UNMANNED AIRCRAFT SYSTEMS:
UNITED STATES & CANADIAN REGULATORY APPROACHES

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DEFINITION: Unmanned Aircraft System (UAS)

A UAS consists of the unmanned aircraft (UA) and its associated support equipment, control station, data links, telemetry, communications and navigation and related equipment necessary to operate the UA.

The UA is the flying portion of the system, flown by a pilot via a ground control system, or autonomously through use of an on-board computer, communication links and any additional equipment necessary for safe operations.

The United States FAA issues an experimental airworthiness certificate for the entire UAS, not just the flight portion of the system.
DEFINITION: Unmanned Air Vehicle (UAV)

a power driven aircraft, other than a model aircraft, that is operated without a flight crew member on board.

FAA:

“Unmanned Aircraft: A device used or intended to be used for flight in the air that has no onboard pilot. This includes all classes of airplanes, helicopters, airships, and translational lift aircraft that have no onboard pilot. Unmanned aircraft are understood to include only those aircraft controllable in three axes and therefore, exclude traditional balloons.”

Section 101.01 of the Canadian Aviation Regulations (CARs)
Uses of UAVs

atmospheric research (including weather and atmospheric gas sampling),
scientific research,
oceanographic research,
geophysical research,
mineral exploration,
imaging spectrometry,
telecommunications relay platforms,
police surveillance,
border patrol and reconnaissance,
survey and inspection of remote power lines and pipelines,
traffic and accident surveillance,
emergency and disaster monitoring,
cartography and mapping,
search, rescue and recovery,
agricultural spraying,
aerial photography,
promotion and advertising,
weather and pollution reconnaissance,
flight research, and
fire fighting monitoring and management.

Source: Canadian government
Safety is the Principal Concern

In the US, approximately 50 companies, universities, and governmental institutions are developing more than 155 unmanned aircraft designs. The National Airspace System (NAS) has more than 100,000 aviation operations per day, including air carrier, air taxi, general aviation, and military aircraft. Approximately 18,000 air carrier aircraft and 230,000 active general aviation aircraft traverse U.S. skies.

Because of the inherent differences from manned aircraft, such as the pilot removed from the aircraft and the need for “sense and avoid,” introduction of UAS into the NAS poses unique challenges.

Moreover, UAS must be integrated into an evolving NAS, from one with ground-based navigational aids to a GPS-based system in NextGen.

Decisions being made about UAS airworthiness and operational requirements must fully address safety implications of UAS flying in the same airspace as manned aircraft, and perhaps more importantly, aircraft with passengers.

Source: FAA, FACT SHEET: UNMANNED AIRCRAFT SYSTEMS (UAS) Updated July 2011
The US FAA has three categories of UAS:

1. Model Aircraft (largely unregulated)
2. Experimental Certificates (for civil aircraft)
3. Certificates of Authorization (for public aircraft)
MODEL AIRCRAFT

Canadian Regulations define a model aircraft as an aircraft, the total weight of which does not exceed 35 kg (77.2 pounds), that is mechanically driven or launched into flight for recreational purposes and that is not designed to carry persons or other living creatures.

In the US, regulatory approval is not required to fly a model aircraft for recreation. The regulations do not address size of the model aircraft. FAA guidance provides that model aircraft flights:

should be kept below 400 feet above ground level (AGL),
should be flown a sufficient distance from populated areas, airports and full size aircraft,
should not be flown for business purposes,
should avoid noise sensitive areas such as parks, schools, hospitals, and churches,
should not fly in the vicinity of spectators until they are confident that the model aircraft has been flight tested and proven airworthy, and should be flown within visual line-of-sight.

No person may operate a UAS in the National Airspace System without specific authority. There are two methods of gaining FAA approval for flying UAS:

1. Special Airworthiness Certificates - Experimental Category (SAC-EC) for civil aircraft, and
2. Certificates of Waiver or Authorization (COA) for public aircraft.

A public aircraft is one that is owned and operated by a governmental institution.

A civil aircraft is other than a public aircraft.
Unmanned Aircraft Systems Operating as Civil Aircraft

Civil applicants seeking to operate a UAS for civil use must obtain an FAA airworthiness certificate the same as any other type aircraft. However, the FAA currently only issues special airworthiness certificates in the experimental category (SAC-EC).

The applicant must prove that the aircraft and its systems, including the control station(s) is designed, built, and maintained in a safe and airworthy condition.

The applicant must state the intended use for the UAS, as well as the time or number of flights along with a description of the areas over which the aircraft will operate. The application must also include drawings or photographs of the aircraft. An on-site review of the UAS and demonstration of the area of operation may be required.

Experimental certificates are typically issued for a period of up to one year. Operational limitations are normally imposed on the certificates.
One may not fly a UAS under a COA or experimental certificate for commercial purposes.

