

CLASS 244, AERONAUTICS AND ASTRONAUTICS

SECTION I - CLASS DEFINITION

This class contains and is limited to:

1. Machines or structures adapted to be completely or partially sustained by the air (e.g., winged aircraft, helicopters, parachutes, kites, balloons, etc.),
2. Machines or structures adapted to be propelled and guided or stabilized through the air (e.g., projectiles with fins, guided missiles, etc.),
3. Machines or structures adapted to be placed in an orbit or which substantially operate outside the earth's atmosphere (e.g., satellites, space vehicles, etc.),
4. Subcombinations of the machines or structures of 1-3, above, not classified elsewhere (guidance and control, aircraft structures, etc.),
5. Devices ancillary to the use of the machines or structures of 1-3 above, not classified elsewhere (e.g., mooring devices, etc.), and
6. Processes or methods peculiarly related to 1-5 above and not provided for elsewhere.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

This class excludes toy or model aeronautical devices unless the invention is such that it also applies logically to full sized devices for actual use in carrying persons or cargo. For toy or model airplanes, etc., see Class 446, Amusement Devices: Toys, subclass 56.

This class excludes motor vehicles for travel on land or water, and which vehicles are supported above said land or water by a relatively thin cushion of air between the vehicle and the land or water, such cushion of air being generated by the motor vehicle (e.g., ground effect machines). For a motor vehicle of the surface effect type, see Class 180, Motor Vehicles, subclasses 116+.

This class provides, in subclasses 76+, the generic subclass for the automatic steering of mobile craft in two or three dimensions. See subclasses 175+ where the control apparatus includes electrical devices or apparatus. See the search notes to these subclasses for the other subclasses which provide for motion and/or steering

control and a statement as to the line between the classes.

Arrangements of aircraft to permit their handling by hoists are found in this class, subclass 1. For similar arrangements on other articles, see Class 220, Receptacles, subclass 1.5+ and Class 294, Handling: Hand and Hoist-Line Implements, subclass 74, and indented subclasses.

Gas cells or balloon envelope distinguished only by the coating on, or by the structure of the fabric or textile are placed in Class 428, Stock Material or Miscellaneous Articles, appropriate subclasses; see especially subclasses 175+, 190, 193, and 196+ for a single or plural layer sheet or web embodying mechanically interengaged strands (e.g., weave or knit), and subclasses 411.1+ for a composite, web or sheet characterized only by the composition of the layers.

SECTION III - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 89, Ordnance, subclasses 1.51+ for bomb flare and signal dropping and subclass 37.16 for gun mounts on aircraft.
- 102, Ammunition and Explosives, subclasses 337+ for parachute flares, subclass 387 for parachute-carried drop bombs, subclass 405 for aerial mines, and subclasses 504+ for parachute-containing projectiles.
- 104, Railways, subclass 23.1 for airplanes attached to or running on tracks.
- 123, Internal-Combustion Engines, subclasses 41.56+ for devices for cooling internal combustion engines by means of air including cowlings for the engines to provide for directing the cooling air against the engine parts to be cooled and subclasses 41.63+ for combinations of impellers with driving means are ordinarily classified in Class
- 414, Material or Article Handling, subclasses 227+ for storage and handling means for vehicles.
- 415, Rotary Kinetic Fluid Motors or Pumps, subclasses 8+ for combinations of impellers with driving means.
- 416, Fluid Reaction Surfaces (i.e., Impellers), appropriate subclasses for impellers such as traction propellers, pusher propellers, helicopter and freely rotating rotors as well as these impellers combined with their driving means, whether recited, per se, or in combination with

- such aircraft structure as is necessary to mount the impellers.
- 434, Education and Demonstration, subclass 111, 186, and 239+ for devices for training in the use of navigational instruments or for such devices when combined with training devices for aircraft operation, per se.
- 442, Fabric (Woven, Knitted, or Nonwoven Textile or Cloth, etc.), subclasses 181+ and 304+ for a woven or knit fabric.

SUBCLASSES

1 MISCELLANEOUS:

This subclass is indented under the class definition. Aeronautical machines and devices not otherwise classifiable.

- (1) Note. Instruments and indicators incorporated with aircraft structure are found here.
- (2) Note. for instruments and indicators, per se, see the search notes below.

SEE OR SEARCH CLASS:

- 33, Geometrical Instruments, appropriate subclasses for instruments and indicators, per se,
- 73, Measuring and Testing, appropriate subclasses for instruments and indicators, per se,
- 116, Signals and Indicators, appropriate subclasses for instruments and indicators, per se,
- 343, Communications: Radio Wave Antennas, subclass 707 for trailing-type antennas with aircraft.

2 COMPOSITE AIRCRAFT:

This subclass is indented under the class definition. Compound aeronautical machines consisting of two or more complete machines of the same or different types acting together to provide a single result or to be mutually interdependent. This subclass also includes aeronautical machines combined with complete land or water vehicles, which may be separable from the aeronautical machine for independent operation during its use as a land or water vehicle.

- (1) Note. This subclass includes complete aeronautical machines cooperating with other complete aeronautical machines to provide landing or launching facilities on one machine for the other.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 50, for aircraft operable as land or water craft.
- 63, for launching of aircraft not claiming the combination of a lifting or propulsive aircraft.

SEE OR SEARCH CLASS:

- 258, Railway Mail Delivery, subclass 1.2 for load pick-up or release by an aircraft in flight and see the reference to this class (244) for the line.

3 Trains:

This subclass is indented under subclass 2. Compound aeronautical machines comprising two or more complete machines of the same or different types, arranged in tandem, and attached together so that one may tow or propel the others, or arranged to cooperate to provide sustentation and propulsion.

SEE OR SEARCH CLASS:

- 40, Card, Picture, or Sign Exhibiting, subclass 215 for devices for attaching signs to aircraft so that they may be towed thereby.
- 105, Railway Rolling Stock, subclasses 1.4+ for railway trains.
- 180, Motor Vehicles, subclasses 14.1+ for motor vehicle trains.
- 280, Land Vehicles, subclasses 400+ for miscellaneous vehicle trains, these subclasses having draft devices, per se, even though disclosed solely for towing one aircraft from another.

3.1 MISSILE STABILIZATION OR TRAJECTORY CONTROL:

This subclass is indented under the class definition. Subject matter including means which operates inherently to compensate for undesired changes in attitude or which operates to affect the trajectory or course of an unmanned aerial missile.

- (1) Note. The term “missile” in the above definition includes: (a): (1) a device explosively propelled through and from the barrel of a gun or (2) a device carrying an explosive which explosive when actuated either (a) detonates to destroy or damage the carrying device, or (b) burns or combusts within the carrying device to (1) release the products of combustion to the atmosphere, or (2) generate a gas to eject an object or substance from the carrying device, or (3) generate heat within the carrying device which damage or partly damages the carrying device; (b) a device having a payload and an attached reaction motor for propelling payload through the earth’s atmosphere. The reaction motor comprises a means for producing a motive fluid and a means for ejecting said fluid (see 1-8 Notes Class 60, Power Plants, subclasses 200.1+).
- (2) Note. This definition excludes aircraft which are sustained by air. For such subject matter see this class, subclasses 4+.
- (3) Note. Where the “missile” is disclosed as having utility for manned flight the patent is excluded under this definition and is classified in this class, subclasses 75.1- 99.9.
- (4) Note. Where the “missile” (manned or unmanned) is (1) disclosed as a body which is to be placed in orbit around the earth (i.e., satellite) or (2) solely disclosed as a vehicle for use in outer space interplanetary travel, it is classified in this class, subclass 1.
- (5) Note. This definition excludes explosive devices designed to be dropped from the air or watercraft on an objective below, known as “drop bombs”. Such subject matter is classified in Class 102, Ammunition and Explosives, subclasses 382+.
- (6) Note. This definition excludes a missile having a payload for display or amusement (e.g., fireworks or toy novelties) with a reaction motor driven by the products of combustion. Pyrotechnic rockets

are classified in Class 102, Ammunition and Explosives, subclasses 347+.

- (7) Note. This definition further excludes a pyrotechnic (firework creating flash, noise or smoke) device of general utility having a vane, a wing, parachute, balloon or propeller. Such subject matter is classified in Class 102, Ammunition and Explosives, subclasses 335+ and 367+.
- (8) Note. This definition further excludes a rocket having a toy, amusement or display (nonpyrotechnic) payload with a reaction motor driven by other than products of combustion. Such a rocket is classified in Class 446, Amusement Devices: Toys, subclass 56.

SEE OR SEARCH CLASS:

- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 1 through 89 for generic data processing control systems.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 3+ for computer systems for vehicle control or vehicle condition indication and subclasses 400-541 for computations in the application of navigation.
- 703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 8 for mathematical simulation of a vehicle.

3.11 Remote control:

This subclass is indented under subclass 3.1. Subject matter comprising means whereby the attitude or the trajectory of the missile is controlled from a command source originating at a point remote from the missile.

SEE OR SEARCH CLASS:

- 102, Ammunition and Explosives, subclass 384 for remote control of drop bombs.
- 318, Electricity: Motive Power Systems, appropriate subclasses for remotely controlled electric motors, particularly subclass 16 for motors controlled by space transmitted electromagnetic or electrostatic energy, subclass 128 for reciprocating motor

and subclass 460 for motors in general controlled by sound, supersonic waves or vibration, subclass 471 for motors controlled by infra red or heat waves and subclass 480, for motors controlled by radiant energy (light waves).

398, Optical Communications, subclasses 106 through 114 for remote control communication systems utilizing light waves.

3.12 Trailing wire:

This subclass is indented under subclass 3.11. Subject matter comprising a wire connected between a moving missile and the command source and used to convey a signal to control the attitude or the flight path of the missile.

3.13 Beam rider:

This subclass is indented under subclass 3.11. Subject matter in which the missile is directed to a target by a beam of electromagnetic wave energy which is transmitted from the command source to the target.

SEE OR SEARCH THIS CLASS, SUBCLASS:

3.14, for remote control systems wherein the command source transmits a radio frequency control signal to the missile.

3.19, for automatic guidance systems for missiles with means for detecting radio waves and having a communication link to the command source in the missile.

SEE OR SEARCH CLASS:

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 385+ for directive beacons.

3.14 Radio wave:

This subclass is indented under subclass 3.11. Subject matter in which the command source transmits a radio frequency control signal to the missile.

SEE OR SEARCH THIS CLASS, SUBCLASS:

3.13, for systems wherein the missile is directed to a target by a beam of elec-

tromagnetic wave energy from the command source.

3.19, for missiles provided with means for detecting radio waves and having a communication link to the command source in the missile.

SEE OR SEARCH CLASS:

318, Electricity: Motive Power Systems, subclass 16 for electric motors supplied or controlled by space transmitted electromagnetic or electrostatic energy (e.g., radio waves).

340, Communications: Electrical, subclasses 539.1 and 539.32 for alarm systems including a radio link, subclasses 12.5, 12.51, 13.25, and 13.26 for remote control utilizing radio waves; and subclasses 870.01-870.44 for telemetering systems.

3.15 Automatic guidance:

This subclass is indented under subclass 3.1. Subject matter wherein the trajectory or stability of the missile is controlled by a command signal originating inside the missile.

(1) Note. The command signal inside the missile may depend upon some source outside the missile which is radiating energy but which is not varied for the purpose of influencing the missile. For example, the source may be wave energy from the sun, the stars, the earth's magnetic field, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

76+, for automatic guidance systems for fluid sustained or manned aircraft.

SEE OR SEARCH CLASS:

700, Data Processing: Generic Control Systems or Specific Applications, subclasses 1 through 89 for generic data processing control systems.

701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 3+ for computer systems for vehicle control or vehicle condition indication and subclasses 400-541 for computations in the application of navigation.

703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 8 for mathematical simulation of a vehicle.

3.16 Optical (includes infrared):

This subclass is indented under subclass 3.15. Subject matter in which means are provided for detecting light waves (includes visible and infrared rays) and a communication link is provided between the detecting means and the command source in the missile.

SEE OR SEARCH CLASS:

102, Ammunition and Explosives, subclass 384 for drop bombs having direction controlling means which may include a detector sensitive to infrared or visible rays.
250, Radiant Energy, subclasses 203.1+ for tracking objects by means of visible or infrared light rays.

3.17 Optical correlation:

This subclass is indented under subclass 3.16. Subject matter in which the light rays are compared with a record located inside the missile (e.g., a film strip or photograph).

SEE OR SEARCH CLASS:

250, Radiant Energy, subclasses 548 and 559.01+ for optical or prephotocell systems having a web, or a web strand in the optical path, and subclasses 555+ for a record in the optical path.
342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclass 5 for such systems where the record is a radar map.
356, Optics: Measuring and Testing, subclasses 429+ for the monitoring of webs for variations in the response of the webs to visible light.

3.18 Celestial navigation:

This subclass is indented under subclass 3.16. Subject matter in which the light rays emanate from a celestial body (e.g., star, sun).

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 178+ for navigation systems in general.

250, Radiant Energy, subclasses 203.1+ for optical systems for following a point (e.g., a star).

3.19 Radio wave:

This subclass is indented under subclass 3.15. Subject matter in which means are provided for detecting radio waves and a communication link is provided between the detecting means and the command source in the missile.

SEE OR SEARCH THIS CLASS, SUBCLASS:

3.13, for missiles that are directed to a target by a beam of electromagnetic energy from a command source.
3.14, for remote control systems wherein a command transmits a radio frequency control signal to the missile.

SEE OR SEARCH CLASS:

342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), appropriate subclasses for radio wave communication systems, especially subclass 417 for direction finding receivers. See Class 343, Communications: Radio Wave Antennas, subclasses 700+ for radio wave antennas.
455, Telecommunications, subclasses 130+ for radio receivers.

3.2 Inertial:

This subclass is indented under subclass 3.15. Subject matter in which automatic guidance is achieved by means of self-contained automatic controlling devices that respond to acceleration producing forces.

SEE OR SEARCH THIS CLASS, SUBCLASS:

79, for automatic aircraft control by gyroscopic means.

SEE OR SEARCH CLASS:

33, Geometrical Instruments, subclasses 316+ and 318+ for direction sensing and indicating devices utilizing a gyroscope.
73, Measuring and Testing, subclasses 178+ for navigation systems which may use inertial guidance systems.

- 74, Machine Element or Mechanism, subclasses 5+ for gyroscopes.
- 114, Ships, for underwater torpedoes with a gyroscopic controlled steering mechanisms.
- 318, Electricity: Motive Power Systems, subclass 457 for electric motor control systems utilizing inertia-type detectors.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 500 through 512 for navigational applications which include an inertial sensor.

3.21 Attitude control mechanisms:

This subclass is indented under subclass 3.15. Subject matter wherein a mechanism for controlling missile attitude is actuated.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 1, for such mechanisms used with space vehicles.
- 76+, for such mechanisms used with fluid sustained or manned aerial vehicles.

SEE OR SEARCH CLASS:

- 102, Ammunition and Explosives, subclass 384 for such mechanisms used with drop bombs.
- 114, Ships, subclass 23 for such mechanisms used with underwater torpedoes.
- 318, Electricity: Motive Power Systems, subclasses 580+ for position servo-mechanisms for single axis vehicular guidance systems, and subclasses 648+ for position servomechanisms responsive to inertial, direction or inclination measuring instruments.

