responsibility for the continuation of flight, during *handover* to the next RPS. [ISO]

transforming vehicle

A vehicle that can drive on the road and fly, e.g. a flying car. [EASA]

translational lift

The improved rotor/propeller efficiency resulting from directional flight. [FAA] Translational lift also helps prevent and recover from *vortex ring state*.

tricopter

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

true altitude

[see *altitude*]

Type Certificate

An official approval issued by aviation authorities confirming that an aircraft design meets all safety and regulatory standards, allowing it to be manufactured and operated legally.

U-space

The U-space is a geographical zone for UAS designated by European Union Member States, where UAS operations are only allowed to take place using U-space services. [German Federal Ministry for Digital and Transport]

uncontrolled crash

A condition resulting from one or a combination of failure conditions that prevents the flight control system from maintaining the UA controllable and manoeuvrable until impact on the ground. [NATO]

uncontrolled flight

A condition resulting from one or a combination of failure conditions that result in loss of UA control and/or manoeuvrability. Uncontrolled flight includes flight outside of pre-planned or contingency flight profiles/ areas. [NATO]

unmanned

The FAA has called for the aviation industry to adopt gender neutral terminologies and several major companies and organizations swapped unmanned for uncrewed. NIST is also considering removing gender-specific terminology. The automotive industry avoided this issue by selecting driverless or autonomous as the primary descriptor. NASA recommends using human/robotic or piloted/ unpiloted for spacecraft, or crewless. (Terminology for 21st Century Technologists)

unmanned aerial vehicle (UAV)

An unmanned aerial vehicle, commonly known as a drone , 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)

1) An aircraft operated without the possibility of direct human intervention from within or on the aircraft. [FAA, ANSI] 2) Aircraft which is designed to be operated remotely or autonomously. [ISO] 3) Any aircraft to be flown without a pilot on board is an unmanned aircraft. They can be remotely and fully controlled from another place (ground, another aircraft, space) or pre-programmed to conduct its flight without intervention. [ICAO] 4) The term unmanned aircraft (UA) may refer

to a remotely piloted aircraft, an autonomous aircraft, or a model aircraft. As used within the ANSI Roadmap, unless otherwise specified, UA, UAV, and UAS are synonymous with remotely piloted aircraft and RPAS, respectively. (ANSI) 5) Any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board. Unmanned aircraft (UA) are aircraft but they have lots of different styles and capabilities that include RPA, these are sometimes referred to as drones in the common vernacular. Regulators need to be able to distinguish between the different categories. Using specific terminology is helpful to distinguish types of aircraft and their capabilities. ICAO is making a clear distinction between those UA that can be accommodated in airspace by keeping them away from other aircraft and those that can be integrated in airspace alongside manned aircraft (i.e. RPA). RPA will be subject to all the same equipage and certification requirements as manned aircraft operating in the airspace/or conducting procedures; they will have the same separation standards. In other words, RPA act like and are treated like manned aircraft. UA that cannot meet these requirements will be dealt with separately. They can be accommodated in airspace with appropriate consideration given to the risk they pose to other aircraft, people and property on the ground. [ICAO] 6). An aircraft that does not carry a human operator and is operated remotely using varying levels of automated functions. Notes: 1. Unmanned aircraft can be expendable or recoverable. 2. Unmanned aircraft may carry a lethal or non-lethal payload. 3. Cruise missiles are not considered unmanned aircraft. [NATO]

unmanned aircraft classification

- aerostat
- airships
- glider
- gyroplane
- multicopter
- parawing, flapping-wing (ornithopter) and other bio-inspired aircraft
- powered fixed-wing plane (or aeroplane)
- single rotor helicopter
- tethered heavier than air aircraft (e.g. kites)
- tethered or free aerostatic balloons
- vertical take-off and landing (VTOL), other than helicopter or multicopter
- others [ISO]

unmanned aircraft observer

[See *visual observer*]

unmanned aircraft system (UAS)

1) An unmanned aircraft and its associated elements (including communication links and the components that control the unmanned aircraft) that are required for the safe and efficient operation of the unmanned aircraft in the national airspace system. [FAA, ANSI] 2) Aircraft and its associated elements which are operated remotely or autonomously. [ISO] An unmanned aircraft and its associated components. [ICAO] 3) An unmanned aircraft (UA) and the equipment to control it remotely. [EASA] [also *remotely piloted aircraft system*] [see graphic] 4) A system whose components include the unmanned aircraft, the supporting network and all equipment and personnel necessary to control the unmanned aircraft. [NATO]

unmanned aircraft system, lightweight

Unmanned small aircraft that are approved for operation under the authority of a CAA (for example, UAS approved to operate by the FAA under 14 CFR Part 107, UAS approved to operate by EASA as Open and Specific Category UA, and UAS approved to operate by CASA as Small, Medium, or Large RPA, or combinations thereof). [ASTM]

unmanned aircraft system (UAS) operator

The individual in the Air Vehicle Control Station tasked with overall responsibility for operation and safety of the UAS. Equivalent to the pilot in command of a manned aircraft. [NATO]

unmanned aircraft system traffic management (UTM)

1) 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] 2) A specific aspect of air traffic management which manages UAS operations safely, economically and efficiently through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions.

unmanned aircraft system traffic management (UTM) system

1) The manner in which the FAA will support operations for UAS operating in low-altitude airspace. [FAA] 2) A system that provides UTM through the collaborative integration of humans, information, technology, facilities and services, supported by air, ground or space -based communications, navigation and surveillance.

unmanned free balloon

Non-power-driven, unmanned, *lighter-than-air aircraft* in free flight. [ISO]

up-link

Direct or indirect data link to the unmanned aircraft. [ISO]

update, major

A change to the software version that includes substantial changes to the application programming interface (API), or the features and functionality, such that the new version is not backward compatible with previous versions. Major updates include a new API endpoint or signature. They constitute significant revisions and may fundamentally change what the service does or how it supports operators. An aircraft operator who does not make the required changes to support the new version of a major software update would lose functionality of the service after the update. [FAA]

update, minor

A change to the software version that changes the API, may include new features or functionality, and remains backward compatible. As a minor update may substantively change a service's features and

functionality, users may be required to make changes to their aircraft and AE to integrate the minor version update properly. An aircraft operator who does not make the required changes would remain unaffected by the minor software update while operating on the older version. [FAA]

update, patch

A change to the software version that does not change the API and is used for backward-compatible bug fixes and performance improvements. Patch updates often improve performance, fix bugs, or address security vulnerabilities but do not change the overall functionality or features of the service. [FAA]

urban

A functional urban area consists of a city and its commuting zone. Functional urban areas therefore consist of a densely inhabited city and a less densely populated commuting zone whose labour market is highly integrated with the city. [OECD]

urban air corridors

Predefined pathways in urban environments designated for low-altitude air mobility operations, ensuring separation from ground infrastructure and minimizing noise impact.

urban air mobility (UAM)

1) 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: business-to-consumer (B2C) service, fractional and shared ownership models, peer-to-peer (P2P) service, and personally owned aircraft. 2) UAM is envisioned as on-demand air transportation within core urban areas and residential suburban destinations outside city centers using new, electric-powered, vertical takeoff and landing (eVTOL) aircraft. [NATA] 3) Our vision of UAM is a safe, efficient, convenient, affordable, and accessible air transportation system for passengers and cargo that revolutionizes mobility around metropolitan areas. This vision includes everything from small package delivery drones to passenger-carrying air taxis that operate above populated areas. [NASA] 3) A subset of Innovative Air Mobility (IAM) operations conducted into, within or outside congested (urban) areas. Urban Air Mobility is a new air transportation system for passengers and cargo in and around densely populated and built-up environments, made possible by vertical take-off and landing electric aircraft (VTOL) equipped with new technologies, such as enhanced battery technologies and electric propulsion. These aircraft will have a pilot on board or be remotely piloted. UAM can be understood as a subset of AAM, which covers transportation systems that move people or cargo by air in and around urban environments. [EASA] [see *rural/regional air mobility*] Very-low altitude airborne traffic, above populated areas, at scale, that is sustainably integrated with surface mobility systems. [UIC2] (see *innovative air mobility*) [see graphic]

urban air mobility (UAM) aerodrome

A specifically defined area that is intended for the arrival, departure, and ground movement of UAM aircraft.31Because of the VTOL/eVTOL nature of many UAM aircraft, most UAM aerodromes look more like today's heliports with landing pads as opposed to long runways. [NASA]

urban air mobility (UAM) aerodrome operators

UAM aerodrome operators are entities responsible for ensuring the safety of individual TLOA, as well as any ground services (embarkation, disembarkation, maintenance, etc.) provided at a UAM aerodrome. UAM aerodrome operators may be private or public entities. [NASA]

UAM Aircraft

An aircraft that chooses to participate in UAM operations. [FAA]

UAM Corridor

A specific type of CA, as an airspace volume within which cooperatively managed operations can occur. ATC ensures separation of non-participating aircraft from the cooperative operations and/or CA. It is comprised of an airspace volume defining a three-dimensional route, possibly divided into multiple segments, with associated performance requirements.

urban air mobility (UAM) maturity level (UML)

A NASA-developed framework categorizing anticipated evolutionary stages of a UAM transportation system from the beginning state to a highly developed state where UAM is a ubiquitous capability, similar to automobiles today. This framework includes six maturity levels, with UML-1 representing the earliest maturity level and UML-6 representing full ubiquity. The ConOps focuses on UML-4, an intermediate state, where hundreds of operations could be occurring at any given time within a single metropolitan area. [NASA]

UAM Operation

A specific type of cooperative operation that occurs within a UAM Corridor and is conducted in compliance with UAM specific rules, procedures, performance requirements, and COPs.

urban air mobility (UAM) operations environment (UOE)

The UOE is a flexible airspace volume encompassing the areas of high UAM flight activity. UOE is a UTM-inspired construct and is not a separate airspace class. The UOE is deliberately designed for each local area to accommodate UAM flights. The UOE may extend into portions of actively ATC-controlled airspace (i.e., the Class B, C, or D airspace surrounding an airport) to enable UAM flights to access this airspace without burdening ATC. Such access may be necessary for UAM flights to access a UAM aerodrome collocated with a commercial airport.) [NASA]

UAM Operator

The person or entity responsible for the overall management and execution of one or more UAM operations. The operator plans operations, shares flight information (e.g., planning, live flight), and ensures infrastructure, equipment, and services are in place to support safe execution of flight. Throughout this document, “UAM operator” is often used to describe the roles and responsibilities of the UAM Code of Federal Regulations (CFR) Title 14, Part 135 carrier, the RPIC/PIC, or conflict management automation to avoid allocating prematurely and allow for evolution of the role. [FAA]

urban canyon

Locations in the urban setting between buildings, such as where a street is flanked by tall buildings. Weather in urban canyons can differ from the surrounding areas outside, particularly with respect to temperature, wind patterns, and air quality. [NASA]

urban geodesic

The shortest path between two vertiports through the low altitude (i.e. vertical height from ground level) airspace. It takes into consideration no-fly zones, existing air routes, critical infrastructure, city obstacles, known wind conditions and topography.

vectored thrust eVTOL

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

VEMS flight

A flight with a VTOL-capable aircraft that operates under a VEMS [VTOL emergency medical services] approval, where immediate and rapid transportation is essential and the purpose of which is either to:

(a) facilitate emergency medical assistance by carrying one or more of the following:

(i) medical personnel;

(ii) medical supplies (equipment, blood, organs, drugs);

(iii) ill or injured persons and other persons directly involved;

or

(b) perform any operation where a person is at imminent or anticipated health risk from the environment and either:

(i) needs to be rescued or provided with supplies; or

(ii) persons, animals or equipment need to be transported to/from the VEMS operating site. [EASA]

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.) [also *upright launch*]

vertical take-off and landing (VTOL) capable aircraft

VTOL-capable aircraft' means a power-driven, heavier-than-air aircraft, other than aeroplane or rotorcraft, capable of performing vertical take-offs and landings by means of lift or thrust units used to provide lift during the take -off and landing. [EASA]

vertideck

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

vertihub

1) A large-scale urban air mobility facility connecting multiple destinations. Vertihubs would work similarly to airports and would be located in close proximity to — but not directly in — urban or suburban areas. They would be the largest of the ground infrastructure and serve as the main space for urban flight in a geographical region. Vertihubs would operate as locations for major maintenance and repairs, space for the storage

of long-haul vehicles, and as the center of operations for a region, in addition to functioning as spaces for pickup and drop off of people and cargo. 2) 2+ FATO/TLOF and 10+ stands, 400 ft. x 350 ft. footprint, full support/services, high intensity operations. [FAA] [see vertiport and vertistation]

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).

vertiplaces

The three different types of urban air mobility (UAM) hubs, each varying in size and overall purpose: Vertihubs, Vertiports, and Vertistations. [also skyports]

vertiport

1) A generic reference to the area of land, water, or structure used, or intended to be used, for the landing and takeoff of VTOL aircraft together with associated buildings and facilities. [ASTM] 2) Infrastructure or system with supporting services and equipment intended for landing, ground-handling and take-off of manned or unmanned vertical take-off and landing (VTOL) aircraft. [ISO] 3) Vertiports: A collective term for the diverse system of public and private vertiports and vertistops. An area of land, water, or a structure used, or intended to be used, to support the landing, takeoff, taxiing, parking, and storage of powered-lift aircraft or other aircraft that vertiport design and performance standards established by the Administrator can accommodate. [FAA] 4) An area of land, water, or structure that is used or intended to be used for the landing, take-off, and movement of VTOL-capable aircraft. [EASA] [also *skyport*] [see *vertical take-off and landing VTOL*]

vertiport elevation

The highest elevation of all usable TLOFs within the vertiport expressed in feet above mean sea level (MSL). [FAA]

Vertiport Identification Markings

[see graphic]

vertistation

1) The smallest of the Vertiplace network. These stations would typically only house one to two landing pads. They would function as intermediate spaces located in suburban areas, allowing easy commutes into urban areas. 2) 1 FATO/TLOF, 100 ft. x 100 ft. footprint, no ground support/service, low intensity operations. [FAA]

vertistop

1) A minimally developed site for boarding and discharging UAM passengers or cargo. (ASTM) 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. 3) A vertistop is a term generally used to describe a minimally developed vertiport for boarding and discharging passengers and cargo (i.e., no fueling, defueling, maintenance, repairs, or storage of aircraft, etc.). [FAA] 4) A minimal infrastructure landing site for eVTOL aircraft, used for emergency landings or temporary operations in urban areas.