However, manufacturers may apply for an experimental certificate for the purposes of R&D, market survey or crew training. Between 2005-2011, the FAA issued 94 SAC-ECs to 13 civil operators covering 20 unique UAS and OPA types.

Public UA operators may self-certify their equipment and personnel, but civil operators must be certified by the FAA.
Unmanned Aircraft Systems Operating as Public Aircraft

The operator must establish:

- UAS airworthiness either from FAA certification, a DOD airworthiness statement, or by other approved means
- that a collision with another aircraft or other airspace user is extremely improbable, and
- Compliance with appropriate cloud and terrain clearances.

Certificates of Waiver or Authorization (COA) for public aircraft.

The COA process is available to public entities seeking to fly a UAS in civil airspace. The COA authorizes an operator to use defined airspace and includes special provisions unique to the proposed operation. For example, a COA may include a requirement to operate only under Visual Flight Rules (VFR) and/or only during daylight hours. Most COAs are issued for a specified time period (up to one year, in most cases).

Most COAs require coordination with an appropriate air traffic control facility and may require the UAS to have a transponder to operate in certain types of airspace.

Due to the inability of UAS to comply with “see and avoid” rules as manned aircraft operations do, a visual observer or an accompanying “chase” aircraft must maintain visual contact with the UAS and serve as its “eyes” when operating outside of airspace that is restricted from other users.

The FAA issued 146 COAs in 2009 and 298 in 2010, more than doubling in one year.

As of June 28, 2011, there were 251 active COAs, 90 different proponents, and 77 different aircraft types.

Source: FAA, FACT SHEET: UNMANNED AIRCRAFT SYSTEMS (UAS) Updated July 2011
Role of the Pilot-in-Command (PIC) and Observer

The PIC is the person in control of, and responsible for, the UAS. The observer must observe the activity of the unmanned aircraft and surrounding airspace, either through line-of-sight on the ground or in the air by means of a chase aircraft. Ordinarily, the pilot or observer must be within 1 mile laterally and 3,000 feet vertically of the unmanned aircraft. Direct communication between the PIC and the observer must be maintained at all times.

Above 18,000 feet, unmanned aerial flight must be conducted under Instrument Flight Rules, on an IFR flight plan, must obtain ATC clearance, be equipped with at least a Mode C transponder preferably Mode S), operating navigation lights and/or collision avoidance lights and maintain communication between the PIC and Air Traffic Control (ATC).

Below 18,000 feet, such flight has similar requirements, except that if operators choose to operate on other than an IFR flight plan, they may be required to pre-coordinate with ATC.

CANADIAN REQUIREMENTS FOR UAV FLIGHTS:

(a) the name, address, and where applicable, the telephone number and facsimile number of the applicant;

(b) the name, address, and where applicable, the telephone number and facsimile number of the person designated by the applicant to have operational control over the operation (Operation Manager);

(c) method by which the Operation Manager may be contacted directly during operation;

(d) the type and purpose of the operation;

(e) the dates, alternate dates and times of the proposed operation;

(f) a complete description, including all pertinent flight data on the aircraft to be flown;

(g) the security plan for the area(s) of operation and security plan for the area(s) to be overflown to ensure no hazard is created to persons or property on the surface;

(h) the emergency contingency plan to deal with any disaster resulting from the operation;

(i) the name, address, telephone and facsimile numbers of the person designated to be responsible for supervision of the operation area (Ground Supervisor), if different from the Operation Manager during the operation;

(j) a detailed plan describing how the operation shall be carried out. The plan shall include a clear, legible presentation of the area to be used during the operation. The presentation may be in the form of a scale diagram, aerial photograph or large scale topographical chart and must include at least the following information:

- the altitudes and routes to be used on the approach and departure to and from the area where the operation will be carried out;

- the location and height above ground of all obstacles in the approach and departure path to the areas where the operation will be carried out;

- the exact boundaries of the area where the actual operation will be carried out;

- the altitudes and routes to be used while carrying out the operation;

- any other information pertinent to the safe conduct of the operation requested by the Minister.
Canadian Special Flight Operations Certificates (SFOCs)

SFOCs are required if the UAV is to be operated beyond visual range. An SFOC is issued once the applicant demonstrates the ability to conduct a safe operation. The operator must evaluate the risks associated with the proposed operation and provide satisfactory risk mitigation measures.
Canada: Detect, sense-and-avoid (DSA) capability

The objective of the DSA system is to perform those collision avoidance functions normally provided by a pilot in a manned aircraft. The DSA system detects traffic in time to process the sensor information, determine if a conflict exists, and execute a manoeuvre according to the right-of-way rules. If pilot interaction is required, transmission and decision time must be included in the total time between initial detection and the point of minimum separation. The DSA system must have the capability to detect both participating and non-participating aircraft.
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