3.22 Fluid reaction type:

This subclass is indented under subclass 3.21. Subject matter in which the mechanism for controlling attitude comprises a fluid reaction jet.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 228+ for reaction motors with a thrust direction modifier.

- 102, Ammunition and Explosives, subclasses 347+ for pyrotechnic skyrockets and subclasses 374+ for missile with propelling charge.
- 114, Ships, subclass 151 for ships with fluid jet-type steering means.
- 440, Marine Propulsion, subclasses 44+ for marine propulsion means of the explosive jet type.

3.23 Stabilized by rotation:

This subclass is indented under subclass 3.1. Apparatus wherein the missile is rotated about its longitudinal axis during the flight of said missile for maintaining stability by means on the missile which reacts with the atmosphere (e.g., fin, etc.) or a fluid reaction jet issuing from said missile.

- (1) Note. This definition excludes a "missile" where the sole means to rotate it is the coaction between pregrooved rifling band and a rifled barrel and the engraved grooves on the band are disclosed for the purpose of reacting with the atmosphere to aid in the rotation of the missile, such a missile is classified in Class 102, Ammunition and Explosive Devices, along with conventional rifling bands which may inherently perform the same function.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 228+ for a reaction motor having thrust direction modifying means.
- 102, Ammunition and Explosives, subclass 348 for pyrotechnic rockets having vane of fin structure and subclass 339 for pyrotechnic rockets with means to cause rotation of the rocket by gas discharge.

3.24 Externally mounted stabilizing appendage (e.g., fin):

This subclass is indented under subclass 3.1. Subject matter where the stabilizing means is an external aerodynamic surface mounted on the missile.

- (1) Note. Nominally recited fin structure on a missile is excluded from this subclass, and is classified in the appropriate mis-

sile subclass in Class 102, Ammunition and Explosives.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

34+, for such surfaces on a fluid sustained or manned aerial vehicle.

SEE OR SEARCH CLASS:

114, Ships, subclasses 23+ for underwater torpedoes with steering mechanism and subclasses 144+ for ship steering mechanisms in general.

3.25 Removable:

This subclass is indented under subclass 3.24. Subject matter wherein the stabilizing surface is removed during the flight of the missile.

3.26 Sliding:

This subclass is indented under subclass 3.24. Subject matter wherein the stabilizing means as a unit is movable along the longitudinal axis of the missile from a first position to a second position.

3.27 Collapsible:

This subclass is indented under subclass 3.24. Subject matter wherein the stabilizing surface moves from a collapsed position to an open position.

3.28 Longitudinally rotating:

This subclass is indented under subclass 3.27. Subject matter wherein the stabilizing surface rotates about an axis perpendicular to an axis parallel to the longitudinal axis of the missile.

3.29 Radially rotating:

This subclass is indented under subclass 3.27. Subject matter wherein the stabilizing surface rotates about an axis parallel to the missile axis.

3.3 Extending beyond rear of missile:

This subclass is indented under subclass 3.24. Subject matter wherein the stabilizing surface is mounted to extend beyond the rear of the missile.

4 AIRCRAFT, HEAVIER-THAN-AIR:

This subclass is indented under the class definition. Miscellaneous aeronautical machines which ordinarily weigh more than the air which

they displace, and depend therefore on some aerodynamic action for their sustentation. This includes combination types not provided for below.

(1) Note. This subclass also includes machines strapped directly to the body of a person, but propelled by mechanical means.

5 Airplanes, weight diminished by bouyant gas:

This subclass is indented under subclass 4. Aeronautical machines sustained by aerodynamic action on airfoils, having also provision for continuous or temporary additional sustentation by bouyant gas.

(1) Note. For airships partially sustained by airplane wings, see this class, subclass 25.

6 Airplane and helicopter sustained:

This subclass is indented under subclass 4. Aeronautical machines having provision for sustentation in part or entirely by aerodynamic action on airfoils in fixed relation to the machines, having also provision for sustentation or vertical lift by means of screw propellers arranged to develop a substantial component of thrust in a vertical direction.

(1) Note. For helicopters without airplane wings, see this class, subclasses 17.11+.

(2) Note. For lighter-than-air craft partially sustained by helicopter propellers, see this class, subclass 26.

7 Convertible:

This subclass is indented under subclass 6. Aeronautical machines, which may be altered so that the major sustaining agency is either the aerodynamic action upon airfoils in fixed relation to the machine or the vertical component of thrust developed by screw propellers. This includes machines which are designed to be operated without change, either as airplanes or as helicopters, and also machines in which some parts of their arrangement are altered for this purpose.

(1) Note. Aeronautical machines sustained at all times by both airplane and helicop-

ter action, but providing for slight variations in the effect of one or the other sustaining agency, are classified in this class, subclass 6.

8 Airplane and auto-rotating wing sustained:
This subclass is indented under subclass 4. Aeronautical machines having provision for sustentation in part or entirely by aerodynamic action on airfoils in fixed relation to the machines, and having also sustaining elements having radially extending airfoil blades, the sustaining elements being rotatable about substantially vertical axes by the reaction of the relative wind on the airfoil blades.

- (1) Note. For machines having only auto-rotating wings for sustentation, see this class, subclasses 17.11+.
- (2) Note. For the rotating sustaining wings, per se, see this class, subclass 39.

9 Airplane and paddle wheel sustained:
This subclass is indented under subclass 4. Aeronautical machines having provision for sustentation in part or entirely by aerodynamic action on airfoils in fixed relation to the machines, having also provision for sustentation or vertical lift by the downward thrust developed by rotating paddle wheels. These paddle wheels may also provide a part or all of the forward propulsion.

- (1) Note. For machines sustained by paddle wheels alone, see this class, subclasses 19 and 20.
- (2) Note. For airships partially sustained by paddle wheels, see this class, subclass 27.

10 Airplane and cylindrical rotor sustained:
This subclass is indented under subclass 4. Aeronautical machines having provision for sustentation in part or entirely by aerodynamic action on airfoils in fixed relation to the machines, having also provision for sustentation or vertical lift by substantially cylindrical members rotating about substantially horizontal axes and reacting with the relative wind to produce a downward component of thrust.

- (1) Note. For machines sustained by cylindrical rotors alone, see this class, subclass 21.

11 Airplane and beating wing sustained:
This subclass is indented under subclass 4. Aeronautical machines having provision for sustentation in part or entirely by aerodynamic action on airfoils in fixed relation to the machines, having also provision for sustentation or vertical lift by the downward thrust developed by flapping or reciprocating blades attached to the machines. These blades may also be the propelling agents.

- (1) Note. For machines sustained by beating wings alone, see this class, subclass 22.
- (2) Note. For lighter-than-air craft partially sustained by beating wings, see this class, subclass 28.
- (3) Note. For beating wing construction, per se, see this class, subclass 72.

12.1 Airplane and fluid sustained:
This subclass is indented under subclass 4. Aeronautical machines having provision for sustentation in part or entirely by aerodynamic action on airfoils in fixed relation to the machines, having also provision for the sustentation by the reaction to the downward movement of restricted masses or jets by air or other fluid, the forward propulsion of the machines may also be derived from movement of the same or similar masses or jets of air or other fluid.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 15, for fluid propelled aircraft.
- 23, for aeronautical machines sustained solely by fluid reaction.
- 29, for lighter-than-air craft partially sustained by fluid reaction.
- 73+, for fluid propulsion and sustentation devices, per se.

12.2 Circular:
This subclass is indented under subclass 12.1. Apparatus wherein the peripheral surface of either the aeronautical machine or the airfoil therefor is substantially in the form of a circle.

12.3 Dual propulsion:

This subclass is indented under subclass 12.1. Apparatus wherein the aeronautical machine comprises separate and distinct power plants or motive means, at least one of the motive means being used solely for forward or horizontal propulsion and at least one other motive means solely for lift or vertical propulsion.

12.4 Thrust tilting:

This subclass is indented under subclass 12.1. Apparatus comprising an airfoil structure having an adjustable power plant or motive means thereon to provide a variable directional thrust to the machine, at least one component or direction of thrust being capable of providing lift to the machine.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

56, for a tiltable power plant mounted to the fuselage of an aeronautical machine.

12.5 With thrust diverting:

This subclass is indented under subclass 12.1. Apparatus wherein there is provided means on the aeronautical machine adjustable to a position for deflecting the direction of travel of exhaust fluid produced by the motive means, the deflector means when positioned to deflect the exhaust fluid providing a vertical or lifting force to the aeronautical machine for vertical or short take-offs and landings (V/STOL).

12.6 Channel wing:

This subclass is indented under subclass 12.1. Apparatus wherein the airfoil fixed to the aeronautical machine is provided with an arched or other undulating configuration for confining, channeling or otherwise affecting, at least in part, the flow of sustentation fluid therepast.

13 Airplane sustained:

This subclass is indented under subclass 4. Aeronautical machines sustained by aerodynamic action on airfoils in fixed relation to the machines.

(1) Note. For the shape and arrangement of sustaining airfoils with relation to the machine, see this class, subclass 35, and indented subclasses.

(2) Note. For the construction of aircraft of all types, see this class, subclass 117, and indented subclasses.

14 Aerial torpedoes:

This subclass is indented under subclass 13. Aeronautical machines of the self-propelled airplane type which carry an explosive or other destructive charge to be set off or liberated by contact with a distant target or by the meeting of other desired conditions. These machines are ordinarily unmanned and are therefore controlled either automatically or by such means as radiant energy from a remote point. This subclass also includes devices of this same type performing useful rather than destructive work at a distance.

15 Fluid propelled:

This subclass is indented under subclass 13. Aeronautical machines of the airplane type propelled by the reaction to the movement of restricted masses or jets of air or other fluids.

(1) Note. For the automatic control of aircraft and other mobile devices, see the search notes below.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

73+, for other fluid propulsion devices on aircraft.

76+, for the automatic control of aircraft and other mobile devices, and note especially the classes referred to in the Notes to subclasses 76 and 175+.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 200.1+ for reaction motors.

102, Ammunition and Explosives, subclass 405, for aerial mines.

239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 127.1+ and 265.11+ for the discharge nozzle sub-combination of a reaction motor.

16 Glider:

This subclass is indented under subclass 13. Aeronautical machines of the airplane type, having no mechanical propulsion and deriving their forward motion entirely from a compo-

ment of the force of gravity along the line of flight.

- (1) Note. For disclosure of similar machines, propelled by manual operated means, see this class, subclass 64.

17.11 Helicopter or auto-rotating wing sustained, i.e., gyroplanes:

This subclass is indented under subclass 4. Aircraft which are sustained in the air by a thrust produced by one or more wings or blades rotating about a substantially vertical axis.

- (1) Note. This type of aircraft is technically called a gyroplane and includes (1) helicopters, wherein the wings or blades are normally mechanically driven, and (2) the autorotating wing type, wherein the wings or blades rotate because of the aerodynamic forces acting on them due to the forward speed of the aircraft, the forward motion being caused by a tractor impeller, jet or other propulsion means.
- (2) Note. The rotary wing may be provided with modifying means whereby the thrust is varied in intensity or direction.
- (3) Note. This subclass and indented subclasses provide for a rotary wing which is significantly combined with the aircraft, i.e., when more structure of the aircraft is recited than is necessary to mount the propulsion or steering means. In the following instances, the aircraft is considered to be significantly recited: (a) Mounting or attachment of a motor or power plant to the frame or body in a particular relation or location with respect to the body. (b) The impeller drive gearing or shaft is located in a specific relation to the aircraft.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 6, 7 and 8, for aircraft having a fixed wing in addition to the rotating wing for sustentation.

SEE OR SEARCH CLASS:

- 416, Fluid Reaction Surfaces (i.e., Impellers), appropriate subclasses, particularly subclasses such as 20+, 87+ and 98+ for the rotor, per se.
- 446, Amusement Devices: Toys, subclasses 36+, for toy helicopters and aircraft employing a freely rotating rotor.

17.13 Automatic or condition responsive control:

This subclass is indented under subclass 17.11. Gyroplanes in which means responsive to a condition of the aircraft controls the rotary wing system.

- (1) Note. The condition responsive means of this subclass comprises separate and distinct controlling means and does not include those rotary wings which are automatically controlled by a condition of the rotary wing itself, e.g., free blade type.
- (2) Note. The mere forward motion of the aircraft is not significant aircraft structure as set forth in (3) Note, subclass 17.11, this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 76+, for automatic control of aircraft.

SEE OR SEARCH CLASS:

- 416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 27+ and 31+ for automatic controls for impellers where no aircraft combination is claimed, especially subclass 40 for impeller control responsive to relative medium flow velocity (e.g., vehicle speed, etc.) and subclasses 103+ and 131+ for free blade-type impellers. See (2) Note above.

17.15 With safety lowering device:

This subclass is indented under subclass 17.11. Gyroplanes having means other than the rotor to allow lowering of the aircraft or in which the rotor is adjustable to allow the aircraft to be safely lowered.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

17.13, for safety lowering devices in which the rotor is automatically adjusted by condition responsive means.

138+, for safety lowering devices for airplanes.

17.17 With landing, mooring, or nonaerial propelling or steering gear:

This subclass is indented under subclass 17.11. Gyroplanes combined with (1) landing gear, (2) aircraft mooring devices, (3) nonaerial propelling devices, and (4) nonaerial steering means.

- (1) Note. The nonaerial propelling and/or steering means of this subclass is directed to devices auxiliary to or other than the aircraft rotor to effect propulsion and/or steering while on land or water.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

2, for vehicles convertible from an aircraft to a land or water vehicle in which the flight mechanism is disabled during travel on land or water.

50, for propulsion and steering of aircraft other than gyroplanes on land or water.

100, for aircraft landing gear.

17.19 With auxiliary propulsion, counter-torque or steering device:

This subclass is indented under subclass 17.11. Gyroplanes combined with means in addition to the rotating wing and operating during flight to (1) propel the craft, (2) counteract the torque of the rotating wing, or (3) steer the aircraft.

- (1) Note. The steering means of this subclass, i.e., so-called aerial steering, is directed to devices auxiliary to the rotating wing of the aircraft to effect steering in flight. Such auxiliary devices may include shiftable weights to change the center of gravity of the craft or a rudder on the craft.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

17.15, for auxiliary propulsion, counter-torque or steering devices combined with a safety lowering device, and 17.17, for similar subject matter combined with a landing, mooring or nonaerial propelling or steering device.

17.21, for devices having a rotary as well as a nonrotary means for auxiliary propulsion counter-torque or steering.

235, for rudders for aircraft.

SEE OR SEARCH CLASS:

416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 48+ and subclasses 147+ for steering by means of a variation in the thrust forces produced by the rotor itself, e.g., tiltable axis or collective pitch changes.

17.21 Auxiliary rotor:

This subclass is indented under subclass 17.19. Gyroplanes in which the additional means is rotatable.

- (1) Note. This subclass includes those devices which include a rotary as well as a nonrotary means for auxiliary propulsion, counter-torque or steering.