VFR flight

Flight conducted in accordance with the visual flight rules (VFR). [ISO] [also *contact flight*]

visual line of sight (VLOS)

1) The ability of a person manipulating the flight controls of the unmanned aircraft or a visual observer (if one is used) to see the unmanned aircraft throughout the entire flight with vision that is unaided by any device other than corrective lenses. [FAA] 2) 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 line-of-sight operation [VLOS]

Operation in which the remote pilot or unmanned aircraft observer maintains direct unaided visual contact with the unmanned aircraft system. [ICAO, ISO] [Note: FAA requires the remote pilot maintain unaided visual contact]

visual meteorological conditions (VMC)

Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima. [ICAO]

visual observer (VO)

1) 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] 2) A trained and competent person designated by the operator who, by visual observation of the unmanned aircraft, assists the remote pilot in the safe conduct of the flight. [ICAO unmanned aircraft observer] [see *RPA observer* and *spotter*]

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]

VTOL-capable aircraft

A heavier-than-air aircraft, other than aeroplane or helicopter, capable of performing vertical take-off and landing by means of more than two lift/thrust units that are used to provide lift during the take-off and landing. [EASA]

VTOL-capable aircraft stand

A defined area that is intended to accommodate a VTOL-capable aircraft for loading or unloading passengers, mail, or cargo, fuelling/charging, parking, or maintenance, and, for the TLOF, where air taxiing operations are contemplated, the TLOF. [EASA]

wake

A track or turbulent portion left immediately after the passage of an object thru water or air, such as the wake of an airplane flying through the air, or wake left in the water by a seaplane

or boat. [Baughman's] [see d*ownwash*, *propeller wash*, *slipstream*]

warning

A geo-limitation function built into a UAS that alerts the remote pilot about the corresponding geo-limitation.

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*]

weather minimums

Ceiling, visibility and other minimums provided for specified types of flight operation, and below which flight operation is not permitted. [see *weathered out* in Slang]

wildlife strike

A collision between an animal and an aircraft which is in flight or on a take off or landing. [see *snarge* in Slang] [see *Bird Strike Avoidance* in graphics]

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

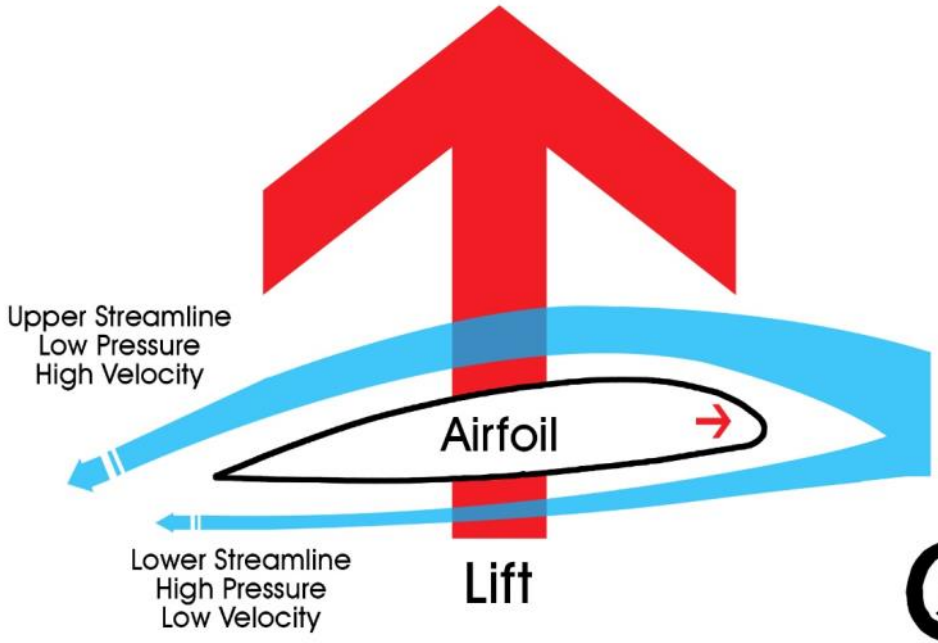
[see *aircraft principle axes*, see graphic]

zone

Airspace of defined dimensions, above the land areas or territorial waters of a State, within which the flight of aircraft is restricted in accordance with certain specified conditions. [EASA] [also *area*]

First published August 17, 2014
[formerly "The Drone Dictionary"]

Airfoil and Lift



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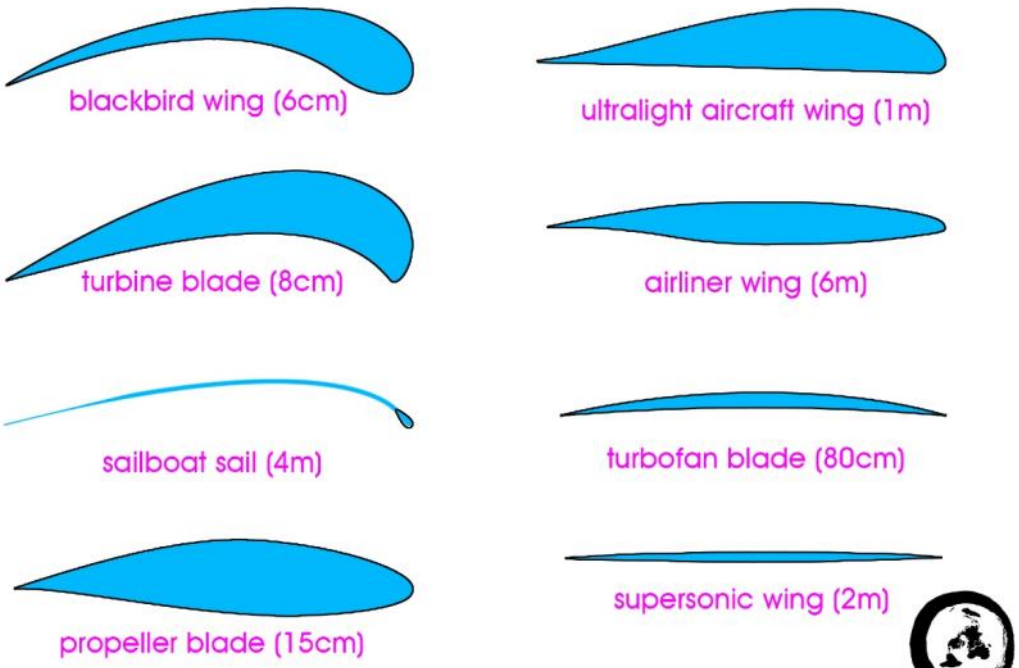
Airfoils



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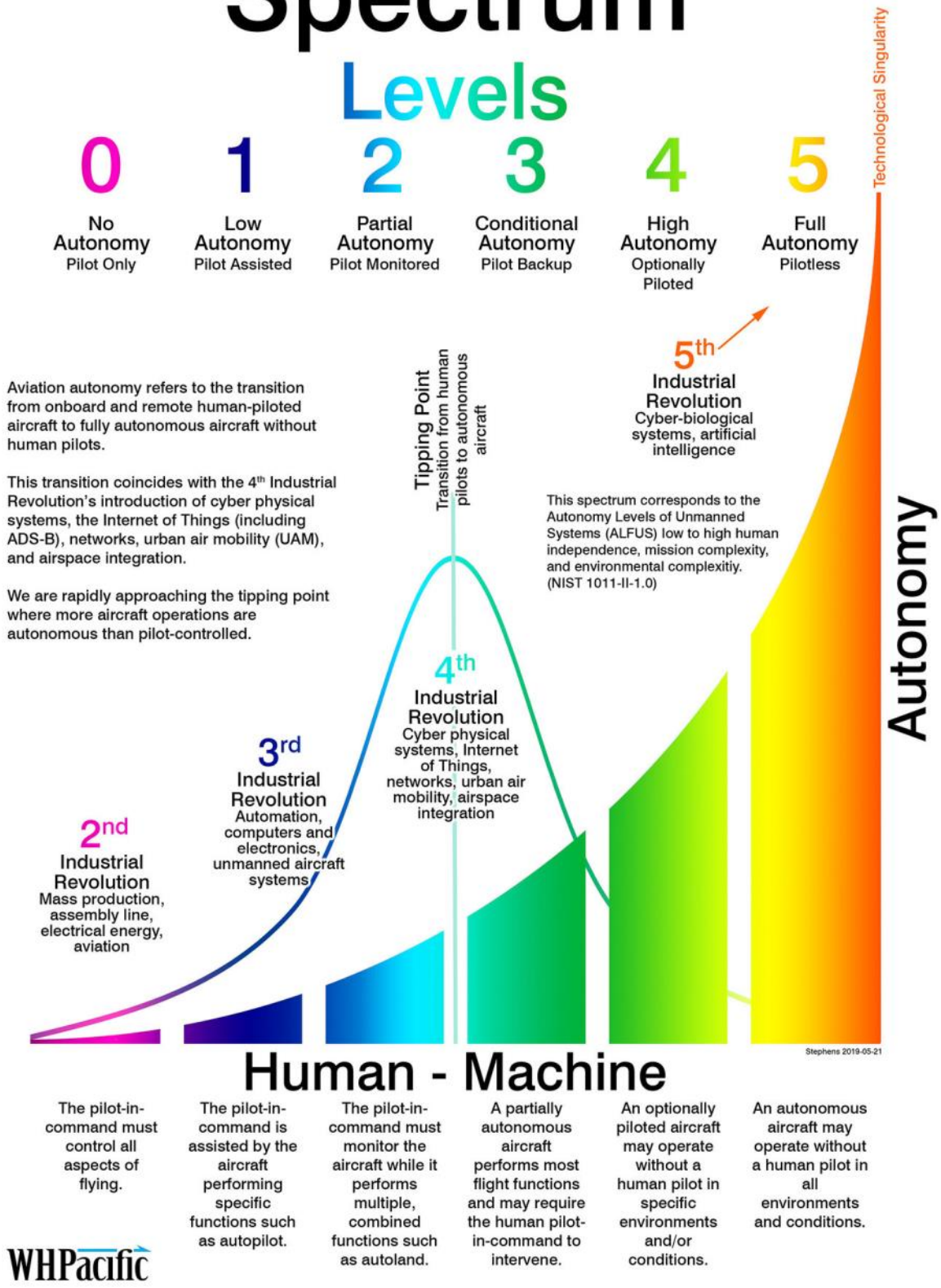
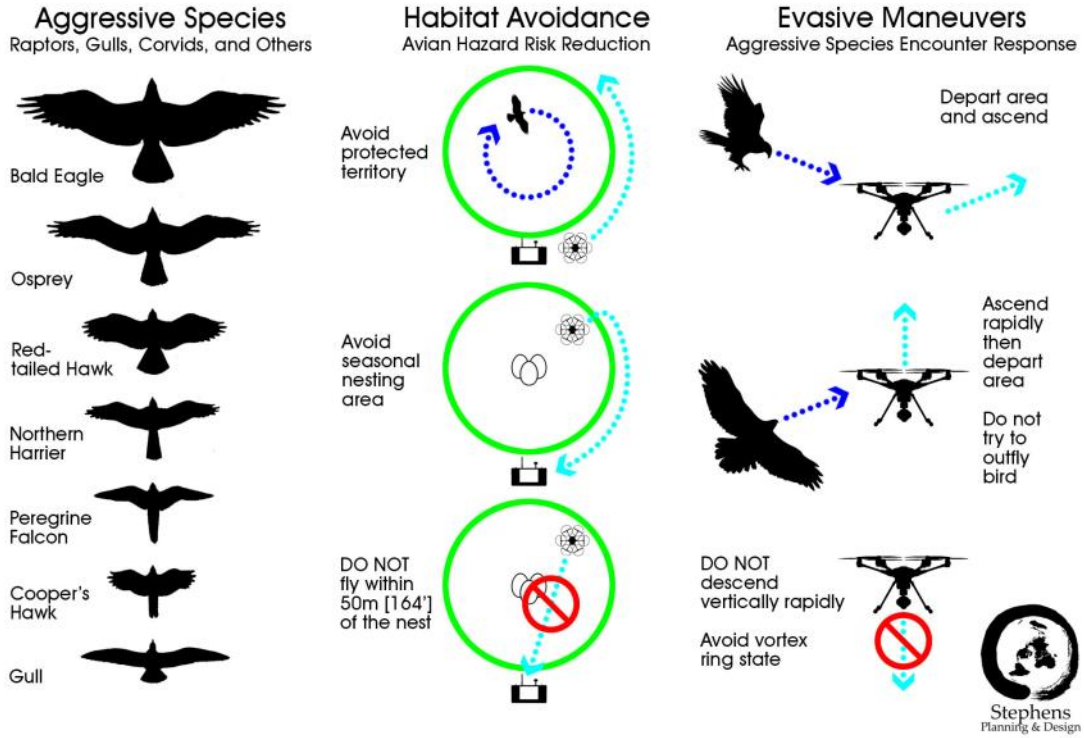
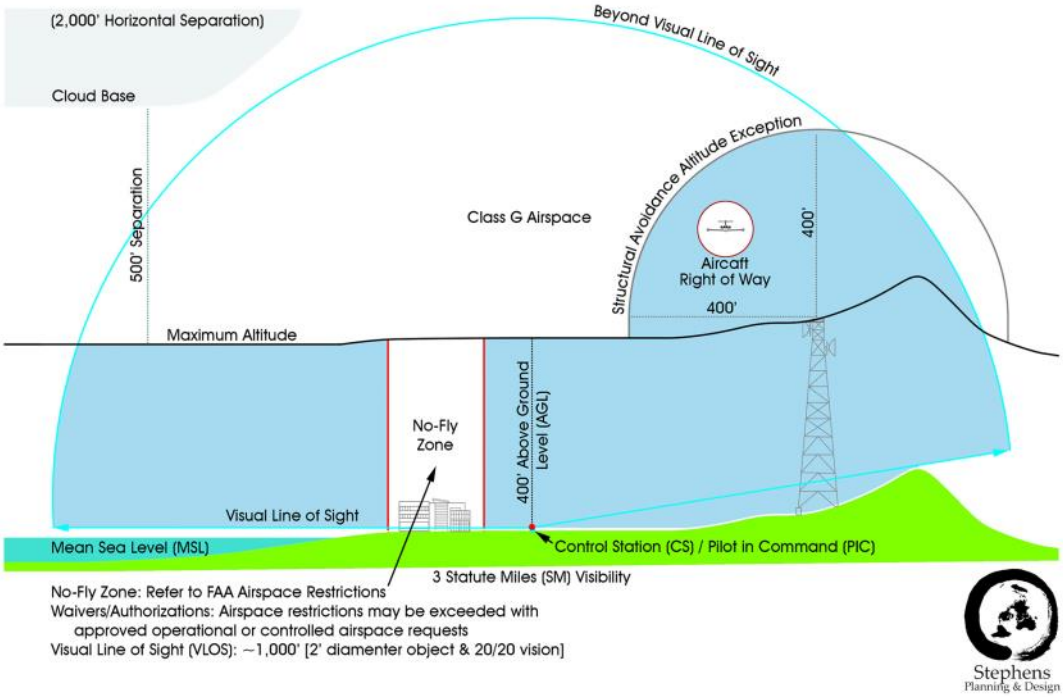
Aviation Autonomy Spectrum



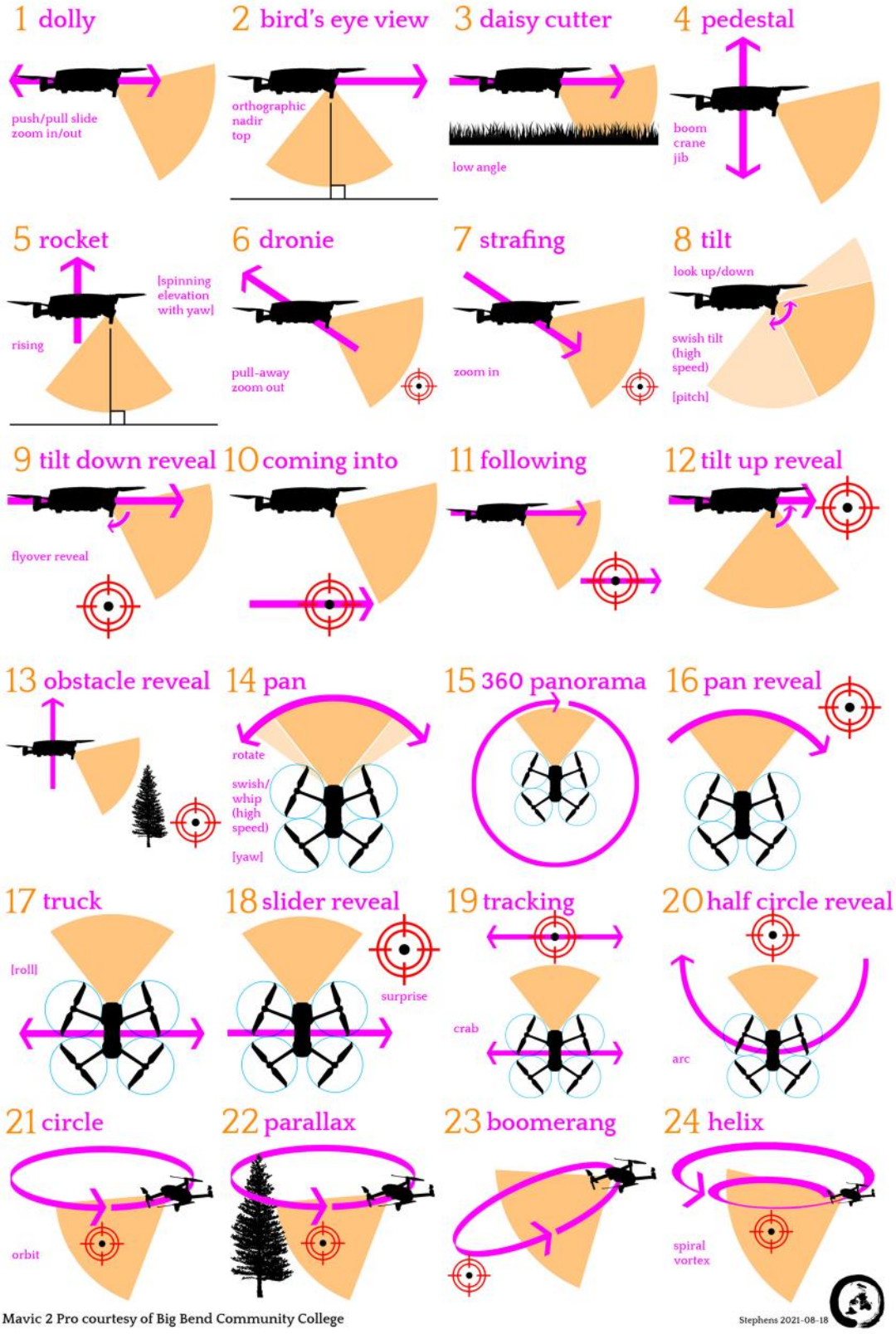
Bird Strike Avoidance



Drone Airspace



Cinematic Shots for Drones

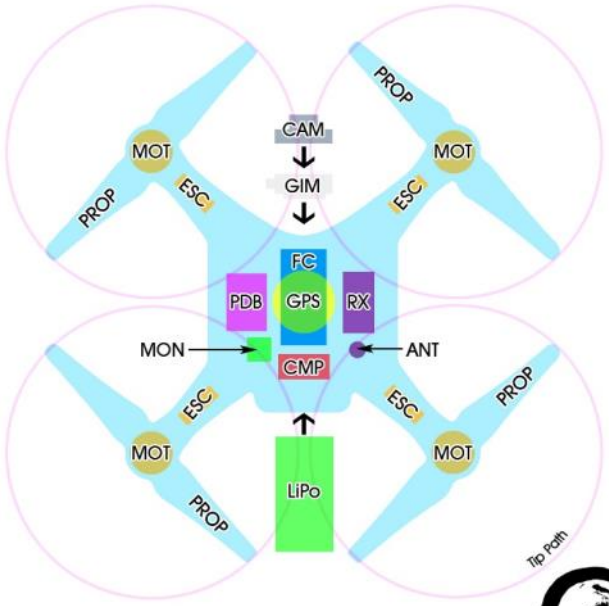


Drone Avionics

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

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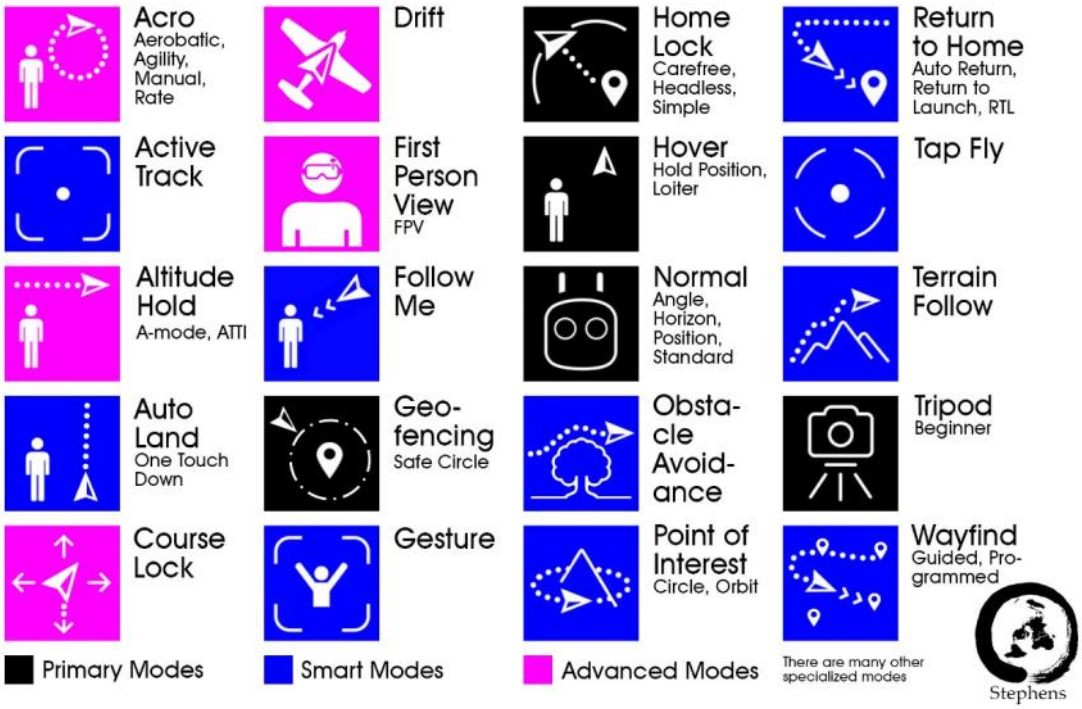
Drone Flight Modes