SEE OR SEARCH CLASS:

416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 120+, for plural impellers which are relatively movable and/or have different axes in which no more aircraft structure is included than is necessary to mount the impellers. See (3) Note, subclass 17.11, this class (244), for the line.

17.23 Having plural lifting rotors:

This subclass is indented under subclass 17.11. Gyroplanes which are provided with a plurality of rotating wings.

SEE OR SEARCH CLASS:

416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 120+, for plural impellers which are relatively movable and/or have different axes and in which only as much aircraft structure

is claimed as is necessary to mount the impelling and/or steering means.

17.25 Lifting rotor having lift direction varying means:

This subclass is indented under subclass 17.11. Gyroplanes in which the direction of lift of the impeller is variable, either by a cyclic pitch control of the impeller thereby tilting the virtual axis of the impeller or by tilting the real axis of the impeller.

SEE OR SEARCH CLASS:

416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 98+ and 148 for impellers, per se, having a tiltable axis or cyclic pitch control.

17.27 Lifting rotor supports, e.g., pylons:

This subclass is indented under subclass 17.11. Gyroplanes including means to position or support the rotating wing on the aircraft.

SEE OR SEARCH CLASS:

416, Fluid Reaction Surfaces (i.e., Impellers), subclasses 121, 149+ and 246 for a shiftable or adjustable impeller support.

19 Paddle wheel sustained:

Aeronautical machines sustained by the downward thrust developed by rotating paddle wheels. These paddle wheels may also be the propelling agents.

- (1) Note. For paddle wheels on machines having also sustaining wings, see this class, subclass 9.
- (2) Note. For machines having feathering paddle wheels, see this class, subclass 20.
- (3) Note. For lighter-than-air craft sustained also by paddle wheels, see this class, subclass 27.

20 Feathering:

This subclass is indented under subclass 19. Aeronautical machines, in which the arrangement of the blades of the paddle wheels is varied during the rotation of the paddle wheel.

21 Cylindrical rotor sustained:

This subclass is indented under subclass 4. Aeronautical machines sustained by elements having cylindrical members rotating about substantially horizontal axes and reacting with the relative wind to produce a downward component of thrust.

- (1) Note. For machines having sustaining airfoils as well as sustaining cylindrical rotors, see this class, subclass 10.

22 Beating wing sustained:

This subclass is indented under subclass 4. Aeronautical machines sustained by the downward thrust developed by flapping or reciprocating blades attached to the machines. These blades may also be the propelling agents.

- (1) Note. For machines having fixed sustaining airfoils as well as beating wings, see this class, subclass 11.
- (2) Note. For lighter-than-air craft sustained also by beating wings, see this class, subclass 28.
- (3) Note. For beating wings, per se, see this class, subclass 72.

23 Fluid sustained:

This subclass is indented under subclass 4. Aeronautical machines sustained by the reaction to the downward movement of restricted masses or jets of air or other fluid. The forward propulsion of the machines may also be derived from the movement of the same or similar masses or jets of air or other fluid.

- (1) Note. For machines having fixed sustaining airfoils as well as means for fluid sustentation, see this class, subclasses 12.1+.
- (2) Note. For airplanes, fluid propelled, see this class, subclass 15.
- (3) Note. For lighter-than-air craft partially sustained by fluid reaction, see this class, subclass 29.

- (4) Note. For fluid propulsion and sustentation devices, per se, see this class, subclasses 73 and 74.

24 AIRCRAFT, LIGHTER-THAN-AIR:

This subclass is indented under the class definition. Miscellaneous aircraft which ordinarily have a total weight less than or equal to that of the volume of air which they displace and are therefore sustained by their buoyancy with respect to the air.

25 Airships with sustaining wings:

This subclass is indented under subclass 24. Propelled aeronautical machines sustained by their buoyancy relative to the air, having also provision for sustentation by aerodynamic action on airfoils in fixed relation to the machines.

- (1) Note. In this subclass the machines are primarily lighter-than-air craft with the fixed sustaining airfoils providing additional sustentation.
- (2) Note. Machines which are primarily airplanes but have provision for carrying some lighter-than-air gas to diminish their weight are found in this class, subclass 5.

26 Airship and helicopter sustained:

This subclass is indented under subclass 24. Propelled aeronautical machines sustained by their buoyancy relative to the air, having also provision for sustentation or vertical lift by means of screw propellers arranged to develop a substantial component of thrust in a vertical direction.

- (1) Note. For helicopters having also sustaining wings, see this class, subclass 6.
- (2) Note. For helicopters without airplane wings, see this class, subclasses 17.11+.

27 Airship and paddle wheel sustained:

This subclass is indented under subclass 24. Propelled aeronautical machines sustained by their buoyancy relative to the air, having also provision for sustentation or vertical lift by the downward thrust developed by rotating paddle

wheels. These paddle wheels may also provide a part or all of the forward propulsion.

- (1) Note. For paddle wheels on machines having also sustaining wings, see this class, subclass 9.
- (2) Note. For machines sustained by paddle wheels alone, see this class, subclasses 19 and 20.

28 Airship and beating wing sustained:

This subclass is indented under subclass 24. Propelled aeronautical machines sustained by their buoyancy relative to the air, having also provision for sustentation or vertical lift by the downward thrust developed by flapping or reciprocating blades attached to the machines. These blades may also provide a part or all of the forward propulsion.

- (1) Note. For machines having fixed sustaining air foils as well as beating wings, see this class, subclass 11.
- (2) Note. For machines sustained by beating wings alone, see this class, subclass 22.
- (3) Note. For beating wing construction, per se, see this class, subclass 72.

29 Airship and fluid sustained:

This subclass is indented under subclass 24. Propelled aeronautical machines sustained by their buoyancy relative to the air, having also provision for sustentation by the reaction to downward movement of restricted masses or jets of air or other fluid. The forward propulsion of the machine may also be derived from movement of the same or similar masses or jets of air or other fluid.

- (1) Note. For machines having fixed sustaining airfoils as well as means for fluid sustentation, see this class, subclasses 12.1+.
- (2) Note. For airplanes, fluid propelled, see this class, subclass 15.
- (3) Note. For machines sustained solely by fluid reaction, see this class, subclass 23.

- (4) Note. For fluid propulsion and sustentation devices, per se, see this class, subclasses 73 and 74.
- 30 Airships:**
This subclass is indented under subclass 24. Propelled aeronautical machines sustained by their buoyancy relative to the air.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 61, for power plants for airships using some gas, used in the sustentation or operation of the craft, also as fuel.
- 94, for ballast storage and release.
- 95, for ballast making.
- 96+, for control devices and their arrangement, particularly adapted for use on airships.
- 125, 126, 127, and 128, for the construction of airships.
- 31 Balloons:**
This subclass is indented under subclass 24. Aircraft sustained by their buoyancy relative to the air, having no provision for propulsion.
- SEE OR SEARCH CLASS:
- 442, Fabric (Woven, Knitted, or Non-woven Textile or Cloth, etc.), subclasses 59+ for a coated or impregnated fabric.
- 32 With parachutes:**
This subclass is indented under subclass 31. Aircraft normally sustained by their buoyancy relative to the air, having also provision for retarding their fall upon failure of their buoyancy, by means of parachutes attached to or formed from some part of their structure.
- (1) Note. This subclass includes those aircraft having propulsion means disclosed, but in which the invention is the combination between the gas bag and the parachute, or the conversion from one to the other.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 139, for the combination of balloon, parachute and heavier-than-air craft for lowering the latter in an emergency.
- 33 Captive:**
This subclass is indented under subclass 31. Aircraft sustained by their buoyancy relative to the air, restrained from free flight by ropes or cables connecting them to some fixed or movable anchoring means on the ground or water.
- SEE OR SEARCH CLASS:
- 40, Card, Picture, or Sign Exhibiting, subclass 214 for similar aircraft provided with signs or other advertising indicia.
- 34 AIRCRAFT SUSTENTATION:**
This subclass is indented under the class definition. Subject matter comprising means to provide support, relative to the air, for an aircraft to which it is attached.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 9, 19, 22, 27, and 70, for paddle wheels which may sustain as well as propel.
- 11, 22, 28, and 72, for beating wings which may sustain as well as propel.
- 35 Sustaining airfoils:**
This subclass is indented under subclass 34. Support providing means comprising an element, of the type commonly called a wing, plane, or blade, having a surface designed to be acted upon by a relatively moving stream of air to support the aircraft, a leading edge upstream and a trailing edge downstream, a theoretical chord line connecting the two edges, an upper surface when viewed planwise from above the chord line, and a lower surface when viewed planwise from below the chord line.
- (1) Note. This subclass contains airfoils in which the novelty is in the shape of the individual airfoil, either in cross-section or in plan view.
- (2) Note. The search should be continued in this class, subclass 45, which is devoted to the arrangement of airfoils, with respect to each other or to the body upon which they are mounted, but which contains many incidental disclosures of airfoils of unusual shape.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
123.1 through 124, for the construction of airfoils such as internal bracing, etc.
- 36 Lifting fuselages:**
This subclass is indented under subclass 35. Airplane fuselages having a shape which permits them to act as sustaining airfoils.
- 37 Lifting struts:**
This subclass is indented under subclass 35. Bracing struts on aircraft constructed and arranged to act as sustaining airfoils.
- SEE OR SEARCH CLASS:
52, Static Structures (e.g., Buildings), subclass 84 for a streamlined building component of more general application.
- 38 Resiliently mounted:**
This subclass is indented under subclass 35. Sustaining airfoils attached to aircraft by such devices as springs, elastic cables, etc.
- 39 Rotatable:**
This subclass is indented under subclass 35. Sustaining airfoils rotatable or capable of being moved in a rotary path with respect to the aircraft.
- (1) Note. For arrangements of autorotating airfoils on aircraft, including hub structure for permitting autorotation, see this class, subclasses 17.11+.
- 45 Arrangement:**
This subclass is indented under subclass 35. Subject matter having the relative arrangements between a plurality of sustaining airfoils or between one or more airfoils and the body or fuselage.
- (1) Note. The particular shape of individual airfoils is found in this class, subclass 35.
- 46 Variable:**
This subclass is indented under subclass 45. Arrangements of sustaining airfoils having provision for altering the arrangement at will or in response to changing conditions.
- (1) Note. Combinations of specific types of variable arrangement individually classified below, are found in this subclass.
- 47 Dihedral:**
This subclass is indented under subclass 46. Sustaining airfoils so arranged that the dihedral angle of the wing surfaces on opposite sides of the aircraft may be altered at will or in response to changing conditions.
- (1) Note. Continue the search in this class, subclass 38.
- 48 Incidence:**
This subclass is indented under subclass 46. Sustaining airfoils so arranged that the angle between their chord line and the line of thrust of the aircraft may be altered at will, or in response to changing conditions.
- (1) Note. Sustaining airfoils tilting from a horizontal to a vertical plane together with similarly tilting propellers to change from an airplane to helicopter operation are found in this class, subclass 7.
- 49 Folding:**
This subclass is indented under subclass 46. Sustaining airfoils arranged so that they may be folded to require less space in storage of the aircraft, or for similar purposes.
- (1) Note. Airfoils which are folded or otherwise reduced in area during flight to vary their sustaining effect, are found in this class, subclass 218.
- (2) Note. Airfoil construction to provide for the detaching of a portion of the airfoil is found in this class, subclass 124.
- 50 AIRCRAFT PROPULSION AND STEERING ON LAND OR WATER:**
This subclass is indented under the class definition. Special devices not ordinarily used in steering or propelling in flight, incorporated with aircraft structure and particularly adapted to provide for steering and/or propelling the aircraft on land or water or both.

- (1) Note. For ordinary propulsion devices, see this class, subclass 62, and indented subclasses.
- (2) Note. For steering by means of brakes either on land or water, see this class, subclasses 111 and 112.
- (3) Note. For ordinary control devices, see this class, subclasses 75.1-99.9.
- (4) Note. For rudder bars used to control ordinary steering apparatus and also to control brakes for steering, see this class, subclass 235.
- (5) Note. For composite air and land or water craft, having the air sustaining means removable for conversion into operable land or water craft, see this class, subclass 2.

51 AIRCRAFT, STEERING PROPULSION:

This subclass is indented under the class definition. Devices and arrangements for steering aircraft in flight by means of the propelling agency.

- (1) Note. For propellers used only in steering or stabilizing, see this class, subclass 92.
- (2) Note. For similar devices and arrangements used on ships, see Class 440, Marine Propulsion, appropriate subclasses.

52 Fluid:

This subclass is indented under subclass 51. Devices and arrangements in which the propelling agency is the movement of restricted masses or jets or air or other fluid.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 228+ for reaction motors having means to modify the thrust direction.
- 239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 127.1+, 265.23 and 265.33+ for discharge nozzles of reaction motors, disclosed on aircraft, and having means to vary the direction of

- fluid stream discharge for steering the craft.
- 440, Marine Propulsion, subclasses 38+, for reaction motors arranged to both propel and steer ships.

53 AIRCRAFT POWER PLANTS:

This subclass is indented under the class definition. Power plants or accessories thereto peculiar to aircraft and incorporated with aircraft structure.

- (1) Note. Power plants, per se, are found in Class 60, Power Plants.
- (2) Note. Starters for power plants of aircraft type are found in Class 123, Internal-Combustion Engines, subclass 179.
- (3) Note. Devices for cooling internal combustion engines by means of air are classified in Class 123, Internal-Combustion Engines, mainly in subclasses 41.56+, particularly subclass 41.7. This includes aircraft engine cowling or enclosure devices to provide for directing a flow of air against the engine or accessory parts to be cooled, and include so much of the aircraft structure as necessary to support the engine, cowling, or enclosure, or to complete the control of the flow of air through the cowling or enclosure. Broad recitation in the claims of the relation of the profile or outline of the cowling or enclosure to that of the adjacent aircraft structure is not sufficient to exclude the patent from Class 123, nor will the patent be excluded by specific recitation of airfoil or airflow characteristics of the cowling or enclosure.
- (4) Note. Impellers combined with a motor are found in Class 416, Fluid Reaction Surfaces (i.e., Impellers).

54 Mounting:

This subclass is indented under subclass 53. Arrangements for mounting power plants on aircraft.

- (1) Note. This subclass includes mounting arrangements which permit release and dropping of the motor.

- (2) Note. See also Class 248, Supports, subclasses 554+.

SEE OR SEARCH CLASS:

180, Motor Vehicles, subclasses 291+ for a motor vehicle wherein the motor and the body frame are particularly related to one another.

55 Arrangement:

This subclass is indented under subclass 53. The relative arrangement between power plants on aircraft or between one or more power plants and the aircraft.

56 Tilting:

This subclass is indented under subclass 55. Aircraft power plants so arranged that the vertical angle between the line of thrust developed by the power plant and the horizontal axis of the aircraft may be varied at will or in response to changing conditions.

- (1) Note. This subclass includes tilting power plants which carry screw propellers. For tilting propellers alone, see this class, subclass 66.

57 Radiator arrangement:

This subclass is indented under subclass 53. Subject matter providing the relative arrangement or mounting of radiators and analogous devices on aircraft.