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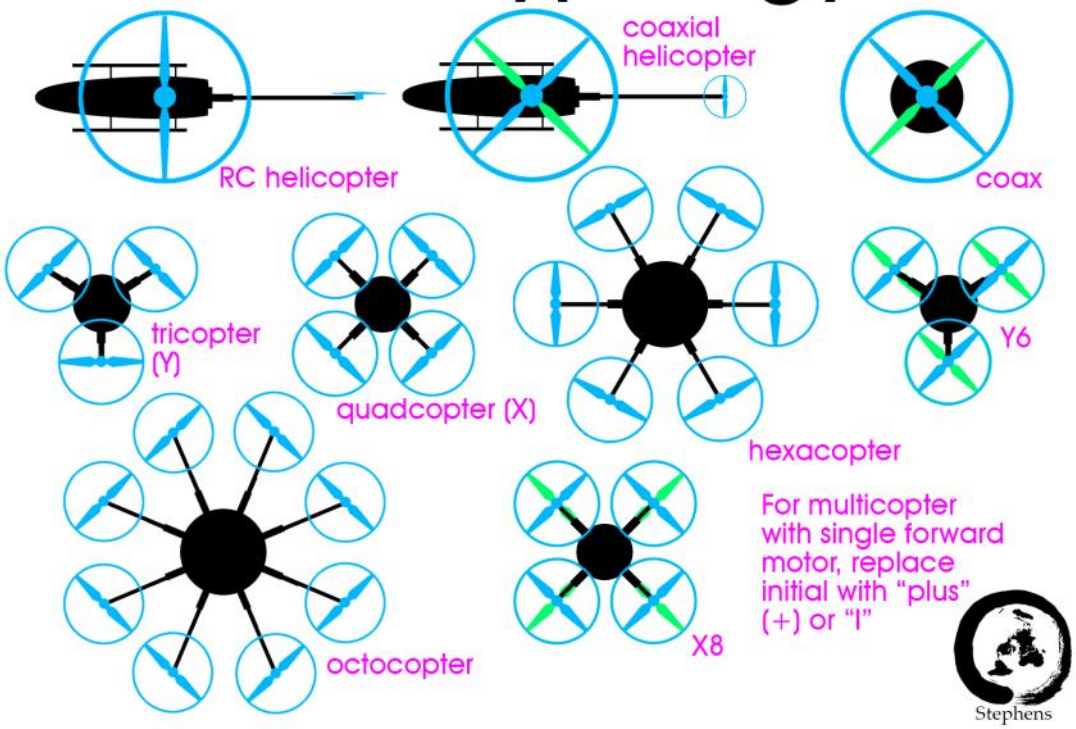
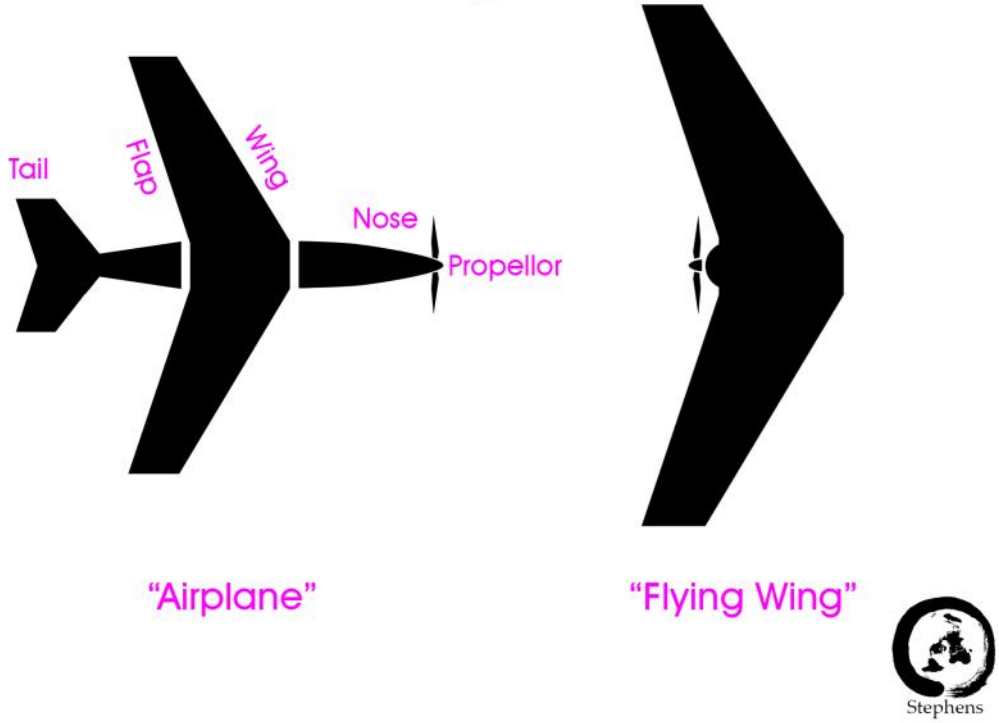
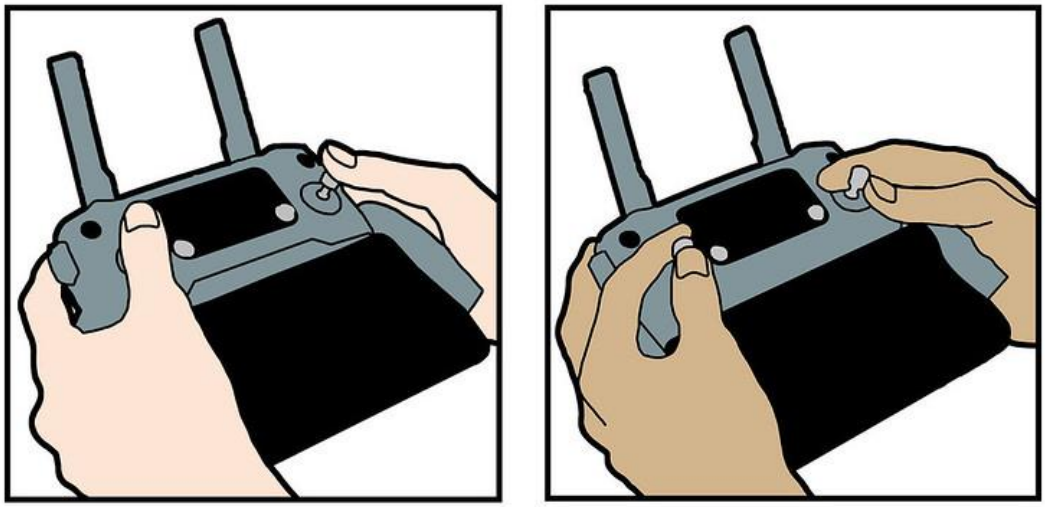
Drone Typology



Fixed Wing Drones



Flight Control



"Thumbing" "Pinching"

Illustration photographer June Stephens / drone pilot Chris Pellechi
DJI Mavic controller courtesy of Big Bend Community College

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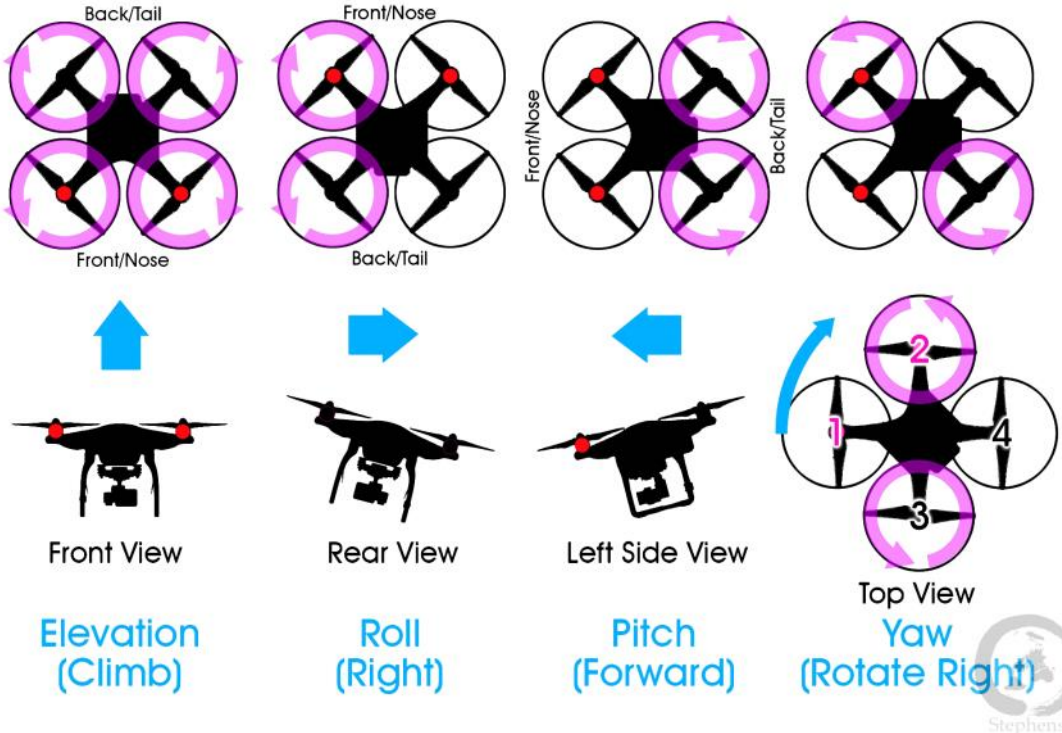
Quadcopter Axes & Motions



History of Drones

Iconic Aircraft


2017 eHang 184


2016 Phantom 4


2016 Intel Shooting Star


2010 X 37B Orbital Test Vehicle


2010 Parrot AR.Drone


1997 Yamaha RMAX


1995 MQ-1 Predator


1942 V-1 Flying Bomb


1941 DeHavilland DH82B "Queen Bee"


1900 Nikola Tesla Wireless-controlled Airship


1896 Samuel Langley "Aerodrome"


1783 Montgolfier Brothers Unmanned Hot Air Balloon

Industrial Revolutions

- 4th Industrial Revolution — 2006—
- 3rd Industrial Revolution — 1969-2006
- 2nd Industrial Revolution — 1870-1969
- 1st Industrial Revolution — 1765-1870

Military Timeline

- Irregular Warfare — 1991—
- Cold War — 1945-1991
- WWII — 1939-1945
- Interwar Period — 1918-1939
- WWI — 1914-1918
- Antebellum — —1914

A timeline of unmanned aircraft events

2020
- 2019 US University of South Florida Brain (BCI) Drone Race
- 2019 French Airbus CityAirbus autonomous eVTOL UAM
- 2019 US Boeing NeXT autonomous air taxi
- 2019 US Bell Nexus on-demand UAM
- 2019 US Vahana self-piloted VTOL passenger aircraft UAM

2010
- 2018 German Audi Pop.Up Next flying taxi
- 2018 US DARPA Aircraft Labor In-cockpit Automation System (ALIAS)
- 2018 Chinese SwellPro Spry UAV/UUV
- 2017 German Volocopter VTOL UAM
- 2017 Chinese e-Hang 184 AAV UAM
- 2017 Chinese DJI Spark & Aire facial/voice recognition
- 2017 Swiss Matternet postal delivery

2000
- 2016 German DHL Parcelcopter postal delivery
- 2016 Chinese MMC HyDrone hydrogen-fueled
- 2016 US Intel Shooting Star swarms
- 2015 International Drone Racing League
- 2015 US Rutgers University Naviator UAV/UUV
- 2015 Australian Flirtey medicine delivery

1990
- 2014 British BAE Taranis "Raptor" fully autonomous UCAV
- 2013 Chinese DJI Phantom 1 quadcopter
- 2013 US Amazon Prime Air delivery
- 2010 French Parrot AR.Drone quadricopter
- 2010 US X37B OTV-1 robotic spaceplane

1980
- 1997 Japanese Yahama RMAX R/C helicopter
- 1995 US General Atomics MQ-1 Predator
- 1991 US Tomahawk cruise missile in Persian Gulf War

1970
- 1987 US "IFO Rembrandt" sci-fi movie with sentient UAV
- 1982 Israeli IAI Scout UAV in Lebanon War
- 1968 German Schluter R/C model helicopter
- 1965 British "The Avengers" TV weaponized R/C model airplane

1960
- 1964-65 US "The Man from UNCLE" TV weaponized R/C model airplane
- 1962 US Ryan Model 147 Lightning Bug reconnaissance RPV
- 1951 US Ryan Firebee jet-powered drone

1950
- 1946 US R/C B-17 Flying Fortress
- 1946 US *Popular Science* target "drone"
- 1945 US Radioplane Norma Jeane Dougherty publicity photo
- 1943 German RFX 1400 R/C bomb
- 1942 German V-1 Flying Bomb
- 1940 US Reginal Denny Target Drone

1940
- 1937 US Nationals R/C event
- 1936 US Ross Hull R/C glider
- 1936 German BF 52 R/C model glider
- 1935 US Admiral Standley "drone"
- 1935 British R/C DH 82B "Queen Bee"
- 1934 US Dennyplane R/C target model

1930
- 1930 British Fairey IIF R/C gunnery target practice model
- 1918 US Kettering Bug aerial torpedo
- 1917 British Ruston Proctor Aerial Target
- 1916 US Hewitt-Sperry Automatic Airplane
- 1909 British "The Airship Destroyer" sci-fi film with aerial torpedo

1920
- 1907 French Breguet Gyroplane No. 1
- 1903 US Wright Brothers unmanned "Wright Flyer"
- 1901 British Langley "Aerodrome" gasoline-powered model aircraft
- 1900 US Tesla wireless-controlled airship

1910
- 1896 British Langley "Aerodrome" steam-driven model aircraft
- 1860s Austrian R/C hydrogen-filled model airships
- 1860 US tethered balloon aerial photo
- 1849 Austrian bomb-carrying balloons attack Venice

1900
- 1848 British Stringfellow "propeller" aircraft
- 1806 British kites flown from HMS Pallas drop propaganda leaflets
- 1794 French Battle of Fleurus reconnaissance hot air balloon
- 1783 French Montgolfier Brothers unmanned hot air balloon