SEE OR SEARCH CLASS:

123, Internal-Combustion Engines, subclass 41.43 for an internal combustion engine with a movably mounted tank or radiator.
165, Heat Exchange, subclasses 41+ for a heat exchanger installed on a vehicle, and subclass 149 for a radiator with edge cover or frame means.

58 Auxiliary:

This subclass is indented under subclass 53. Devices for developing power either for the purpose of emergency aircraft propulsion or for assisting in the propulsion or operation of aircraft.

59 High altitude:

This subclass is indented under subclass 53. Devices and arrangements for propelling aircraft at high altitudes, and devices peculiar to aircraft for permitting aircraft to be propelled to high altitudes.

- (1) Note. For super-chargers in general, see Class 123, Internal-Combustion Engines, subclasses 434+.
- (2) Note. For garments for aviators providing an oxygen supply, see Class 128, Surgery, subclass 202.11.
- (3) Note. For arrangements providing breathable air and all sorts of applications, see Class 128, Surgery, subclasses 200.24+.
- (4) Note. Search Class 454, Ventilation, subclasses 71+ for means to automatically maintain the air in aircraft cabins under pressure and subclasses 76+ for means to circulate air through aircraft cabins, where characteristics of aircraft propulsion, sustentation, or details of structure are not claimed.

60 Transmission of power:

This subclass is indented under subclass 53. Gearing and other means peculiar to aircraft for transmitting power from a power plant to a driven element.

- (1) Note. For foot pedals, including double pedals, and their associated mechanism for operating controls and brakes, see this class, subclass 235.
- (2) Note. For gearing in general and other machine elements and mechanisms, see appropriate subclasses in Class 74, Machine Element or Mechanism.

61 Power plant using airship gas as fuel:

This subclass is indented under subclass 53. Aircraft power plants adapted to use some part of the sustaining gas or some other gas peculiarly adapted for airship use as fuel.

62 AIRCRAFT PROPULSION:

This subclass is indented under the class definition. Devices and arrangements for propelling aircraft in flight.

- (1) Note. For propellers used only to steer or stabilize aircraft, see this class, subclass 92.
- (2) Note. For reaction motors, per se, capable of propelling any type of vehicle, see Class 60, Power Plants.
- (3) Note. For the combination of a motor driven propeller, per se, see Class 416, Fluid Reaction Surfaces (i.e., Impellers), appropriate subclasses.
- (4) Note. Devices for cooling internal combustion engines by means of air are classified in Class 123, Internal-Combustion Engines, subclasses 41.56+, particularly subclass 41.7. This includes cowling devices for the engines to provide for directing the cooling air against the engine parts to provide for directing the cooling air against the engine parts to be cooled. Combinations of impellers with driving means are ordinarily classified in Class 416, Fluid Reaction Surfaces (i.e., Impellers), various subclasses but such combinations with modifications to assist in cooling the engine are classified in Class 123, subclasses 41.63+.

63 Launching:

This subclass is indented under subclass 62. Devices and arrangements particularly adapted to assist in the take-off of aircraft from land or water.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2+, for launching of aircraft claiming the combination of a propulsive and/or lifting aircraft even though the combination may exist for only a brief period of time such as may be required to condition the launched aircraft to be self-sustaining.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 632+, for one shot explosion-actuated expansible chamber-type motors.
- 124, Mechanical Guns and Projectors, appropriate subclasses, for mechanical projecting devices, per se, analogous to those found in this subclass (63).
- 446, Amusement Devices: Toys, subclasses 63+, for toy gliders combined with means for projecting them into the air.

64 Manual:

This subclass is indented under subclass 62. Devices and arrangements for propelling aircraft, operated entirely by human agency without the assistance of any power plant.

SEE OR SEARCH CLASS:

- 280, Land Vehicles, subclass 200, and indented subclasses, for occupant propelled land vehicles.

65 Screw:

This subclass is indented under subclass 62. The arrangement relative to aircraft and the combination with aircraft of devices using the effect of helical screws rotating in air for propelling aircraft.

66 Tilting:

This subclass is indented under subclass 65. Aircraft screw propellers so arranged that the vertical angle between their line of thrust and the horizontal axis of the aircraft may be varied at will or in response to changing conditions.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 7, for propellers tilting from horizontal to vertical thrust axes.
- 51, for propellers which are adjustable in inclination in both horizontal and vertical planes for steering
- 56, for propellers which are adjusted in inclination in a vertical plane as a result of the tilting of power plants on which they are mounted.

- 67 Body encircling:**
This subclass is indented under subclass 65. Aircraft screw propellers arranged to rotate about the external periphery of aircraft bodies.
- 68 Elongated:**
This subclass is indented under subclass 65. Arrangement of aircraft screw propellers of the long helix type, in which the blades extend for substantially a full pitch length or more along the hub members.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
67, for propellers of the type in this subclass (68) arranged to rotate about the external periphery of some aircraft body.
73, for propellers of the type in this subclass (68) arranged in tubes for fluid propulsion.
- 69 Contra-propeller arrangements:**
This subclass is indented under subclass 65. Fixed or static aircraft structure arranged to reduce the rotary motion of the slip-stream of screw propellers on aircraft.
- SEE OR SEARCH CLASS:
440, Marine Propulsion, subclasses 66+, for similar arrangements of marine propellers.
- 70 Paddle wheel:**
This subclass is indented under subclass 62. The arrangement relative to aircraft and the use on aircraft of devices using the thrust developed by rotating paddle wheels for propelling aircraft.
- (1) Note. Continue the search in this class, subclasses 9, 19, 20, and 27.
- 71 Reciprocating propeller:**
This subclass is indented under subclass 62. The arrangement relative to aircraft and the combination with aircraft of devices using the thrust developed by elements moving back and forth over substantially the same path for propelling aircraft. These elements usually have provision for reducing their resistance to motion in one direction.
- 72 Beating wing:**
This subclass is indented under subclass 62. Devices and their arrangement relative to aircraft for using the thrust produced by flapping wings for propelling aircraft.
- (1) Note. Continue the search in this class, subclasses 11, 22 and 28.
- 73 Fluid:**
This subclass is indented under subclass 62. The arrangement relative to aircraft and the combination with aircraft of devices using the reaction to the movement of restricted masses or jets of air or other fluid for propelling aircraft.
- (1) Note. Continue the search in this class, subclasses 12.1+, 15, 23, and 29.
- SEE OR SEARCH CLASS:
60, Power Plants, subclasses 200.1+ for reaction motors, per se.
239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 127.1+ and 265.11+ for the discharge nozzle sub-combination of a reaction motor.
- 74 Explosive jet:**
This subclass is indented under subclass 73. The arrangements and use of devices in which the jet of air or other fluid is produced by an explosion.
- SEE OR SEARCH CLASS:
60, Power Plants, subclasses 200.1+ for reaction motors, per se.
239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 127.1+ and 265.11+ for the discharge nozzle sub-combination of a reaction motor.
- 75.1 AIRCRAFT CONTROL:**
This subclass is indented under the class definition. A device or arrangement directed to and limited to the controlling of an aircraft in flight.
- (1) Note. This subclass provides for control elements as distinguished from control surfaces, such as a leading edge flap, which are provided for elsewhere. See the search notes below for the location of control surfaces, per se.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 2, through 33, for general arrangement of control systems on aeronautical machines of a particular type.
- 50, and 110, through 113, for aircraft steering on land or water.
- 51, for aircraft steering by adjustment of propelling devices.
- 52, for steering of fluid propelled aircraft by some modification of the fluid propelling devices.
- 96 through 99, for control systems and devices peculiar to lighter-than-air craft.
- 213 through 217, for a control surface comprising a flap or spoiler.

SEE OR SEARCH CLASS:

- 60, Power Plants, appropriate subclasses for actuating devices including controls and especially subclass 528 for shape memory and piezoelectric type devices.
- 74, Machine Element or Mechanism, subclass 501.5, for constant tension sustaining devices for flexible cable operators.
- 91, Motors: Expansible Chamber Type, appropriate subclasses for fluid servomotors and controls therefor.
- 102, Ammunition and Explosives, subclass 384 for drop bombs with means for controlling the course of their flight.
- 114, Ships, subclass 21.1, 23, and 24 for torpedoes with means to control the steering and/or motion of the torpedo, and subclass 25 for torpedoes with automatic means to keep the torpedo at a predetermined depth below the surface, and subclasses 144 through 172 for miscellaneous devices for controlling the direction and/or speed of a ship.
- 180, Motor Vehicles, subclasses 167 through 169 for a motor vehicle provided with means for controlling its operation which is responsive to electromagnetic radiation, magnetic force, or sound waves received from a source, or reflected from an object or surface, which is located apart from

the vehicle; and subclass 170 through 179 for a motor vehicle provided with means which is responsive to the speed of the vehicle for maintaining its speed at, or preventing it from exceeding, a particular value.

- 280, Land Vehicles, subclass 263, 771 through 93.515 for miscellaneous steering mechanisms for land vehicles.
- 310, Electrical Generator or Motor Structure, for piezoelectric devices, per se.
- 318, Electricity: Motive Power Systems, appropriate subclasses for electric motor systems. See the notes in subclass 175 of Class 244 for the line between this class and Class 318.
- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 1 through 89 for generic data processing control systems.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 3 through 18 for computing systems for vehicle control or vehicle condition indication and subclasses 400-541 for computations in the application of navigation.
- 703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 8 for mathematical simulation of a vehicle.

76 Automatic:

This subclass is indented under subclass 75.1. Devices and systems for automatically controlling aircraft along a predetermined course or in response to changing conditions. This includes aircraft arranged to automatically maintain stable equilibrium.

- (1) Note. For similar subject matter for controlling missiles continue the search in this class, subclasses 3.1+.
- (2) Note. These are the generic subclasses for the steering of dirigible craft automatically in two or three dimensions. See subclass 175 for a statement as to the line between the various vehicle and motor classes and for the classes which provide for electrically controlled or actuated steering for mobile craft.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 178+ for navigating instruments in general where no control of the craft is involved.
- 91, Motors: Expansible Chamber Type, appropriate subclasses for fluid servomotors and controls therefor.
- 102, Ammunition and Explosives, subclass 384 for drop bombs having automatic means for controlling the course of their flight.
- 114, Ships, subclasses 21.1 and 23+ for torpedoes with automatically actuated steering mechanism; see subclass 24 where the control mechanism includes a gyroscope, and subclasses 144+ for miscellaneous devices, including the automatically actuated devices for changing the direction or speed of a ship.
- 180, Motor Vehicles, subclasses 167+ and 170+ as explained in the reference to that class (180) appearing in subclass 75 above.
- 700, Data Processing: Generic Control Systems or Specific Applications, subclasses 1 through 89 for generic data processing control systems.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 3+ for computing systems for vehicle control or vehicle condition indication and subclasses 400-541 for computations in the application of navigation.
- 703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 8 for mathematical simulation of a vehicle.

78.1 Fluid:

This subclass is indented under subclass 76. Subject matter in which the device or system includes a pneumatic or hydraulic system that automatically generates a control signal for controlling the aircraft.

- (1) Note. This subclass does not provide for the mere use of hydraulic or pneumatic apparatus to actuate a control surface in response to an automatic signal, but a hydraulic or pneumatic apparatus that

forms part of the structure responsible for the automatic operation of the control means.

78.2 Fluid amplifiers:

This subclass is indented under subclass 78.1. Subject matter in which the fluid system includes a pure fluid device for amplifying an input signal.

- (1) Note. Devices known in the art as "pure fluid devices" or "fluid amplifiers" and which act to control or vary high energy flows by relatively low energy flow or fields are included here. These devices rely upon the phenomenon known as the Coanda effect which occurs when a jet of fluid is injected into a wide container and due to some disturbance in flow or shape of the container the jet stream moves to one wall or other of the container and continues to flow along that wall. As long as the flow is not otherwise disturbed the flow remains "locked" onto the wall of the container.

SEE OR SEARCH CLASS:

- 137, Fluid Handling, subclasses 803 through 842 for pure fluid devices, per se.

79 Gyroscope actuated:

This subclass is indented under subclass 76. Systems for automatically controlling aircraft, operated in response to the action of a gyroscope.

SEE OR SEARCH CLASS:

- 114, Ships, subclass 24, for similar systems on torpedoes.

80 Gravity actuated:

This subclass is indented under subclass 76. Systems for automatically controlling aircraft, operated in response to the action of a pendulous weight or analogous device.

81 Operated by landing:

This subclass is indented under subclass 76. Devices and arrangements for operating aircraft control systems in response to conditions peculiar to the landing of aircraft, as, for example, the contact of some member with the ground or water.

- 82 Vane operated:**
This subclass is indented under subclass 76. Devices and arrangements for operating aircraft control systems automatically in response to variations in air forces on vane members.
- 87 Rudders and empennage:**
This subclass is indented under subclass 75.1. Auxiliary airfoils and their arrangements with respect to each other or to fixed portions of aircraft, for steering and stabilizing.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
91, for fixed stabilizing fins.
- 88 Rudders universally mounted:**
This subclass is indented under subclass 87. Rudders mounted for movement about a plurality of axes.
- 89 Elevators both front and rear:**
This subclass is indented under subclass 87. Horizontal rudders arranged at both the front and the rear of aircraft.
- 90 Ailerons and other roll control devices:**
This subclass is indented under subclass 89. Devices for controlling aircraft about their horizontal fore-and-aft axes.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
201+, for variable lift devices arranged to act also as roll control devices.
- 91 Vertical fins:**
This subclass is indented under subclass 75.1. The arrangement of vertical surfaces with respect to aircraft, for stabilizing purposes. These surfaces are usually fixed.
- 92 Stabilizing propellers:**
This subclass is indented under subclass 75.1. Auxiliary propellers on aircraft for steering or stabilizing.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
51, for main thrust propellers used also to steer.
- 93 Stabilizing weights:**
This subclass is indented under subclass 75.1. Movable or variable weights on aircraft for steering or stabilizing.
- (1) Note. In this subclass the weights themselves are the controlling agencies. For pendulous weights connected to operate control members, see the search notes below.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
80, for pendulous weights connected to operate control members.
- SEE OR SEARCH CLASS:
114, Ships, subclass 124 for shifting weights on ships.
- 94 Ballast storage and release:**
This subclass is indented under subclass 93. Arrangements for the storage and release of heavy material on aircraft for controlling relative buoyancy or stability.
- 95 Ballast making:**
This subclass is indented under subclass 93. Devices on aircraft for producing heavy material for ballast purposes. An example is the production of water-ballast from exhaust gases to replace the weight of fuel used.
- 96 Airship control:**
This subclass is indented under subclass 75.1. Control devices and arrangements particularly adapted to use on lighter-than-air craft.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
75.1 through 99.9, for general aircraft control systems.
- 97 Buoyancy varying:**
This subclass is indented under subclass 96. Devices and arrangements for controlling lighter-than-air craft by changing the buoyancy of all or part of the craft with respect to the surrounding air.
- (1) Note. Devices for compressing or expanding one or more gas cells to alter

their buoyancy, are found in this subclass.

98 Gas bag inflation:

This subclass is indented under subclass 96. Devices and arrangements for inflating the buoyant gas containers of lighter-than-air craft.

99 Gas release:

This subclass is indented under subclass 96. Devices and arrangements for releasing the buoyant gas from lighter-than-air craft.

99.1 Fuselage:

This subclass is indented under subclass 75.1. Subject matter in which the device or arrangement includes a movable portion of the fuselage or means to provide specific control of air flow about the fuselage.

- (1) Note. This subclass includes pivoted nose portions or devices that affect the flow about the nose.

99.11 Wing:

This subclass is indented under subclass 75.1. Subject matter in which the complete wing is moved to effect control of the entire aircraft.

- (1) Note. This does not provide for the mere movement of a flap or change of angle of attack of the wing, but the longitudinal or lateral movement of the wing to effect a change in direction of flight.

99.12 Drag:

This subclass is indented under subclass 75.1. Subject matter in which the control of the aircraft is effected by the deployment of a device (e.g., a parachute) that changes the wind resistance of the aircraft to effect an in-flight control of the aircraft beyond mere braking during landing.

- (1) Note. An aircraft in which deployment of a parachute from a particular location on the aircraft to pull the aircraft out of a spin condition is classified here.

99.13 Flutter control:

This subclass is indented under subclass 75.1. Subject matter in which the control of the aircraft involves (1) means for manipulating (e.g., positioning) a control element (e.g., control

surface) or (2) static structure for supporting a control element, the means for manipulating or the static structure operating to prevent or limit vibration (i.e., flutter) of the control element.

99.14 Trim tab:

This subclass is indented under subclass 75.1. Subject matter including a control surface mounted on and adjustable relative to another control surface.

99.2 Specific control connection or actuator:

This subclass is indented under subclass 75.1. Subject matter including a specific connection between the device or arrangement for controlling an aircraft (e.g., pilot control, autopilot) and a controlled element (e.g., a control surface).

99.3 Linkage:

This subclass is indented under subclass 99.2. Subject matter including details of a mechanical linkage that forms a part of the connection.

- (1) Note. Included in this subclass, for example, is a linkage arranged to compensate for variations in temperature with flight altitude and speed.

99.4 Redundant arrangements:

This subclass is indented under subclass 99.2. Subject matter in which the specific control connection has plural control transmission paths each capable of operation in the absence of any of the others.

99.5 Fluid:

This subclass is indented under subclass 99.2. Subject matter in which the control connection includes a fluid system (e.g., hydraulic) that transmits forces to the controlled element through a fluid.

99.6 Fluid pressure source arrangement:

This subclass is indented under subclass 99.5. Subject matter including details of an arrangement of a source of pressure for the fluid system as it relates to the structure of the aircraft.

- (1) Note. For placement here, specific aircraft structure that includes part of the pressure source must be claimed or the pressure source must be specially adapted for association with an aircraft

(e.g., a pressure source particularly constructed to fit within a wing).

99.7 Nonlinear fluid actuator:

This subclass is indented under subclass 99.5. Subject matter in which the fluid system includes a specific non-linear actuator having a specific relation to the aircraft.

- (1) Note. For example, the control connection may include a rotary actuator that forms the hinge of a flap of a wing and moves the flap relative to the wing.

99.8 Actively deformable material (e.g., piezoelectric, shape memory, magnetostrictive, electrostrictive):

This subclass is indented under subclass 99.2. Subject matter in which the connection or actuator is formed at least in part of a material that changes its shape in response to an input (e.g., an electrical signal).

99.9 Failure tolerant (e.g., jam tolerant, no-back control connection):

This subclass is indented under subclass 99.2. Subject matter in which the control connection is constructed so as to mitigate the effect of a failure in some portion of the control system or the controlled element.

100 LANDING GEAR:

This subclass is indented under the class definition. Devices and structural arrangements attached to aircraft for supporting the aircraft on the surface of the land or water and for taking the shock of landing.

SEE OR SEARCH CLASS:

305, Wheel Substitutes for Land Vehicles, for wheel substitutes. Class 305 takes wheel substitute landing gear where no aircraft structure is claimed, or where only a nominal relationship between the aircraft and landing gear is claimed.

101 Amphibian:

This subclass is indented under subclass 100. Landing gear designed to permit aircraft to land on either land or water at will. This includes landing gear having one type retractable to permit use of the other type.

102 Retractable:

This subclass is indented under subclass 100. Landing gear movable from an operative position to one in which it offers less resistance to flight.

- (1) Note. For landing gear retractable to permit use of another type of landing gear, the search must be continued in this class, subclass 101.

103 Wheel:

This subclass is indented under subclass 100. Landing gear using wheels to support aircraft on the surface of the ground. This subclass also includes mountings for wheels and accessory devices, such as protecting fairings and arrangements to cause the wheels to be rotating when they strike the ground.

- (1) Note. Continue the search in this class, subclasses 101 and 102.

104 Resiliently mounted:

This subclass is indented under subclass 103. Devices mounted on such devices as springs or other shock absorbing members which reduce the shock of landing.

105 Water landing:

This subclass is indented under subclass 100. Landing gear for use on water.

- (1) Note. For float and pontoon construction, per se, see Class 114, Ships, subclass 292.

106 Flying boat:

This subclass is indented under subclass 105. Water landing gear, part of which serves also as the passenger carrying body.

107 Emergency:

This subclass is indented under subclass 105. Devices for aircraft not ordinarily capable of landing on water to permit safe landing on water in emergency.

- (1) Note. Detachable lifeboats attached to aircraft for emergency use after landing on water are found in this class, subclass 1.

- 108 Skids:**
This subclass is indented under subclass 100. Landing gear using sliding surfaces for the ground-contacting members.
- (1) Note. For skids used only to support the tail of aircraft, see this class, subclass 109.
- 109 Tail supports:**
This subclass is indented under subclass 100. Devices and structural arrangements for supporting the tail of aircraft in landing and on the surface of the land or water.
- 110 RETARDING AND RESTRAINING DEVICES:**
This subclass is indented under the class definition. Devices for slowing the progress of aircraft or for holding or restraining them from movement.
- (1) Note. This subclass includes also devices separate from the aircraft for retarding or restraining the aircraft. The search for external retarding or arresting mechanism should be continued in this class, subclass 63, for devices intended primarily to launch but usable also to retard.
- (2) Note. For devices retarding the progress of water supporting member through the water, see Class 114, Ships, subclass 145.
- 111 Wheel brake arrangement:**
This subclass is indented under subclass 110. Arrangement of devices for retarding the rotation of the landing wheels.
- (1) Note. For operating mechanism for wheel brakes, operated from the rudder pedals or from pedals attached to or adjacent the rudder pedals, see this class, subclass 235.
- 112 Water brake arrangement:**
This subclass is indented under subclass 110. Arrangement of devices for retarding the progress of aircraft on water during landing.
- (1) Note. For similar devices on ships, see Class 114, Ships, subclass 145.
- 113 Aerodynamic retarders:**
This subclass is indented under subclass 110. Devices for retarding the progress of aircraft through the air.
- 114 LANDING FIELD ARRANGEMENT:**
This subclass is indented under the class definition. Arrangements of fields, runways or platforms to receive aircraft in landing and to provide handling accommodations for aircraft.
- SEE OR SEARCH CLASS:
- 40, Card, Picture, or Sign Exhibiting, subclass 217 for ground indicia for aeroplanes.
- 52, Static Structures (e.g., Buildings), appropriate subclasses, particularly subclasses 64+ and 86+ for a building which may house aircraft.
- 114, Ships, subclass 261 for ships and other floating structures particularly arranged to receive aircraft in landing or to transport or harbor them, as well as appliances and accessories peculiar to such ships and structures.
- 181, Acoustics, subclass 210 for sound absorbing fences or screens used in deflecting, absorbing, or directing sound waves.
- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 33+ and 350+ for systems of directive beams of radio energy for guiding aircraft to their landing fields.
- 414, Material or Article Handling, subclasses 227+ for means for charging or discharging a parking facility for a wheeled vehicle.
- 115 Mooring devices:**
This subclass is indented under subclass 114. Devices for securing aircraft to some structure or station on land or water.
- 116 Movable:**
This subclass is indented under subclass 115. Devices for securing aircraft to some movable structure or station on the land or water.

- (1) Note. Arrangements for securing one aircraft to another during flight are found in this class, subclass 2.

117 AIRCRAFT STRUCTURE:

This subclass is indented under the class definition. Miscellaneous aircraft construction not provided for in subclasses indented hereunder. This subclass includes the combination construction of body and wings on aircraft and the connection between body and wings. Loud speakers forming a part of the aircraft structure are classified here.

- (1) Note. Hub construction for autorotating wings is found in this class, subclasses 17.11+.
- (2) Note. For float and pontoon construction, per se, see Class 114, Ships, subclass 292.

SEE OR SEARCH CLASS:

- 428, Stock Material or Miscellaneous Articles, appropriate subclasses, for a stock material product in the form of a single or plural layer web or sheet, and especially subclasses 116+ for such a product embodying a honeycomb-like component.

118.1 Load accommodation:

This subclass is indented under subclass 117. Structure particularly designed to improve the efficiency with which cargo, or a like load, is carried.

- (1) Note. A load which is like cargo includes a projectile on military aircraft, another aircraft, equipment such as a camera, or the like; the invention being limited to carrying efficiency.
- (2) Note. The original of the document to an invention to aircraft provided with, or convertible to accommodation of both cargo and personnel (passengers or crew) will be placed in this locus (subclasses 118.1+) and should be cross-referenced in subclasses 118.5+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 137.1+, for cargo loading and unloading means exclusively for aircraft, regardless of the features also, and frequently necessarily involved in the subject matter of the instant and superior subclasses (118.1+).

SEE OR SEARCH CLASS:

- 62, Refrigeration, subclass 61 for a refrigeration system in a vehicle, such as aircraft, effective by utilizing the motion of the vehicle; see, too, subclasses 239+ for other refrigeration systems with a vehicle feature.
- 410, Freight Accommodation on Freight Carrier, appropriate subclass for freight load accommodation of such general utility as to be not necessarily restricted to such a single type of freight carrier as an aircraft, even though the disclosure is limited to such single use; e.g., retainer structure for such a load bearer as a container is provided for under subclasses 77+. See, too, the class definition and notes therein for more precise and more detailed definition of freight accommodation that is required and detailed in the instant class (244) subclass 118.1 which is broad enough to include mere cargo plane construction.

118.2 Removable load bearing, airframe section:

This subclass is indented under subclass 118.1. Structure which, in flight, is an integral part of the aircraft body and is further useful as a load container; i.e., which is of a cubic capacity to define an entity comprising (a) wall structure which complements or adds to the aircraft exterior configuration, and (b) includes a volumetric capacity inward thereof to contain a load; the entity being attachable to and separable from the remainder of the aircraft body together with the load.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2, for an aircraft having body section which is releasable for operation as a land vehicle.

135, for an aircraft with externally mounted (e.g., wing-tip mounted) fuel tanks.

118.3 Airframe wall displaceable to function as ramp:

This subclass is indented under subclass 129.5. Structure comprising panel means attached to the aircraft body to complement the in-flight external contour thereof and movable, on ground, relative to the remainder of the body, to a position whereat the distal edge of the panel means extends outwardly of said remainder and contacts the ground for introduction and removal of persons or a load into or out of the aircraft interior.

SEE OR SEARCH CLASS:

410, Freight Accommodation on Freight Carrier, subclass 6 for a freight carrier (usually a rail car), a side of which swings down to convert to a ramp onto which a vehicle, as an article of freight, is rolled or placed and to which the vehicle is secured so that when re-erected, the wall retains the vehicle within the freight carrier for haulage; and subclass 93 for a drop-side (usually rail) car, a side section of which is tilted so as to convert to a ramp for freight loading.

118.5 Passenger or crew accommodation:

This subclass is indented under subclass 117. Structure particularly designed to improve the convenience or efficiency with which passengers or flight personnel are carried.

SEE OR SEARCH THIS CLASS, SUBCLASS:

137.2, for a device or arrangement designed to permit aircraft passengers to be taken on board or discharged, that subclass (137.2) being the applicable locus regardless of the presence of the passenger-carrying features also, and frequently necessarily likewise involved, which latter feature is subject matter for the instant and superior subclasses (118.5+).

SEE OR SEARCH CLASS:

62, Refrigeration, subclasses 239+ for a refrigeration system with such a vehi-

cle feature as the cooling of the occupant space.

118.6 Seating arrangement berth or berthage:

This subclass is indented under subclass 118.5. Structure in which the convenience or efficiency in carrying persons is enhanced (a) by the structure or arrangement of interior furnishing by which a person may be seated or may recline, or (b) by interior aids or amenities attached to or directed toward such furnishing or arrangement; e.g., attached or attachable dining service structure, particularly focused lighting or ventilation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

118.5, principal subclass, for interior aids or amenities directed toward cabin space rather than focused on the individual seat or berth or arrangement thereof.
122, for details of the structure of an aircraft seat.

SEE OR SEARCH CLASS:

5, Beds, subclasses 9+ for berth or bunk structure.

119 Fuselage and body construction:

This subclass is indented under subclass 117. Construction of aircraft bodies or fuselages.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), appropriate subclasses for a static structure of general application even though the claims recite "In an airplane" or the like.

120 Sectional:

This subclass is indented under subclass 119. Construction of aircraft bodies or fuselages which are made up in a plurality of separate sections and attached together.

121 Shields and other protective devices:

This subclass is indented under subclass 119. Devices for protecting persons in or near aircraft from danger or inconvenience.

(1) Note. This subclass includes propeller guards, windshields, crash pads, armor, etc., where they are essential parts of aircraft structure.

- (2) Note. For armor attached to an otherwise complete aircraft, the search should be continued in Class 89, Ordnance, subclass 36, and see the notes to the definition of such subclasses.

122 Seats and safety belts:

This subclass is indented under subclass 119. Seats peculiar to aircraft and devices for holding the occupant to their seats.

SEE OR SEARCH THIS CLASS, SUBCLASS:

118.6, for an arrangement or layout of seating on an aircraft.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 632+, for one shot explosion-actuated expansible chamber-type motors.

119, Animal Husbandry, subclass 770 for tethering a human being and subclass 771 for a tether attached to a vehicle; see search notes of these subclasses for further field of search.

297, Chairs and Seats, appropriate subclasses, for seats of general utility, particularly subclasses 464+, and especially subclasses 468+, for a seat combined with a restraining harness and not involving significant aircraft structure nor parachute arrangement.

123.1 Airfoil construction:

This subclass is indented under subclass 117. Subject matter including details of the structure of an airfoil.

- (1) Note. This subclass is primarily concerned with airfoil features that relate to the strength and mass of an airfoil rather than airflow characteristics.

SEE OR SEARCH THIS CLASS, SUBCLASS:

35 through 49, for the shape or arrangement of sustaining airfoils with relation to an aircraft or airflow related aspects of an airfoil.

131, for connections of a wing to a fuselage.

123.11 Inflatable:

This subclass is indented under subclass 123.1. Subject matter in which a substantial portion of the rigidity of the airfoil is provided by internal air pressure.

123.12 Corrugated panels:

This subclass is indented under subclass 123.1. Subject matter in which a substantial portion of the rigidity of the airfoil is provided by sheet material having alternating ridges and grooves for strength.