1890

1880


2018 Audi / Airbus Pop.Up Next


2010 Parrot AR.Drone Quadricopter


2010 X-37 Orbital Test Vehicle


1997 Yamaha R-MAX


1941 De Havilland "Queen Bee"


1907 Breguet-Richet Gyroplane No. 1


1896 Samuel Langley "Aerodrome"

Abbreviations

AAV Autonomous Aerial Vehicle
BCI Brain-Computer Interface
eVTOL electric Vertical Takeoff and landing
R/C Remote/Radio Controlled
sci-fi science fiction
TV television
UAM Urban Air Mobility
UAV Unmanned Aerial Vehicle
UCAV Unmanned Combat Aerial Vehicle
UUV Unmanned Underwater Vehicle
VTOL Vertical Takeoff and Landing

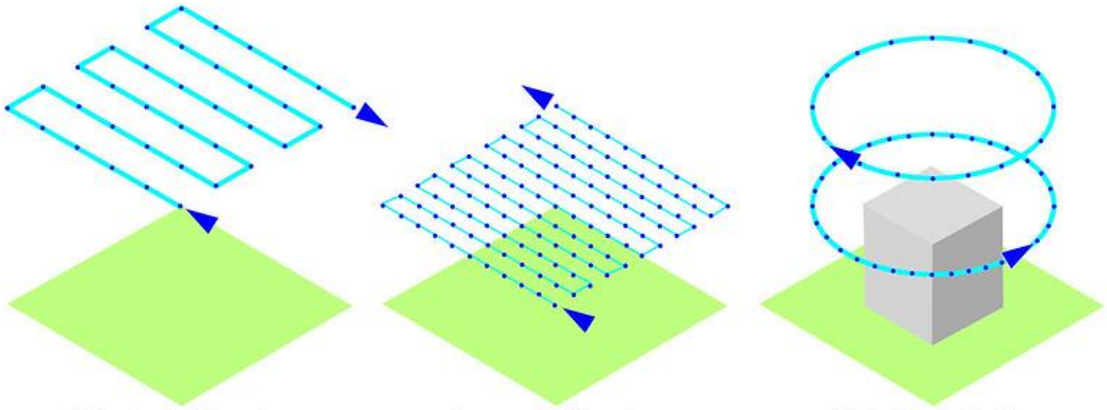
Stephens June 2, 2019

ICAO Phonetic Alphabet

with Mnemonic Icons , Signal Flags and Meanings

Mapping and Modeling

Flight Paths



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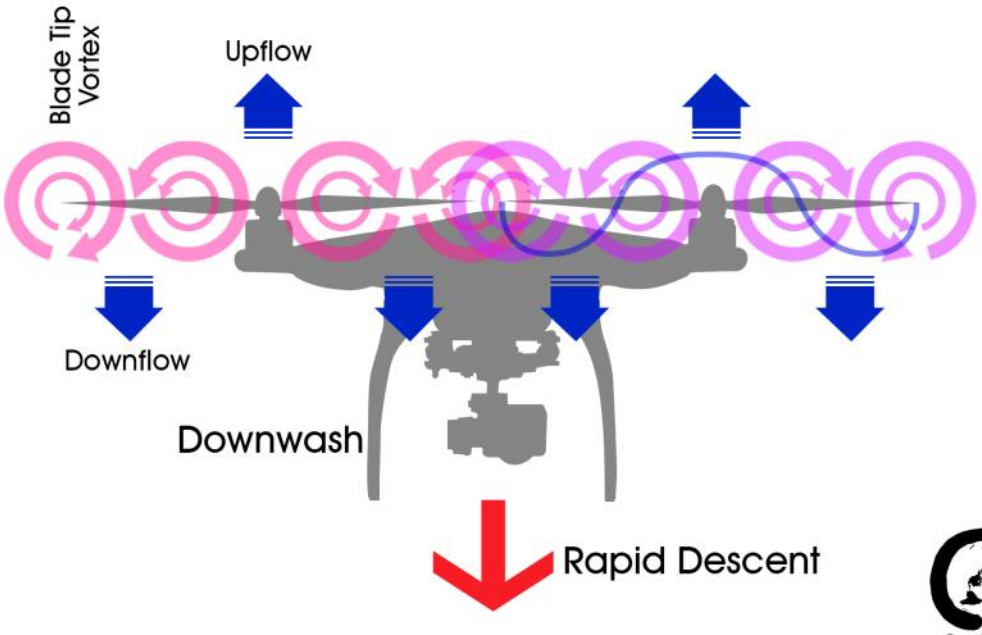
Quadcopter Vortex Ring State

Settling with Power



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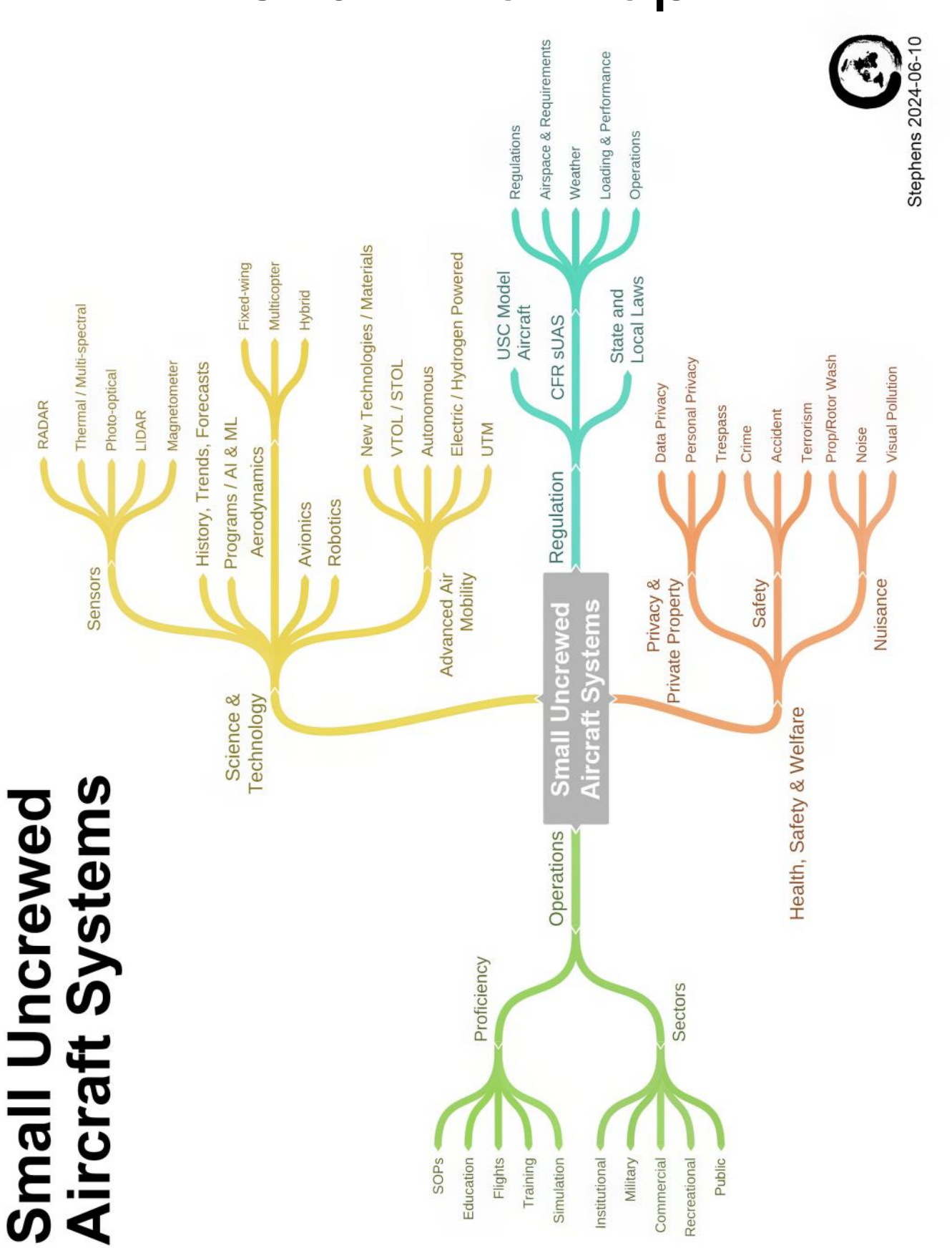
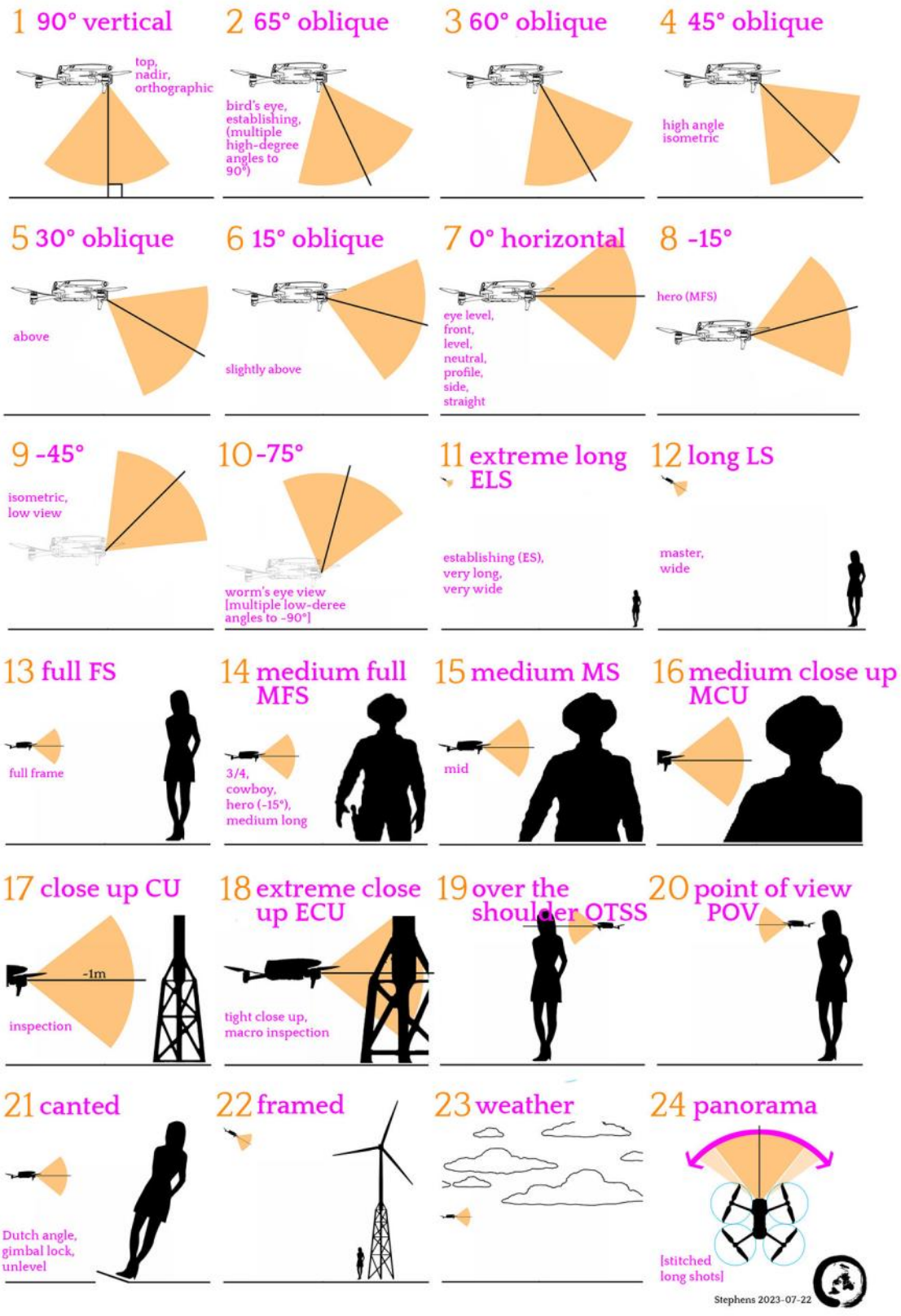
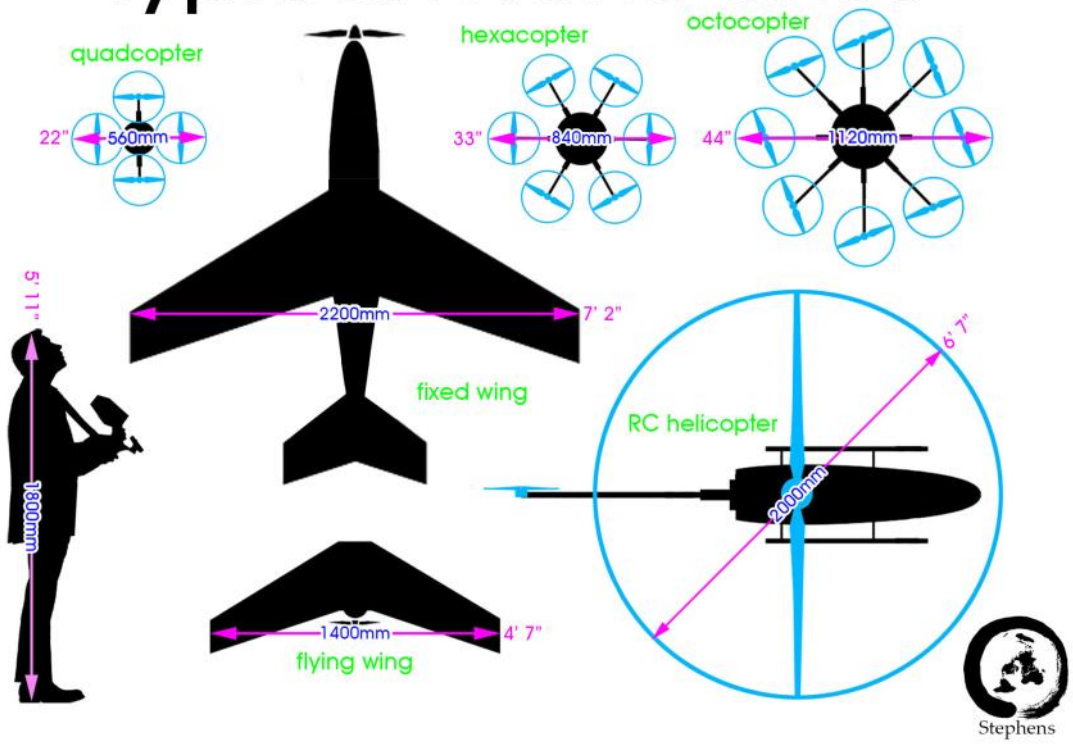
UAS Mind Map