123.13 Honeycomb in skin panels:

This subclass is indented under subclass 123.1. Subject matter in which the outermost layer of the airfoil is formed of a structure having interconnected hollow, thin-walled, substantially parallel cells.

SEE OR SEARCH CLASS:

428, Stock Material or Miscellaneous Articles, subclass 116 for honeycomb-like structure.

123.14 Hollow:

This subclass is indented under subclass 123.1. Subject matter in which substantially all of the rigidity of the airfoil is provided by the skin and its interior is substantially open.

123.2 Sparless frame construction:

This subclass is indented under subclass 123.1. Subject matter in which the airfoil has an internal framework comprising a network of interconnected members that provides substantially all of the rigidity of the airfoil and in which none of the members alone would be capable of providing this rigidity or even providing only the vertical load supporting capacity of the airfoil.

123.3 Integral frame and skin:

This subclass is indented under subclass 123.2. Subject matter in which the internal framework is integrally formed with the outer layer of the airfoil.

123.4 Open truss/lattice construction:

This subclass is indented under subclass 123.2. Subject matter in which the internal framework comprises a plurality of members connected so as to form open areas between the members.

123.5 Non-metallic filler (e.g., metal skin with foam, cork, or rubber filler):

This subclass is indented under subclass 123.1. Subject matter in which a substantial portion of the rigidity of the airfoil is provided by a structure formed of a material other than metal substantially filling its interior.

123.6 Honeycomb:

This subclass is indented under subclass 123.5. Subject matter in which the structure that provides the rigidity has a plurality of interconnected hollow cells resembling a honeycomb.

SEE OR SEARCH CLASS:

428, Stock Material or Miscellaneous Articles, subclass 116 for honeycomb-like structure.

123.7 Box beam:

This subclass is indented under subclass 123.1. Subject matter in which substantially all of the rigidity of the airfoil is provided by a hollow beam extending along the length of the airfoil substantially from the root of the airfoil to the tip, the beam having a generally rectangular cross section and having upper and lower surfaces forming portions of the upper and lower exterior surfaces of the airfoil.

123.8 Main spar:

This subclass is indented under subclass 123.1. Subject matter in which substantially all of the rigidity of the airfoil transverse to its length (i.e., the dimension extending generally from the root to the tip of the airfoil) is provided by a beam (i.e., spar) extending along the length of the airfoil and connected to the upper and lower portions of the skin.

(1) Note. The spar need not provide all of the torsional rigidity of the airfoil for placement in this subclass.

123.9 Tubular spar:

This subclass is indented under subclass 123.8. Subject matter in which the beam (i.e., spar) is hollow.

124 Sectional:

This subclass is indented under subclass 123.1. Construction of airfoil elements which are made up in a plurality of separate sections and attached together.

125 Airship hull construction:

This subclass is indented under subclass 117. Construction of hull and internal structure of lighter-than-air craft.

126 Airship skin construction:

This subclass is indented under subclass 117. Construction of the outer surface or skin of lighter-than-air craft.

SEE OR SEARCH CLASS:

428, Stock Material or Miscellaneous Articles, appropriate subclasses, for a stock material product in the form of a single or plural layer web or sheet, and especially subclasses 175+, 190, 193, and 196+ for such a product embodying mechanically interengaged strands or strand-portions.
442, Fabric (Woven, Knitted, or Non-woven Textile or Cloth, etc.), subclasses 59+ for a coated or impregnated fabric.

127 Airship load attachment:

This subclass is indented under subclass 117. Devices and structural arrangements for attaching gondolas and other loads to lighter-than-air craft.

128 Airship gas cell construction and arrangement:

This subclass is indented under subclass 117. Construction and arrangements of gas-containing units in lighter-than-air craft.

(1) Note. Devices for compressing or expanding one or more gas cells to alter their buoyancy are found in this class, subclass 97.

SEE OR SEARCH CLASS:

428, Stock Material or Miscellaneous Articles, appropriate subclasses, for a stock material product in the form of a

- single or plural layer web or sheet, and especially subclasses 175+, 190, 193, and 196+ for such a product embodying mechanically interengaged strands or strand-portions.
- 442, Fabric (Woven, Knitted, or Nonwoven Textile or Cloth, etc.), subclasses 59+ for a coated or impregnated fabric.
- 129.1 Details:**
This subclass is indented under subclass 117. Apparatus comprising miscellaneous structural parts or members peculiar to aircraft and forming part of an airplane construction not otherwise classified.
- 129.2 Fire prevention devices:**
This subclass is indented under subclass 129.1. Apparatus wherein the aircraft comprises incendiary deterrent means for at least minimizing the probability of an incendiary action occurring either I, in the normal use of the aircraft, or II, at the time of a crash or other sensed condition whereby to inhibit an incendiary action on or about the aircraft.
- SEE OR SEARCH CLASS:
169, Fire Extinguishers, subclass 62 for fire extinguishing systems on vehicles which may also include fire-preventative means.
- 129.3 Windows:**
This subclass is indented under subclass 129.1. Apparatus wherein the miscellaneous aircraft part comprises a transparent panel or closure for covering or otherwise closing an opening in a body surface of the aircraft.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
121, for aircraft canopies.
- 129.4 Closures:**
This subclass is indented under subclass 129.1. Apparatus wherein the miscellaneous aircraft part comprises either a removable or movable partition or panel member for opening and closing an entranceway or other opening on the aircraft.
- 129.5 Door:**
This subclass is indented under subclass 129.4. Apparatus wherein the part comprises a partition or panel forming a significant external surface portion of the aircraft and movable to allow movement of cargo, passengers, etc., therepast.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
118.1+, and 119, for a doorway interconnecting plural compartments in an aircraft.
- 129.6 Steps:**
This subclass is indented under subclass 129.1. Apparatus wherein the aircraft part comprises stair or other foothold means for ascent or descent from one level to another.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
129.5, for stair means combined with door structure.
- 130 Aerodynamic resistance reducing:**
This subclass is indented under subclass 129.1. Devices and structural arrangements for reducing the resistance of aircraft or aircraft elements to motion through the air.
- 131 Joints and connections:**
This subclass is indented under subclass 129.1. Joints and connections peculiar to aircraft or incorporated with aircraft structure.
- (1) Note. For joints and connections in general, see Class 403, Joints and Connections.
- 132 Skin fastening devices:**
This subclass is indented under subclass 129.1. Devices and arrangements for fastening the skin or covering of aircraft elements to the framework or internal structure.
- 133 Materials of construction:**
This subclass is indented under subclass 129.1. Miscellaneous materials peculiarly adapted to aircraft construction or incorporated with other aircraft structure.

134 Ice prevention:

This subclass is indented under subclass 117. Devices and arrangements for preventing the formation of ice on the exposed surfaces of aircraft.

SEE OR SEARCH CLASS:

343, Communications: Radio Wave Antennas, subclass 704 for antennas with an ice clearer or preventer.

135 Fuel supply:

This subclass is indented under subclass 117. Arrangements for storing and feeding fuel on aircraft, or for supplying fuel to or removing fuel from aircraft.

136 Material discharging and diffusing:

This subclass is indented under subclass 117. Arrangements of aircraft structure to provide for the discharging or diffusing of material in the air.

SEE OR SEARCH CLASS:

40, Card, Picture, or Sign Exhibiting, subclass 213 for skywriting devices, and subclass 216 for pamphlet distributing devices from aircraft.
89, Ordnance, subclasses 1.51+, for bomb dropping devices.

137.1 Passenger or cargo loading or discharging:

This subclass is indented under subclass 117. Device or arrangement for permitting a living being or goods to be taken aboard or removed from aircraft.

(1) Note. This is the generic subclass for patents, not otherwise classifiable, relating to the loading or unloading of aircraft, including the mere dumping of a load from the aircraft, whether in flight or not in flight.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, for means whereby an aircraft in flight may pick up or release another aircraft, including gliders, singly or in trains.
115+, for loading or unloading means associated with mooring devices.

118.1+, and 118.5+, for aircraft structure designed to improve the efficiency for transporting cargo or people, respectively, absent detail or arrangement for loading or unloading or discharge thereof.

135, for supplying fuel to or discharging fuel from an aircraft in flight.

136, for discharging and diffusing material in air from aircraft in flight.

138+, for parachutes or other devices, either, per se, or in combination with aircraft structure, for safely lowering persons, cargo, or aircraft structure to the ground.

905, for an inflatable evacuation slide.

SEE OR SEARCH CLASS:

89, Ordnance, subclass 1.5 for bomb, flare, and signal dropping.

182, Fire Escape, Ladder, or Scaffold, subclasses 137+ for a body catcher.

258, Railway Mail Delivery, subclasses 1.2+ for means, other than mere dumping, for transferring a load to or from an aircraft in flight, and other subclasses for transferring objects to and from moving vehicles in general.

414, Material or Article Handling, various subclasses for the loading or unloading, in general, of vehicles, and particularly subclasses 373+ for the combination of a load-transporting type vehicle and an external means cooperating in the loading or unloading of the vehicle (except that this subclass (137.1) is proper if the claims make it clear that the vehicle structure with which the means cooperates is structure which is peculiar to a vehicle of the aircraft type) and see also subclasses 467+ for a self-loading or unloading vehicle (except that this subclass (137.1) is proper if the disclosure relates solely to a vehicle of the aircraft type).

137.2 Passenger:

This subclass is indented under subclass 137.1. Device or arrangement wherein a living being may be taken aboard or removed from the aircraft.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
118.5+, for aircraft structure designed to improve the efficiency of transporting passengers, absent detail or arrangement for loading, or unloading or discharge thereof.
905, for an inflatable evacuation slide.
- 137.3 Aerial cargo unloading by parachute extraction:**
This subclass is indented under subclass 137.1. Device or arrangement whereby goods are withdrawn in flight by an umbrella-like canopy, i.e., parachute-type device.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
138+, for parachutes or other devices, either, per se, or in combination with aircraft structure wherein features for safely lowering persons, cargo, or aircraft structure to the ground are claimed.
- 137.4 Releasable, external mounted cargo:**
This subclass is indented under subclass 137.1. Device or arrangement whereby cargo is attached to the external surface of the aircraft, e.g., the fuselage or wings, for transportation thereby until set free, i.e., released.
- (1) Note. The aircraft may or may not be in flight when the cargo is released.
- SEE OR SEARCH CLASS:
89, Ordnance, particularly subclass 1.5 for bomb, flare, or signal dropping.
294, Handling: Hand and Hoist-Line Implements, particularly subclasses 83+ for a hoist-line or grab hook adapted for releasing a load.
- 138 SAFETY LOWERING DEVICES:**
This subclass is indented under the class definition. Devices for safely lowering persons, cargo or aircraft structure to the ground.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
137.1+, and see the notes thereto for loading and unloading of aircraft in general when no safety lowering features are claimed.
- 139 Entire aircraft:**
This subclass is indented under subclass 138. Devices for safely lowering entire aircraft to the ground.
- (1) Note. For lowering a plurality of aircraft parts separately, see this class, subclass 138.
- 140 Passenger compartment:**
This subclass is indented under subclass 138. Devices for safely lowering the passenger compartments of aircraft to the ground.
- 141 Seat:**
This subclass is indented under subclass 140. Devices attached to aircraft seats for safely lowering the occupants thereof to the ground.
- 142 Parachutes:**
This subclass is indented under subclass 138. Devices having umbrella-like canopies of such area that their resistance to motion through the air will cause persons or objects attached to them to be lowered slowly to the ground.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
32, for balloons with parachutes.
113, for parachutes to retard an aircraft during flight.
- SEE OR SEARCH CLASS:
102, Ammunition and Explosives, subclasses 386+ for drop bombs with parachute retarding means, and subclasses 337+, for parachute flares.
446, Amusement Devices: Toys, subclasses 49+, for toy parachutes.
- 143 Garment attached:**
This subclass is indented under subclass 142. Parachutes attached to garments to be worn by occupants of aircraft.
- 144 Aircraft element convertible to parachute:**
This subclass is indented under subclass 142. Conventional aircraft elements convertible in emergency to structure acting as parachutes.
- (1) Note. For balloons acting as parachutes when deflated, search this class, subclass 32.

- 145 Canopy construction:**
This subclass is indented under subclass 142. Details of construction of parachute canopies.
- (1) Note. Means for attaching shroud lines to canopies are found in this subclass.
- 146 Inflated bracing:**
This subclass is indented under subclass 142. Parachutes having hollow bracing members which are inflated to cause the parachutes to open or to hold them open.
- 147 Storage and release:**
This subclass is indented under subclass 142. Devices and arrangements for storing parachutes in containers or compartments on aircraft and for releasing or expelling them therefrom.
- (1) Note. This search may be continued in this class, subclass 139, where storage and release of parachutes designed to lower the entire aircraft to the ground will be found.
- SEE OR SEARCH CLASS:
60, Power Plants, subclasses 632+, for one shot explosion-actuated expansible chamber-type motors.
- 148 Packs:**
This subclass is indented under subclass 147. Devices and arrangements for storing parachutes in containers designed to be carried entirely on the person of the user, and for releasing or expelling parachutes from such containers.
- 149 Opening devices:**
This subclass is indented under subclass 147. Devices for opening or assisting in the opening of parachutes.
- (1) Note. For bracing members inflated to open parachutes, see this class, subclass 146.
- 150 Timing mechanism:**
This subclass is indented under subclass 147. Devices for causing parachutes to open at the expiration of some predetermined time.
- 151 Harness:**
This subclass is indented under subclass 142. Devices for attaching parachutes to the person or objects to be lowered.
- SEE OR SEARCH CLASS:
119, Animal Husbandry, subclass 770 for tethering a human being; see search notes for further field of search.
- 152 Control devices:**
This subclass is indented under subclass 142. Devices for controlling the speed or direction of descent of parachutes.
- 153 KITES:**
This subclass is indented under the class definition. Devices connected by a string or cord to a remote point and sustained by relative movement of air past surfaces.
- (1) Note. Kites containing buoyant gas to provide additional sustentation are found in this class, subclass 33.
- 154 Airplane type:**
This subclass is indented under subclass 153. Kites having the appearance of airplanes.
- 155 Accessories:**
This subclass is indented under subclass 153. Devices not a part of the kite structure to be operated in connection with kites.
- 158.1 SPACECRAFT:**
This subclass is indented under the class definition. Subject matter comprising a machine or structure especially designed for travel in the upper reaches of or beyond the atmosphere of a celestial body (e.g., Earth).
- (1) Note. By "upper reaches of the atmosphere" is meant the height at or beyond which the atmosphere (if any) is incapable of providing (1) lift or sustentation to a winged or other aircraft or (2) sufficient oxygen for operating the propulsion system of an aircraft.
- (2) Note. A machine or structure (manned or unmanned) which is (1) disclosed as a body (i.e., satellite) which is to be placed in orbit about a celestial body (e.g.,

Earth) or (2) solely disclosed as a vehicle for use in outer space travel is considered proper for classification here.

- (3) Note. Methods of using spacecraft are classified with the corresponding apparatus.
- (4) Note. For a vehicle designed solely for travel on the surface of a planet, see the appropriate vehicle class.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 3.1 through 3.3, for missiles that may travel in the upper reaches of or beyond the Earth's atmosphere and see the search notes thereunder.