Small Uncrewed Aircraft Systems
Small Uncrewed Aircraft Systems
Science & Technology
Sensors
RADAR
Thermal / Multi-spectral
Photo-optical
LIDAR
Magnetometer
History, Trends, Forecasts
Programs / AI & ML
Aerodynamics
Fixed-wing
Multicopter
Hybrid
Avionics
Robotics
Advanced Air Mobility
New Technologies / Materials
VTOL / STOL
Autonomous
Electric / Hydrogen Powered
UTM
Regulation
USC Model Aircraft
CFR sUAS
State and Local Laws
Regulations
Airspace & Requirements
Weather
Loading & Performance
Operations
Privacy & Private Property
Data Privacy
Personal Privacy
Trespass
Safety
Crime
Accident
Terrorism
Health, Safety & Welfare
Nuisance
Prop/Rotor Wash
Noise
Visual Pollution
Operations
Proficiency
SOPs
Education
Flights
Training
Simulation
Sectors
Institutional
Military
Commercial
Recreational
Public
Stephens 2024-06-10

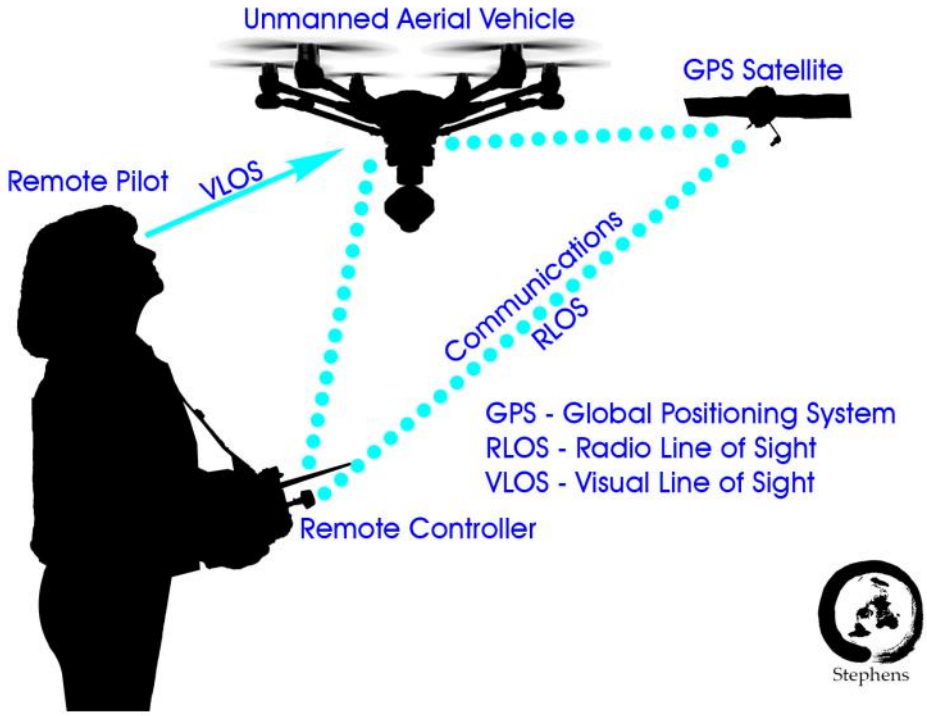
Still Shots for Drones



Typical Drone Sizes



Unmanned Aircraft System



Urban Air Mobility

Vertical Take-Off and Landing (VTOL) Aircraft Typology

Helicopter / Rotary Wing

Multicopter / Multi-Rotor

Multicopter/Airplane Hybrid Lift and Cruise

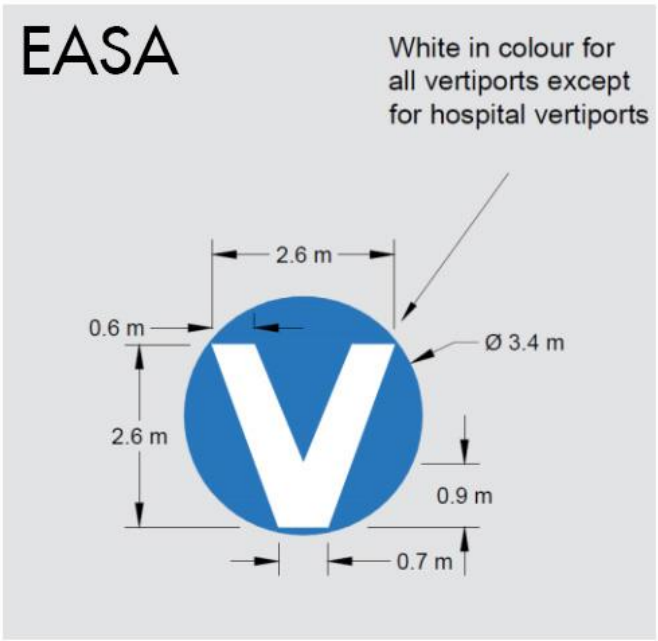
Multicopter/Airplane Hybrid Vectored Thrust

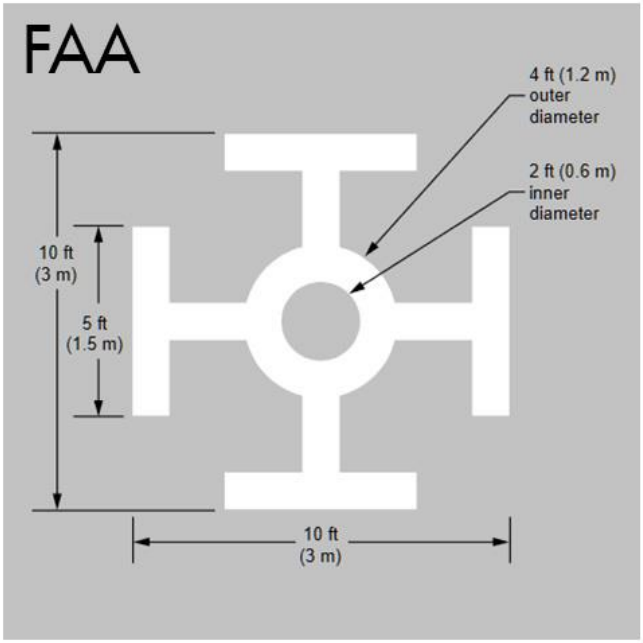
Hoverbikes / Hovercycles

Flying Cars / Roadable Aircraft

1 Airbus H160
2 Uber Helicopter
3 eHang 216
4 VoloCity
5 Kittyhawk Cora
6 Uber eCRM 003
7 Lilium Jet
8 A³ Vahana
9 Colin Furze Hoverbike
10 HoverSurf Scorpion
11 Terrafugia TF-X
12 Audi Pop.Up Next

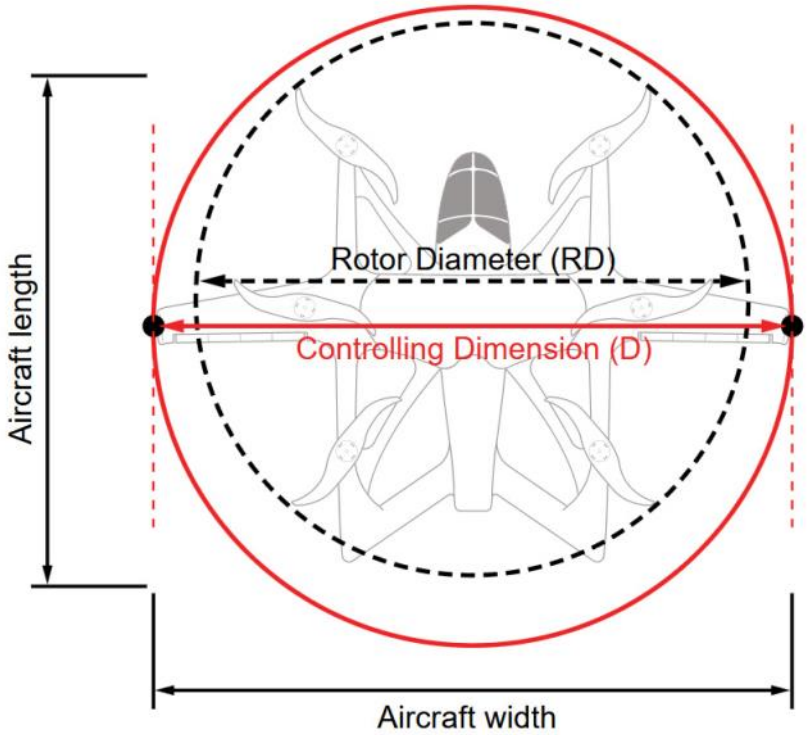
Vertiport Identification Markings





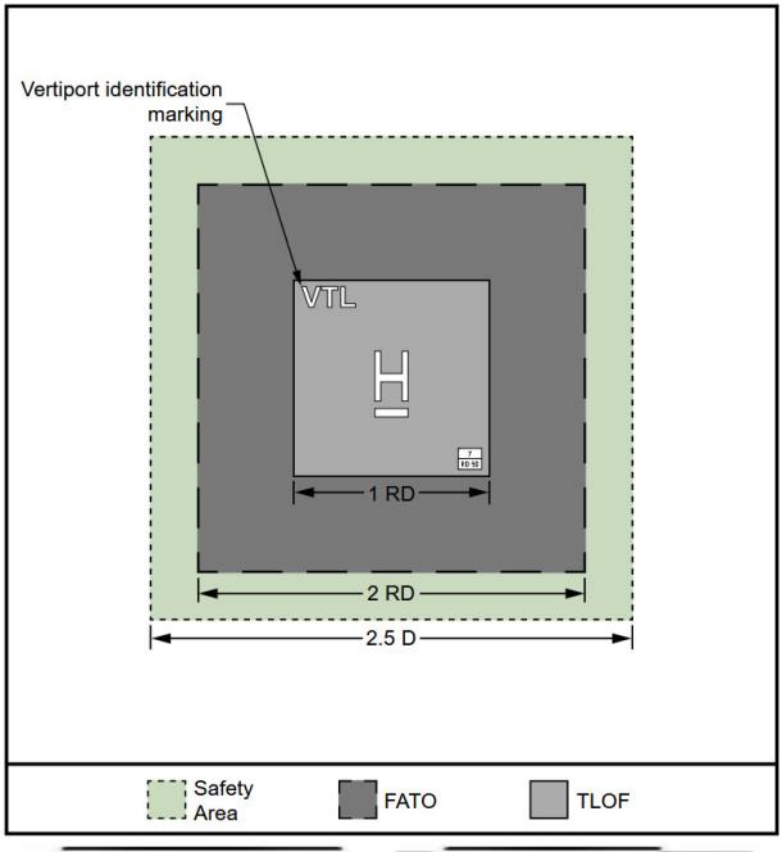
Vertiport Caution Sign

Vertiport Design Controlling Dimension



Vertiport Downwash Caution Area Sign

Vertiport Identification Markings



acro mode

Acrobatic mode [see *flight modes* in glossary]

aerocab, aerobus

Aerial cab, aerial bus. “The traffic of the future will be in the skies....” (1908) [Historical Dictionary of Science Fiction, HDSF]

aerocar

Aerial car. (1900) [HDSF]

aeronautical engineering

- **Cycle power to the panel** - Turning the aircraft off and on again.
- **High impedance air-gap** - Unplugged aircraft.
- **Kinetic disassembly** - Exploded aircraft. (also *rapid unplanned disassembly*)
- **Organic grounding** - Electrocuting/ shocking aircraft.
- **Percussive maintenance** - Hitting the aircraft until it starts working.
- **Thermally reconfigured** - Melted aircraft.
- **Thermal shock** - Burned aircraft.

air-minded

Archaic term descriptive of persons who are naturally and intensely interested in the development, uses and improvements in aeronautics.

air pocket

Transient jolt of turbulence.

aircab

Aerial cab. (1934) [HDSF]

aircar

Aerial car. (1871) [HDSF]

airplane rule

Complexity increases the possibility of failure; a twin-engine airplane has twice as many engine problems as a single-engine airplane.

airscrew

A propeller.