SEE OR SEARCH CLASS:

- 62, Refrigeration, appropriate subclasses, especially subclass 315 for a porous wall connected to a fluid coolant supply.
- 102, Ammunition and Explosives, subclass 374 for a missile or payload and an attached reaction motor; and subclasses 501 through 529 for a projectile.
- 138, Pipes and Tubular Conduits, subclass 45 for ablating compositions in a tube or nozzle portion.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, appropriate subclasses for particular method or apparatus for making a laminated ablating surface.
- 165, Heat Exchange, subclass 41 for heat exchange with a vehicle feature; and subclass 61 for heating and cooling the same material.
- 220, Receptacles, especially subclass 2.1 for containers enclosing an electrical device; and subclasses 581 through 592 for high pressure containers.
- 239, Fluid Sprinkling, Spraying, and Diffusing, especially subclass 265.15 for a nozzle with ablating surface.
- 250, Radiant Energy, subclasses 203.1 through 203.7 for optical sensors, 238 for a heat shield covering a heat-seeking detector.
- 252, Compositions, subclass 62 for heat-insulating compositions; and sub-

classes 67 through 69 for compositions involving refrigeration, heat, or energy exchange including vaporization or expansion of material.

- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 352 through 358 for a satellite in combination with directive radio wave equipment.
- 343, Communications: Radio Wave Antennas, Digest 2, and subclass 872 and 873 for missile nose cones used as a housing or covering for a radar antenna.
- 427, Coating Processes, appropriate subclasses.
- 455, Telecommunications, subclass 12.1, 98, 427 through 430 for a satellite combined with specific communication equipment of the type provided for in that class.
- 501, Compositions: Ceramic, appropriate subclasses for ceramic compositions.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, subclass 531, for mathematical computations of space craft orbits or paths. If significant vehicle structure is recited, classification is in the appropriate vehicle class.

158.2 Tethered:

This subclass is indented under subclass 158.1. Subject matter in which the spacecraft is connected by an elongate flexible member (e.g., a cable) to a mother craft or to a celestial body.

- (1) Note. This subclass includes 'space elevators' and 'orbital skyhooks'.

SEE OR SEARCH CLASS:

- 57, Textiles: Spinning, Twisting, and Twining, appropriate subclasses for a cable or rope, per se, formed by twisting or twining.
- 87, Textiles: Braiding, Netting, and Lace Making, appropriate subclasses for a cable or rope, per se, formed by braiding, knotting, or intertwisting strands.

158.3 Inflated:

This subclass is indented under subclass 158.1. Subject matter in which the spacecraft is con-

structed to be placed in orbit about the celestial body and to be expanded after launch by introduction of a gas into an interior portion of the spacecraft.

158.4 Spacecraft formation, orbit, or interplanetary path:

This subclass is indented under subclass 158.1. Subject matter including details of an arrangement of plural spacecrafts in orbit about a celestial body or details of a path traveled by the spacecraft in orbit or between planets.

- (1) Note. Only minimal spacecraft to spacecraft communication is included here. Specific GPS systems, communication equipment, ground station, gateway, signal transfer, handoff, or other telecommunication equipment or procedures places satellite orbital arrangements in other classes. See under SEE OR SEARCH CLASS below.

SEE OR SEARCH CLASS:

- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), subclasses 352 through 358 for spacecraft orbit features combined with specific GPS or other directional radio system details appropriate for that class.
- 455, Telecommunications, subclass 12.1, 98, 427, and 428 for spacecraft orbit features combined with specific communication equipment of the type provided for in that class.

158.5 Orbit insertion:

This subclass is indented under subclass 158.4. Subject matter including a process or specific means for initiating travel of the spacecraft along an orbital path from a non-orbital path or another orbital path.

- (1) Note. This subclass provides for final orbit insertion only. Subject matter directed to vehicles or procedures for initial launch are classified elsewhere.

158.6 Orbital control:

This subclass is indented under subclass 158.4. Subject matter including a process or specific means for controlling the spacecraft so as to maintain an orbit or set a new orbit.

- (1) Note. This subclass does not provide for satellite attitude control or for general propulsion equipment, which may be usable with orbital control means.

158.7 Aerobraking:

This subclass is indented under subclass 158.6. Subject matter including a procedure or specific means for creating an interaction between the spacecraft and the upper atmosphere of the celestial body to effect a drag force on the satellite to change its orbit.

158.8 Automatic:

This subclass is indented under subclass 158.6. Subject matter in which the process or means acts without human intervention.

158.9 Reusable or returnable:

This subclass is indented under subclass 158.1. Subject matter in which the spacecraft is intended to be launched from a celestial body and returned to it and in which the spacecraft includes specific means to ensure that it returns to the celestial body in an operable condition.

- (1) Note. The term 'operable' does not exclude devices requiring a limited amount of maintenance or refurbishment before being returned to use.

159.1 With reentry shield:

This subclass is indented under subclass 158.9. Subject matter in which the means to ensure includes specific means for protection of the spacecraft due to motion through the atmosphere of the celestial body.

- (1) Note. In this subclass are structures to control the heating of all or part of a vehicle caused by the resistance to the vehicle moving through an atmosphere. The mere recitation of a coating or layer on the whole or a part of the surface of a vehicle is not sufficient for placement in this subclass. A heat control device claimed merely in terms of the composition or material of which it is composed is classified in an appropriate composition or material class.

159.2 Inflatable:

This subclass is indented under subclass 159.1. Subject matter in which the reentry shield is constructed to be expanded by the introduction of a gas into an interior portion of the shield.

159.3 Having aerodynamic lifting body (e.g., Space Shuttle):

This subclass is indented under subclass 158.9. Subject matter in which the spacecraft includes structure that produces aerodynamic lift that enables the spacecraft upon return to the celestial body's atmosphere to be flown as an aircraft to an appropriate landing site.

159.4 Modular and assembled in space:

This subclass is indented under subclass 158.1. Subject matter in which the spacecraft comprises a plurality of units configured to be assembled beyond the atmosphere of any celestial body.

- (1) Note. This subclass includes a satellite or space station formed of modules.

159.5 Foldable:

This subclass is indented under subclass 159.4. Subject matter in which all or a significant part of the machine or structure can be reversibly and without damaging it deformed or bent into a more compact configuration.

159.6 Including use of launch vehicle part:

This subclass is indented under subclass 159.4. Subject matter in which one of the units includes a significant portion of the structure of a vehicle used to separate the spacecraft from the surface of a celestial body.

164 Attitude control:

This subclass is indented under subclass 158.1. Apparatus wherein the machine or structure includes regulatory means for either maintaining or correcting its position or attitude either at or to a desired setting respectively as it moves in the upper reaches of and/or beyond the atmosphere of a celestial body.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 3.15+, for automatic guidance for missile stabilization and guidance control.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclass 178 for navigation and see the search notes in the definition thereto.
318, Electricity: Motive Power Systems, subclasses 580+ for servo systems for vehicular guidance with single axis control.
701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 3+ for computing systems in the application of vehicle control.

165 By gyroscope or flywheel:

This subclass is indented under subclass 164. Apparatus wherein the regulatory means comprises a rotating body of stabilizing or fixedly maintaining an attitude of the machine or structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 3.2, for inertial missile stabilization or trajectory control.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclasses 5+ for gyroscopes, per se.

166 By magnetic effect:

This subclass is indented under subclass 164. Apparatus wherein the regulatory means comprises a magnetic device for generating a controlling or damping magnetic force to interact with either the magnetic field of a celestial body, e.g., earth, or a structure of or a structure mounted on the machine for stabilizing or fixedly maintaining an attitude of the machine.

SEE OR SEARCH CLASS:

- 310, Electrical Generator or Motor Structure, subclass 93, for rotary torque transmitting magnetic clutches or brakes.

167 By gravity gradient:

This subclass is indented under subclass 164. Apparatus provided with means utilizing gravitational force to dampen spin or other undesired movement for stabilizing and/or maintaining the machine or structure either in a desired attitude, per se, or with respect to a celestial body.

- (1) Note. Despin weights for space craft are considered proper subject matter for classification here.

168 By solar pressure:

This subclass is indented under subclass 164. Apparatus provided with means utilizing incident radiant energy from the sun or other similar celestial body for maintaining the machine or structure in a desired attitude.

SEE OR SEARCH CLASS:

- 136, Batteries: Thermoelectric and Photoelectric, subclasses 243+ for solar panels or photoelectric panels, per se.
250, Radiant Energy, subclasses 203.1+, for circuits and apparatus including photo cells for following a point, e.g., star.

169 By jet motor:

This subclass is indented under subclass 164. Apparatus provided with propelling nozzle or like means exhausting a pressurized medium, e.g., fluids, ions, etc., for imparting a controlled force to the machine or structure for adjusting either the flight attitude or the flight path thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 52, for aircraft steered by fluid jet propulsion.

170 By nutation damper:

This subclass is indented under subclass 164. Apparatus provided with means for diminishing the effect of gyratory, unbalancing forces about the spin axis of the machine or structure to eliminate wobbling or nodding thereof whereby to stabilize and/or maintain the spin axis of the machine or structure in a desired attitude.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, subclass 5.5 for damping means for gyroscope control.

171 With attitude sensor means:

This subclass is indented under subclass 164. Apparatus provided with means for sensing the in-flight position of the machine or structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 3.16+, for automatic guidance for missile stabilization and guidance control using optical means.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 178+ for navigation and see the search notes in the definition thereto.
250, Radiant Energy, subclasses 203.1+ for circuits and apparatus for following a point, e.g., star.

171.1 With propulsion:

This subclass is indented under subclass 158.1. Subject matter in which the spacecraft includes attached structure (i.e., propulsion means) for causing movement of the spacecraft as a whole.

- (1) Note. The propulsion means may be another vehicle temporarily attached to the spacecraft.

171.2 Steerable mount:

This subclass is indented under subclass 171.1. Subject matter in which the spacecraft includes a support for attaching the propulsion means to the spacecraft that is movable relative to the spacecraft for purposes of affecting the direction of travel of the spacecraft.

171.3 Launch from surface to orbit:

This subclass is indented under subclass 171.1. Subject matter in which the propulsion means is constructed to propel the spacecraft from the surface of a celestial body to orbit.

171.4 Horizontal launch:

This subclass is indented under subclass 171.3. Subject matter in which the launch takes place in a horizontal direction.

171.5 Without mass expulsion:

This subclass is indented under subclass 171.1. Subject matter in which the propulsion means operates to move the spacecraft other than by generating a propelling force in reaction to the ejection of mass (e.g., gas, liquid, or plasma) from the propulsion means.

- (1) Note. For example, the spacecraft may be propelled by use of magnetic fields or solar pressure.
- 171.6 Having launch pad cooperating structure:**
This subclass is indented under subclass 158.1. Subject matter including specific structure to operably support the spacecraft on a launch pad.
- 171.7 With shield or other protective means (e.g., meteorite shield, insulation, radiation/plasma shield):**
This subclass is indented under subclass 158.1. Subject matter including structure for protecting the physical structure of the spacecraft from the hazards or extreme conditions of space travel.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
121, for aircraft shields and other protective devices.
- 171.8 Active thermal control:**
This subclass is indented under subclass 171.7. Subject matter including structure to actively control the temperature of the spacecraft.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
159.1, and 159.2, for reentry shields.
- 171.9 With special crew accommodations:**
This subclass is indented under subclass 158.1. Subject matter including structure particularly designed to improve the convenience, efficiency, or safety with which passengers or flight personnel are carried.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
171.8, for control of temperature to maintain the comfort of the crew.
- 172.1 Emergency rescue means (e.g., escape pod):**
This subclass is indented under subclass 171.9. Subject matter including specific means for the emergency return of spacecraft personnel from orbit.
- (1) Note. Included in this subclass are escape pods or devices for reentry of an individual.
- 172.2 With fuel system details:**
This subclass is indented under subclass 158.1. Subject matter including details of arrangements for storing and feeding fuel on a spacecraft or for supplying fuel to or removing fuel from it.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
135, for details of aircraft fuel systems.
- SEE OR SEARCH CLASS:
137, Fluid Handling, appropriate subclasses for a fluid handling system which may be used for fuel, but does not include specific aeronautic structure.
141, Fluent Material Handling, With Receiver or Receiver Coating Means, appropriate subclasses for a fluid handling system involving a receiver or receiver coating means which may be used for fuel, but does not include specific aeronautic structure.
220, Receptacles, appropriate subclasses for a container per se which may be used for fuel (e.g., as a fuel tank). See subclass 560.01 and 560.02 for a fuel tank or other container that is puncture resistant.
- 172.3 Fuel tank arrangement:**
This subclass is indented under subclass 172.2. Subject matter including a specific arrangement or placement of tanks within the structure of the spacecraft.
- 172.4 Rendezvous or docking:**
This subclass is indented under subclass 158.1. Subject matter including a specific means or process for bringing the spacecraft into either proximity to or fixed engagement with complimentary means on another machine or structure while traveling in the upper reaches of or beyond the atmosphere of the celestial body.
- (1) Note. A spacecraft using an arm to grasp a satellite is classified here.

172.5 Including satellite servicing:

This subclass is indented under subclass 172.4. Spacecraft structure including means for performing repair or maintenance of one of the docked structures once docking has occurred.

- (1) Note. The mere transfer of crew or equipment between docked spacecraft is not sufficient to warrant placement here.

172.6 With deployable appendage:

This subclass is indented under subclass 158.1. Subject matter in which the machine or structure includes a portion that is extendable, deployable, or otherwise erectable in orbit.

- (1) Note. This subclass includes various booms, antennae, etc. that are specifically a part of a spacecraft. See the search notes below for the location of an antenna or boom, per se.

SEE OR SEARCH CLASS:

- 52, Static Structures (e.g., Buildings), appropriate subclasses, e.g., subclasses 108 through 111 and 645-646 for extendable frameworks, booms, and other structures, per se.
343, Communications: Radio Wave Antennas, for an antenna, per se.

172.7 With solar panel:

This subclass is indented under subclass 158.1. Subject matter in which the structure or machine has a surface portion for receiving incident light and converting it to another usable form of energy.

SEE OR SEARCH CLASS:

- 136, Batteries: Thermoelectric and Photoelectric, subclasses 244 through 251 for a photoelectric solar collector, per se.

172.8 Having solar concentrator:

This subclass is indented under subclass 172.7. Subject matter including means for concentrating the light energy to the panel.

172.9 Having launch hold down means:

This subclass is indented under subclass 172.7. Subject matter including structure to hold the solar panel securely to the spacecraft during

launch, which structure is not required when the solar panel is in use.

173.1 With payload accommodation:

This subclass is indented under subclass 158.1. Subject matter in which the spacecraft includes special structure particularly designed to improve the efficiency with which cargo, or a like load, is carried.

173.2 Including vibration control:

This subclass is indented under subclass 173.1. Subject matter in which the special structure includes means to limit vibration of the payload (e.g., during launch).

173.3 And payload deployment:

This subclass is indented under subclass 173.1. Subject matter in which the spacecraft includes means for separating the payload from the spacecraft once in orbit.

174 Flutter control:

This subclass is indented under subclass 76. Subject matter in which the control system prevents or reduces vibration of a control element (e.g., a control surface) of the aircraft.