AirStack

A busy airspace layer involving multiple drones or aircraft, seen in urban mobility simulations or discussions about future traffic management.

Alpha Mike Foxtrot

Adios Mother F*cker. [see graphic]

aluminum overcast

Very large aircraft.

angels

Altitude measured in thousands of feet.

anti-smash

Aircraft collision lights.

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*]

augur in

Have a major accident.

automagically

Autonomous and flying in a way that seems ingenious, inexplicable, or magical.

aviate, navigate, vegetate

Pilot priorities on long, boring flights.

aviator's stomach

Aeroneurosis, airsickness, aviator's neurasthenia, flying sickness, flying stress, flying staleness, pilot performance anxiety.

ballooning

Rotorcraft ascending due to strong updrafts. [see *sinking*]

barnstorm

An expression used by pilots when flying from no fixed or permanent base, i.e., in the early days a pilot was doing barnstorm flying when he carried passengers at one location for a period of time and then when he was so inclined, moved on to a new location. [Baughman's]

barnstormer

Reckless, low-level, stunt pilot.

beefed up

Strengthened.

beeper

Remote controller. (Popular Science 1946 November] [see *Yehudi*)

BASH

Bird/Animal Strike Hazard.

bat-pack

A drone's battery pack, used in conversations about flight time or power efficiency.

bat turn

A tight, high-G change of heading. A reference to the rapid 180-degree Batmobile maneuver in the old "Batman" television series.

bear in the air

Police helicopter/multicopter. [see *rotorcraft*]

beeper

"Control box." (Popular Science 1946 November)

bending plastic

Crash.

bent

Damaged, broken, or inoperative.

bingo

Minimum fuel or battery charge for a safe return to home.

bird

Aircraft.

birdmen

Pilots. [see *Quiet Birdmen*]

blowtorch

Jet engine.

Blue UAS

Small uncrewed aircraft systems that have been vetted for U.S. federal operations.

boat anchor

A small UAV that is irreversibly dead or useless. [also *doorstop*]

Boola-Boola

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

BOREX

A dull or repetitive exercise.

bounce and blow

Alternative to "touch and go" landing.

box office

All female crew cockpit.

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

Phonetic praise for a good job. [see graphic]

brick

Handheld radio.

bringing the mail

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

brownout (brown-out)

An in-flight visibility restriction due to dust or sand in the air.

bubba

Fellow pilot of the same aircraft. [see *puke*]

bugsmasher

Small, slow general aviation plane.

build [noun]

Homebuilt aircraft.

bumpy air

Gusting winds.

bush pilot

A pilot flying in remote areas.

buzzing

Diving close to the ground especially near human population.

cameraship

A multicopter built with photography as a primary purpose.

CAVOK

Ceiling and Visibility OK. [see *CAVU. clear blue and 22*, and *severe clear*]

CAVU

Ceiling and Visibility Unlimited: the best possible flying weather. [see *CAVOK, clear blue and 22,* and *severe clear*]

Centurion

A pilot with over 100 missions.

Charlie Foxtrot

Cluster F*ck. [see graphic]

Check six

Look behind you.

Cherubs

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

chicken switch

The return-to-home switch when used to abort the mission.

chopper

[see *rotorcraft]*

chute

Parachute.

cinewhoop

(see *whoop*)

clean air

(see *dirty air*)

cleanup in aisle 5

Messy indoor crash.

clear blue and 22

Clear skies with 22,000 foot ceilings, and 22 mile visibility.

cloud-weavers

A nickname for autonomous drones performing complex aerial maneuvers, especially during synchronized shows or swarming operations.

coffee grinder

Old, unstable aircraft.

colorful actions

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

compass dance

Rotating the aircraft to orient the drone to magnetic north.

control box

Remote controller. (archaic)

conversion

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

copter

[see r*otorcraft*]

corkscrew

Descending in a spiral to avoid *ring vortex state*.

cowboy

Cargo operator. [see *freight dog*]

craft

Aircraft.

creamed

Crashed.

crewless and clueless

Solo hobbyist violating aviation laws.

daisy chain

Visual observers assisting the pilot when the drone goes beyond visual line of sight.

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*. [see graphic]

departure

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

destructive test

Crash.

dirty air

Turbulance from a rotor or propeller. (propwash, rotorwash, downwash). Smooth air flow is *clean air*.

ditching

The forced landing of aircraft on water.

dodo

Archaic term applied to a new flying school cadet. [Baughman’s]

dot

Refers to how a distant aircraft looks on the horizon, (“I’m a dot” means “I’m out of here”).

down

Broken, not flying. A sick pilot or snagged aircraft is “down”.

DPE

Dumb pilot error.

driver

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

Drone Ranger

Pilot who assists with anti-poaching and/or park monitoring with reference to the “Lone Ranger”.

drone wrangler

A person in charge of multiple drones and/or drone operators.

dronegoozler

A spectator who does not contribute to either the content or interest of an event. From the derogatory term for canalboat spectators: *gongoozler*. [see *gaper*]

dronejacking

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

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.

Dummy 101

The Part 107 counterpart. (see clueless *and crewless*)

duster

Any aircraft utilized as an aid to agriculture for the purpose of dusting crops.

dusting

The spraying of powdered or liquid insecticide or fertilizer on crops, especially from the air. [also *crop dusting*]

E-ticket ride

A wild ride. Back in the day, Disneyland issued different classes of tickets. The best rides took an "E" ticket.

Easy Victor

Evacuate the aircraft.

eggbeater

[see *rotorcraft*]

elephant walk

When a large number of aircraft taxi in sequence.

EVAC

Evacuation. [also medevac-medical evacuation, hazevac-hazard evacuation]

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*]

firewall

Push the throttles all the way forward. Piston airplanes had a literal firewall between the engine and the pilot. Also “Balls to the wall,” which means the balls on the end of the

throttles to the firewall (bet you thought it meant something else). Also "bend the throttles off."

first person at the scene of the crash

Pilot.

fisheye lens effect

The distortion caused by a very wide angle lens.

five by five

Radio reception is loud and clear on a scale of 1 to 5.

flat out

Flying at full speed or full throttle.

flathatting

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

flight line

Where the planes are parked. An old prank was to send a new student out to get "10 feet of flight line". In earlier days they would be told to get "a gallon of prop wash".

flightseeing

Air tourism for sightseeing.

floater

Futuristic small uncrewed aerial vehicle (tricopter). (1984)

flock

[see *swarm*]

floor

Ground. [see *ceiling* in Glossary]

flyboy/girl

Pilot.

Flying Cuisinart

Multi-rotor aircraft.

flying lawn mower

Loud, fast multirotor drone.

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*]

flying the needles

Flying by *instrument flight rules* IFR.

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

1) Foreign Object Damage. Typically when objects hit the rotor. [see *snarge*] 2) Foreign Object Debris; often used to describe messy cockpits.

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*]

freight dogs

Cargo operators. [see *cowboys*]

gaper

Derogatory term for person who views flight operations (often disturbing pilots and/or operations) without actually flying on their own. [see *gongoozler*]

George

Auto-pilot.

ghetto bird

Police helicopter. [also *night bird* when using floodlight at night]

Ginsu knives

Carbon fiber propellers.

gizmo

A piece of technical gear.

go for a spin

Recreational flying in a rotorcraft.

goat rope

A messed up situation.

go-no-go

The decision to launch or not launch: the point of no return.

goggles

First person view (FPV) headset.

golden hands

A pilot who flies really well would be said to have golden hands.

goo

Bad weather.

good stick

A competent pilot. “He's a good stick.”

graveyard spiral/spin

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

grease it on

Make a perfect/beautiful landing.

gripe

A mechanical problem with the aircraft.

ground beeper pilot

Remote control pilot. (Popular Science 1946 November)

ground pounder

Non-flyer.

grounded

Unable to fly.

gun

A reference to the throttle of an aircraft, i.e., to cut the “gun” means to close the throttle and to “gun” the engine/motor means to open the throttle momentarily. [Baughman’s]

gyropilot

An instrument which automatically controls an airplane about its three axes of angular movement. [archaic]

hair on fire

Going really fast, but implies recklessness or a lack of control.

ham fist

Someone who is rough on the controls.

hard landing

Aircraft crash.

heavy driver

Pilot of a large aircraft.

heavy-handed

Handling the controls of an aircraft in a clumsy manner, or over-controlling the aircraft.

hedge-hop

Flying very close to the ground, hopping over obstructions, fences, hedges, etc.

hedge-hopper aircraft

Any small underpowered aircraft with enough power and lift to get off the ground a few feet for a brief period of time.

helicab

A helicopter serving as a taxi. (1943)

high-spy

The pilot of an observation aircraft.

"Hold my beer."

Expression indicating the pilot is about to attempt a questionable flight maneuver to impress their peers. [corresponds to "machoism" behavior as defined by FAA]

holes in the air

Small aeras of descending air (down currents), which cause the aircraft to slightly drop momentarily when the aircraft passes through them.

homeplate

Home airfield or base.

hop

A mission or flight of short duration usually at low altitudes.

hopped up

An engine, or engine and aircraft that has been speeded up beyond the limit established by the manufacturer. [Baughman's]

hover-hype

The overemphasis or exaggerated claims surrounding the capabilities of certain drone technologies, particularly in marketing.

hovercar

A car that hovers above the ground. (1958) [HDSF]

hump

Generally meaning a mountain and often used as "Over the hump" which means over the mountain, or the most difficult part of a flight. [Baughman's]

IFE

In Flight Emergency.

IFR

I follow roads, rivers, railways. (from *instrument flight rules*)

In the weeds

Flying really low. Also *on the deck*.

INOP

Inoperative.

involuntary conversion

An aircraft crash. You convert an operational aircraft to scrap.

iron man

Automatic pilot. [Baughman's]

Iron Mike

Gyropilot. [archaic]

jamming and spoofing

Jamming causes the GNSS receiver to die, spoofing causes the GNSS receiver to lie. [see *jamming* and *spoofing]*

jink

Drastic, violent maneuver to avoid a collision.

JAFO

Just another f*cking observer.

jail break software

Computer program that overrides drone geo-fencing.

jello

The visual effect of drone vibration on the video image.

jet car

A form of aircar powered by jets. (1946) [HDSF]

Jim Wilson

Airline nickname for air-transported dead body.

jock

Pilot (e.g. Phantom jock).

jockey

A person who operates or works with a specified vehicle. E.g. *Mavic jockey*.

kamikaze drone

(see *one-way attack drone OWA-UAV*)

Kobayashi Maru

Any situation in which there is no decision leading to a positive outcome. (1982) [HDSF]

landing hot

Making a relatively high speed landing.

lawn dart

Nickname for an aircraft that crashed nose-first.

level off

To make the flight path of an aircraft horizontal after ascending or descending.

LIPO

Lithium polymer battery.

locals

Indigenous wildlife near operations.

loiter mode

[see *flight modes* in glossary]

Machbusting

Flying faster than the speed of sound.

mark one eyeball

Human sight. Maintaining visual line of sight with the aircraft.

meat servo

Rotary-wing pilot.

mid-air

Mid-air collision.

mod

Modification to a aircraft.

mud

General modifier for “ground.”

mushing

Flying an airplane in a semi-stalled condition, or pulling out of a dive so fast that the airplane settles, due to the action of the inertia forces.

naviguesser

Navigator.

NFG

1) Non-Functioning Gear. 2) No F*cking Good.

no joy

Failure to make visual sighting or to establish radio communications.

no-op

An aircraft that will not fly.

nose over

Accidental turning of an aircraft over on its nose [front] when landing.

ops

Operations.

overshoot

To fly beyond a designated mark or area while attempting to land on the mark or within the area.

package

Group of different aircraft combined to perform a single mission. [see *swarm*]

"Pan pan"

International radio urgency call. It usually indicates a threat to the safety of an aircraft or its passengers. Less urgent than Mayday.

pancake

1) To crash so hard as to flatten the aircraft. 2) Crash landing with the landing gear retracted. 3) A landing in which the leveling-off process is carried out several feet above the ground, as a result of which the airplane settles rapidly on a steep flight path in a normal attitude. The airplane is stalled too high above the ground. [Baughman's]

park

To hover in one spot for a long period of time.

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.

passenger hopping

Flights of short duration with passengers.

pay-hop

A short flight made for financial compensation.

pea soup fog

An exceptionally thick, heavy, wet fog. [see *soup*]

perching

UAS contact with the environment to save battery power and extend time of operation. The typically means attaching to a high structure or tree branches. [see *resting*]

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...

playmates

The pilots of other aircraft on the same mission as you.

plumber

An inept pilot.

Popeye

Pilot flying in bad weather or visibility. [see *soup* and *goo*]

porpoise

A rough landing or a case of dropping the airplane onto its wheels at too great a vertical speed, and causing it to bound back into the air. [Also airline *Two-for-one-special*]

prang

To bump, crunch or break an aircraft.

prop

Propeller.

prop chop

Accidental finger hit by spinning blades.

prop-pop

The sudden sound made when a drone's propeller clips an object, used humorously to describe minor drone accidents.

prop wash

[see *propeller wash*, slipstream in Glossary]

proximity event

Near collision.

pucker factor

How scary something is.

puddle jumper

Small commuter aircraft.

puke

Someone who flies a different kind of aircraft than you. [see *bubba*]

pusher

An aircraft with the propeller or propellers in the rear of the main supporting surfaces. [see *tractor aircraft*]

pushing the envelope

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

quad

Quadcopter.

Queen

- **garage queen** - A UAV that may look pretty, but never flies.
- **hangar queen** - An aircraft always undergoing maintenance.
- **ramp queen** - Beautiful aircraft that rarely flies.

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.

Quiet Birdmen

A secretive club for male aviators. It is also known as *ye Anciente and Secret Order of Quiet Birdmen*. [Baughman's]

quiet sun

Conditions of the sun when it is relatively free of sun spots and other factors that interfere with radio transmission.

ramp-rat

Ground crew.

resting

Making and stabilizing contacts with the environment, which will allow the UAV to consume less energy while retaining its altitude. [see *perching*]

Robbie Ranger

Civilian.

rotorcade

A procession of rotary aircraft preceding an important person or event.

rotorcraft

- bear in the air (law enforcement)
- chopper
- copter
- eggbeater
- eye in the sky (law enforcement)
- ghetto bird (law enforcement)
- heli
- helo (military)
- night bird (law enforcement)
- whirlybird

rotorheads

1) Rotary-wing aircraft pilots. 2) Enthusiasts and professionals passionate about multirotor drones or rotorcraft technology, often found experimenting with builds and piloting techniques.

RTC

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

sats

GPS satellites.

scrub

To cancel a flight.

scud

1) Low clouds or rain. 2) Shreds of small detached masses of cloud moving rapidly below a solid deck of higher clouds. Scut may be composed of either fractocumulus or fractostratus clouds.

scud running

Flying at low altitude to avoid approaching low clouds or rain [*scud*].

severe clear

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

ship

Airplane. [archaic] [Baughman's]

short hop

Quick flight.

Sierra Hotel

Phonetic abbreviation for "sh*t hot," high praise; the pilot's favorite and all-purpose expression of approval. [see graphic]

sinking

Rotorcraft descending due to strong downdrafts. [see ballooning]

skygating

The act of using geofencing to limit or regulate drone operations within specific areas, often to prevent trespassing or ensure safety.

Sky Roomba

Autonomous drone wandering without direction.

sky selfie

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

sky taxis

Casual term for eVTOL (electric vertical take-off and landing) aircraft used in urban air mobility as a ride-sharing or air taxi service.

sky writing

The act of emitting from an aircraft a trail of smoke or other visible substance , the flight of

the aircraft being so directed as to cause the trail to assume the form of letters or symbols.

slop

Imprecision of a control system.

smash

Airspeed.

smoking hole

An aircraft crash site.

snarge

The remains of a bird after it has collided with an aircraft (*bird strike*). [also remains of insects on drone propellers] Biological foreign object debris (FOD).

socked in

Grounded by bad weather.

souls on board (SOB)

All passengers and crew. Term sometimes used to alert first responders to the number of people to search. [Also POB persons on board]

soup

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

spam can

Mass-produced aluminum aircraft.

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.

spiral

A maneuver in which an aircraft descends in a helix.

spooling up

Rotor acceleration when powering on the aircraft. Also *spinning up* and *powering up*.

spotter

Another term for *visual observer*. [see *JAFO*]

spy in the sky

Remotely piloted aircraft used for surveillance.

stewardess

Female flight attendant. [archaic] [also *air hostess*, *air stewardess*]

stick flick

Multiple rapid movements with the remote control sticks as opposed to smooth operation. [see *golden hands*]

stick-throttle interconnect

Mock-tech term for a pilot.

suicide drone

(see *one-way attack drone OWA-UAV*)

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*, *package*]

sweet

Up and working.

switchology

Complicated pre-flight flight control routines. (also *switchcraft*)

Tally Ho

Aircraft in sight. [see *no joy*]

Tango Uniform

Phonetics for "t*ts up"; broken, not functioning. [see graphic]

target rich environment

Airspace crowded with poor pilots.

throttle jockey

Irresponsible pilot.

tiger

An aggressive pilot.

TLAR

That looks about right. [military]

toilet bowl effect

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

toothpick

FPV micro quadcopter <50 grams. No ducts. ~2.5 inch propellers. (see *twig* and *whoop*)

totaled

Complete wreck. [see *plastic bag*]

tractor airplane

An airplane with the propeller or propellers forward of the main supporting surfaces. [Baughman's]

trash hauler

Cargo aircraft or a crew member of a cargo aircraft.

tree trimmer

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

trouble shooting

Diagnosing and locating trouble or causes of malfunctioning of mechanisms, systems, units, etc. [Baughman's]

tumbleweed

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

turning final

Old pilot's euphemism for death.

turnt-up

A UAV that is optimized with the best components; high speed and maneuverability.

tweak

To fine tune or adjust.

twig

FPV micro quadcopter >50 grams. ~3.5 inch propellers. (see *toothpick* and *whoop*)

twirly

Anti-collision beacon on an aircraft.

uncontrolled landing

Crash landing.

undershoot

Falling short of reaching the landing area.

Unmanned Aerial Veg-o-matic (UAV)

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

unobtainium

A substance or piece of hardware that is desirable but unobtainable.

upstairs

Referring to a pilot or aircraft being in the air or flying at considerable altitude. [Baughman's]

verti-junkies

Individuals highly enthusiastic about vertiports and the concept of urban air mobility, often discussing infrastructure and future cityscapes.

VRS death plunge

[see *vortex ring state* in Glossary]

washout

To flunk out of a military flying school.

"Watch this!"

The two most dangerous words in aviation. (see "*Hold my beer.*")

weathered in

Weather conditions that prohibit flying such as poor visibility, high winds, and/or heavy precipitation. [see *weather minimums* in Glossary]

weed wacker

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

whirlybird

Rotary-wing aircraft.

Whisky Charlie

Phonetics for "Who Cares?" [see graphic]

Whisky Delta

Phonetics for "Weak D*ck." [see graphic]

Whisky Tango Foxtrot

Phonetics for "What The F*ck!" [see graphic]

whoop

FPV micro quadcopter with ducts (whoops). A "tiny whoop" is 65-75mm. A "power whoop" is >85mm. A cine whoop has a high-resolution video camera. [see *toothpick* and *twig*]

windmilling

A freely rotating propeller which is rotating because of a wind or airstream passing over the blades.

window

A period which a mission is possible and/or most economical.

wobble of death

[see *vortex ring state* in Glossary]

WOT

Wide Open Throttle. Full power.

wringing it out

An expression meaning to do acrobatics or to encounter exceptionally severe flying conditions. It also refers to the occasional bad habit of an instructor, who is inclined to be cocky, to show his superior flying ability to a student by forcing him to endure a stunt ide. It invariably is the forerunner to serious difficulties, or a completely discouraged student. [Baughman's]

Yehudi

"Remote flight control unit." Derived from the poem and song "The little man who wasn't there." (Popular Science 1945 December) [see *beeper*]

yoke

One of the many current terms for the control column of an aircraft. Others include *wheel*, *stick*, or simply 'controls'. The yoke was initially referred to as the *joystick*.

zap-landing

A slang term for an emergency landing of an electric drone due to sudden battery failure or other technical issues.

zebra striping

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

zero-zero

No ceiling, no visibility.

dreun
AFRIKAANS—drone

dron
ALBANIAN—drone

طائرة بدون طيار
tayirat bidun tayaar
ARABIC—drone

Anmardapet lusavor spahorq sark
ARMENIAN—unmanned aerial vehicle

İnsansız hava vasitəsi
AZERBAIJANI—unmanned aerial vehicle

беспілотнік
biespilotnik
BELORUSIAN—drone

дрон
dron
BULGARIAN—drone

ngai cu
BURMESE—drone

无人驾驶飞机
wú rén jiàshǐ fēijī
CHINESE—unmanned aircraft

bespilotno sredstvo napada
CROATIAN—drone

bezpilotní letoun
CZECH—drone

drone
DANISH—drone

ubemandet luftfartøj
DANISH—unmanned aerial vehicle

onbemand luchtvaartuig
DUTCH—unmanned aerial vehicle (drone)

senpilota aerveturilo
ESPERANTO—unmanned aircraft

Droon
ESTONIAN—drone

miehittämättömiä ilma, Kauko-ohjattava lentolaite
FINNISH—unmanned aerial vehicle

aéronef sans pilote
FRENCH—unmanned aircraft

véhicule aérien sans pilote
FRENCH—unmanned aerial vehicle

petit véhicule aérien sans pilote (drone)
FRENCH—small unmanned aerial vehicle (drone)

Dróni
GEORGIAN—drone

Drohne
GERMAN—drone

ferngesteuretes Flugzeug
GERMAN—remotely piloted aircraft

ferngesteuretes 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

μη επανδρωμενο εναεριο Οχημα
GREEK—unmanned aerial vehicle

כלי טיס בלתי מאויש
Rakhefan
HEBREW—unmanned aerial vehicle

मानव रहित हवाई वाहन
HINDI—unmanned aerial vehicle

drón
HUNGARIAN—drone

pilóta nélküli légi jármű
HUNGARIAN—unmanned aerial vehicle

dróna
ICELANDIC—drone

drón
IRISH—drone

aerfheithicil gan foireann
IRISH—unmanned aerial vehicle

aeromobili pilotaggio remoto (APR)
ITALIAN—remotely piloted aerial vehicle (RPAV)

drona
ITALIAN—drone

無人機
mujin-ki
JAPANESE—unmanned aircraft

ドローン
dorōn
JAPANESE—drone

無人航空機
JAPANESE—unmanned aircraft

무인 항공기
mu-in hang-gong-gi
KOREAN—unmanned aircraft

무인 항공기 시스템
mu-in hang-gong-gi siseutem, Deulon
KOREAN—unmanned aircraft systems

wak□áŋgli ziŋtkála
LAKOTA—electric bird

Bezpilota lidmašīna
LATVIAN—unmanned aircraft

Skraidyklė be pilotų
LITHUANIAN—unmanned aircraft

Rōere
MAORI—drone

ubemannede fly
NORWEGIAN—unmanned aircraft

Ubemannet luftfartøy
NORWEGIAN—unmanned aerial vehicle

drone
NORWEGIAN—drone

bezzałogowego samolotu
POLISH—unmanned aerial vehicle

bezzałogowy statek powietrzny
POLISH—unmanned aerial vehicle

veículo aéreo não tripulado (VANT)
PORTUGUESE—unmanned aerial vehicle (UAV)

vehicul aerian fără pilot
ROMANIAN—unmanned aerial vehicle

беспилотные летательные аппараты
bespilotnyye letatel'nyye apparaty (BPLA)
RUSSIAN—unmanned aerial vehicle (UAV)

беспилотный самолет
RUSSIAN—unmanned aircraft

дрон
RUSSIAN—drone

Bezpilotný lietadlo
SLOVAK—unmanned aircraft

Brezpilotno letalo
SLOVENIAN—unmanned aircraft

vehículo aéreo no tripulado (VANT)
SPANISH—unmanned aerial vehicle (UAV)

Ndoto ya bila rubani
SWAHILI—unmanned aircraft

obemannat luftfordon
SWEDISH—unmanned aerial vehicle

insansız hava aracı
TURKISH—unmanned aerial vehicle

безпілотний літальний апарат
UKRAINIAN—unmanned aerial vehicle

Máy bay không người lái
VIETNAMESE—unmanned aircraft

nltlhon
KLINGON—drone (ChatGPT)