175 Electric course control:

This subclass is indented under subclass 76. System for automatically controlling aircraft by means of electrical apparatus.

- (1) Note. This is the generic subclass for the steering of dirigible craft automatically in two or three dimensions by means of electrical apparatus. Where significant structure of the ship, aircraft, or other vehicle is claimed, the patent is classified in the class providing for the particular craft. See the classes referred to under SEE OR SEARCH CLASS below. Where no significant structure of the craft is claimed, and the rudder, ailerons, or other steering means is recited in the claims by name only, the patents which claim or disclose a motor for actuating the steering means are classified in accordance with the principles set forth in the following sections. It should be noted that where a motor control system and the device controlled by the motor is claimed, but the motor is not specifically recited in the claims or is recited only as

a motor, the patent is classified in the motor class which provides for the type of motor disclosed. That is, if the system discloses that an electric motor is used to actuate the steering control device, the patent will be classified in Class 318, Electricity: Motive Power Systems. Where the patent discloses that either a nonelectric motor or an electric motor may be used to actuate the steering device, and the claims are not limited in any way to any particular type of motor, the patent is classified in the electric motor class. Note the following: (a) if the claims specify that two different craft control devices are controlled, even though the control devices are recited by name only (e.g., as rudder and elevator, etc.), the patent is excluded from the motor class and will be classified in this or the other appropriate craft class; (b) the nonelectric motor classes will provide for the combination of a motor controlling a single steering means recited by name only where no significant structure of the craft is recited and where no subject matter is claimed which limits the invention to use with a moving craft. Examples of subject matter considered to limit the invention to use with a moving craft are movable sensing means to be directed upon a target or in a reference direction, as a scanning antenna or photocell for determining the proper direction of steering with respect to the target or reference direction, or means responsive to a condition to maintain the craft upon a course, as a gyroscopic device. Mere remote control of the craft by transmitted energy (e.g., radio, etc.) where the control function is manually selected at the control station is not in itself considered to limit the invention to use with a moving craft; (c) Class 318 Electricity: Motive Power Systems, provides for electric motor systems where one or more electric motors are controlled. Class 318, provides for electric motor controlled steering within the limitations of the paragraphs above even though subject matter is claimed which limits the invention to use with a moving device. For example, the mere inclusion of a movable antenna which is to be

directed in a reference direction for determining the proper heading of the craft with respect to a fixed point will not exclude the patent from Class 318; (d) the above lines apply to systems using radiant energy (e.g., radio, etc.) to control the motor. Class 340, Communications: Electrical, subclasses 12.5, 12.51, 13.25, and 13.26 for controlling devices utilizing radio waves where the device is so broadly recited as to form no basis of classification in any other class. An apparent exception should be noted with respect to Class 343, Communications: Radio Wave Antennas, in the systems which include a vehicle having a directional antenna fixed with respect to the vehicle so that as the vehicle is turned the directional antenna is also turned. These systems will be classified in Class 343 (see subclasses 711-717 especially) irrespective of whether or not significant motor system, motor steering means, or craft structure is claimed if the ultimate function of the apparatus can be construed as merely orienting a directional antenna by automatic means. If the directional antenna is movably mounted on the craft, and the craft also has gyroscopic means to maintain the craft upon a course, the system will not be classified in Class 343, but will be classified according to (b) and (c) above, as the craft is not controlled solely by radiant energy, but is controlled by two different sensing means (i.e., the gyroscope and the radiant energy control means).

SEE OR SEARCH THIS CLASS, SUBCLASS:

3.1+, for trajectory control or stabilizing means for missiles

SEE OR SEARCH CLASS:

33, Geometrical Instruments, subclasses 328+ for an altitude indicator usable in an aircraft.
 60, Power Plants, subclasses 698+ for work producing systems having plural motors or having diverse types of energy input.
 73, Measuring and Testing, subclasses 178+ for a navigation instrument.

- 91, Motors: Expansible Chamber Type, appropriate subclasses for expansible chamber motors and controls therefor, and see particularly subclasses 361+ and 459 for those involving electrical control, and subclasses 165+ and 508+ for plural expansible chamber motors.
- 102, Ammunition and Explosives, subclass 384 for drop bombs having control means, including electrical controls for controlling the source of flight.
- 114, Ships, subclass 21.1, for torpedoes controlled from a remote station means involving electrical circuits, and subclasses 23+ for torpedoes with automatic control of the steering which include electrical circuits, and subclasses 144+ for the miscellaneous automatically controlled steering or speed control of ships. See (2) Note, above.
- 180, Motor Vehicles, subclasses 167+ as explained in the reference to that class (180) appearing in subclass 75.1 above.
- 246, Railway Switches and Signals, subclasses 4, 7, 29+, and 189 for railway train control and signaling systems utilizing radiant energy.
- 250, Radiant Energy, subclasses 200+ and the classes and subclasses specified in the notes thereto for photosensitive electrical circuits.
- 280, Land Vehicles, subclasses 263+ and 771+ for miscellaneous steering mechanism for land vehicles.
- 318, Electricity: Motive Power Systems, appropriate subclasses, for electric motor systems. See (2) Note, above. See subclass 16 where the motor is supplied or controlled by space transmitted electrical energy (e.g., radio). See subclasses 34+ for the plural motor systems (see (2) Note, above). See subclass 445 and the subclasses specified in the notes thereto for the automatically controlled motor systems, note subclass 460 where the automatic means responds to sound or mechanical vibrations, subclass 480 where the automatic means responds to light or radiant energy other than electrical waves, subclass 481 where the automatic means responds to fluid pressure, subclasses 648+ where the automatic means responds to direction, inclination angular position or to a change thereof, subclasses 561+ for adaptive or optimizing systems, subclasses 563+ for protective or reliability increasing features including fail-safe systems, redundant systems, monitoring systems and maneuver or force limiting systems, subclasses 580+ for all types of single axis vehicular guidance, subclass 591 for multiple mode systems, e.g., manual to automatic, subclass 624 for dead band compensation, and subclasses 638+ for serve-mechanisms with particular error detectors responsive to a wide variety of conditions pertinent of this search.
- 340, Communications: Electrical, subclasses 12.22, 12.5, 12.51, and 13.24-13.3 for wireless remote control, in general; and subclasses 945-983 for communication involving aircraft condition.
- 701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 3+ for a calculator for vehicle control or condition indication.
- 177 Multiple-axis altitude stabilization:**
This subclass is indented under subclass 175. System wherein the aircraft is governed in a condition of preset and uniform flight relative to its course, its altitude and its disposition with respect to the horizon, in order to maintain uniform flight.
- (1) Note. The flight of the aircraft can be uniform with respect to its pitch, or its roll or yaw, or its level light.
- 178 Trim control:**
This subclass is indented under subclass 177. System wherein the path of uniform flight is maintained by governing the position, or directing the movement, of auxiliary surfaces on airfoils, which auxiliary surfaces modify the sustaining or controlling characteristics of the airfoil.

179 By change in bank:

This subclass is indented under subclass 177. System wherein the path of uniform flight is governed by altering the angular orientation of the aircraft about an axis extending along the direction of movement thereof when such alteration is needed to maintain the altered course.

180 By change in altitude:

This subclass is indented under subclass 175. System wherein the path of flight of the aircraft is altered from a first height to a second height above ground level.

181 By change in pitch, angle of attack or flight path:

This subclass is indented under subclass 180. System wherein the height is governed by altering the inclination of the aircraft relative to ground level.

182 By change in speed:

This subclass is indented under subclass 180. System wherein the height is governed by altering the forward rate of movement of the aircraft.

183 Of aircraft on its landing course:

This subclass is indented under subclass 175. System wherein the path of flight is that which leads the aircraft in a direction towards its intended destination on the ground along a desired glide path line which is a line inclined to the horizontal and intersecting the destination.

- (1) Note. Control of aircraft take off involves functions different from those for landing. For a system including the measuring of conditions required for take off, see Class 73, Measuring and Testing, subclass 178, and for a system including the calculation of a signal for take off, see Class 701, Data Processing: Vehicles, Navigation, and Relative Location, subclass 15.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, for pertinent subclass (es) as determined by schedule review.

- 701, Data Processing: Vehicles, Navigation, and Relative Location, subclasses 16 through 18 for data processing indication or control of landing.

184 By steering or yaw:

This subclass is indented under subclass 183. System wherein the direction of the aircraft, or its orientation relative to its glide path, is changed from right to left or vice versa, the change occurring in an inclined plane; the inclined plane being one wherein two lines intersect, one of the lines being a horizontal line and the other line being said inclined glide path line of subclass 183.

- (1) Note. Included herein is a system wherein the deviation of an aircraft relative to its landing path is detected by a remote radio signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 189, for a system wherein the deviation of an aircraft relative to its flight path is detected by a remote radio signal and see (1) Note above.

185 And vertical glide path control:

This subclass is indented under subclass 184. System wherein the direction of the aircraft, or its orientation relative to its glide path, is changed from right to left as defined in subclass 184 and is also changed in a vertical plane as defined in subclass 186.

186 Vertical glide path control:

This subclass is indented under subclass 183. System wherein the direction of the aircraft, or its orientation relative to its glide path, is changed from an actual glide path line to a desired glide path line to obtain the desired glide path, the change occurring in a vertical plane; the vertical plane being one that is perpendicular to the ground, extending in the direction of landing and coextensive with both said lines.

187 With 'flare-out' detection:

This subclass is indented under subclass 186. System wherein the direction of the aircraft during landing is changed from a first path to a second path, the first path being inclined to the

- ground and the second path being parallel to and close to the ground, the change being responsive to a sensing of the altitude of the aircraft to cause a change of inclination of the aircraft.
- 188 Slope control by throttle:**
This subclass is indented under subclass 186. System wherein the direction of the aircraft is changed from a first inclination to a second inclination relative to ground level, such change being accomplished by varying the speed of the aircraft in response to a throttle adjustment.
- 189 By remote radio signal:**
This subclass is indented under subclass 175. System wherein the path of flight is governed by means in the aircraft responsive to electromagnetic waves transmitted from a distant generator of such waves.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
189, for a system controlled by a remote radio signal to control steering or yaw.
- SEE OR SEARCH CLASS:
180, Motor Vehicles, subclasses 167+ as explained in the reference to that class (180) appearing in subclass 75.1 above.
- 190 Of pilotless aircraft:**
This subclass is indented under subclass 189. System wherein the path of flight of an aircraft having no pilot therein is governed.
- (1) Note. The usual aircraft system of this subclass controls an airplane that is capable of carrying cargo but is not manned by a pilot, or an airplane that is configured similarly to such an aircraft but sized to a smaller scale, e.g., a "model" airplane.
- 191 Acceleration control:**
This subclass is indented under subclass 175. System which governs the aircraft in response to a rate of change in speed thereof.
- 192 With 'dead-zone' control:**
This subclass is indented under subclass 175. System wherein the aircraft is governed by a command or control signal, and the aircraft temporarily flies in a condition in which it receives a null or minimal signal, and wherein the aircraft has no finite control signal applied thereto during the temporary period or minimal signal, in spite of which the aircraft continues to fly by its own mechanism.
- (1) Note. Included in this subclass are systems wherein the signal is generated by, for example, a remote radio, a gyroscope or an accelerometer.
- 193 With 'softener' circuit:**
This subclass is indented under subclass 175. System wherein an auto pilot of an aircraft includes a circuit that reduces coarse or harsh or excessive control signals to smooth response of the aircraft to such signals.
- 194 Monitoring circuit or response:**
This subclass is indented under subclass 175. System which includes means for sensing whether the control system of an aircraft is operating as intended and for correcting or modifying the system if it should operate in a manner other than as intended.
- (1) Note. Some systems in this subclass provide for redundant (i.e., duplicate operative or inoperative) circuits which are activated by the monitor if the main or primary circuit fails or operates not as intended.
- 195 Self-adaptive control:**
This subclass is indented under subclass 194. System wherein a model of desired performance characteristics of the control system is programmed into the system and the system detects whether the program is being followed by the aircraft.
- 196 Override of automatic control by human pilot:**
This subclass is indented under subclass 175. System which has means permitting the human pilot to inactivate or overcome the auto pilot circuitry.

- (1) Note. In this subclass the system circuit is overpowered in response to manual operation of the aircraft's control system. The auto pilot regains control of the aircraft upon discontinuance of manual effort exerted by the human pilot.
- 197 By engaging manual control system:**
This subclass is indented under subclass 196. System which has means permitting a human pilot to disengage the auto pilot and put into operation a system controlled by the human pilot for an indeterminate time period.
- (1) Note. In this subclass the human pilot selects a mode of operation wherein either manual control or auto pilot control is connected and used, and the unused control is disconnected
- 198 With lift modification:**
This subclass is indented under subclass 35. An airfoil having means associated therewith for modifying a characteristic of the support created thereby.
- 199.1 By vortex control outside of boundary layer:**
This subclass is indented under subclass 198. Subject matter in which the airfoil comprises or includes airflow modification means designed to create or disperse a swirling air flow, this flow either circulating about the surface of the airfoil outside of the boundary layer or flowing toward or away from the surface of the airfoil to effect changes in the lift of the airfoil.
- (1) Note. This subclass does not provide for devices that affect the boundary layer through the use of vortices.
- (2) Note. An airfoil having special vortex-modifying shape is found here.
- 199.2 Of tip vortex:**
This subclass is indented under subclass 199.1. Subject matter in which the airflow modification device acts upon a vortex (i.e., tip vortex) located at an outer end portion (i.e., tip) of the airfoil.
- (1) Note. The tip vortex is that vortex that is formed at the wing tip when lift is generated by the wing.
- (2) Note. An arrangement involving the modification of the shape or profile of the wing tip or other portions of the wing to effect tip vortex control is classified here.
- 199.3 Active:**
This subclass is indented under subclass 199.2. Subject matter in which the airflow modification device is a jet, propeller, or other moving member located on the airfoil.
- 199.4 Wing tip foils/fences:**
This subclass is indented under subclass 199.2. Subject matter in which the airflow modification means is a structure mounted on the tip of the airfoil.
- 200 By characteristic of airfoil's skin:**
This subclass is indented under subclass 198. Lift modification devices wherein the modification consists of a design feature of all or part of the surface or skin of the airfoil.
- 200.1 Vortex generation in boundary layer:**
This subclass is indented under subclass 200. Subject matter in which the surface of the airfoil has means to generate vortices in close proximity thereto that modifies the boundary layer flow.
- (1) Note. The means to generate vortices can include various projections, tabs, depressions, etc. that alter the boundary layer by creating a vortex. This means may be retractable.
- 201 Variable:**
This subclass is indented under subclass 198. Lift modification devices including means to vary or adjust the modification.
- (1) Note. The adjusting means may be actuated differently on opposite sides of the aircraft to provided roll control.
- 202 With landing gear:**
This subclass is indented under subclass 201. Variable lift modifier which operates in response to a change in condition of the aircraft landing gear or control therefor.

- 203 Condition responsive:**
This subclass is indented under subclass 201. Variable lift modifier which operates in response to a change in condition of the aircraft.
- 204 By controlling boundary layer:**
This subclass is indented under subclass 201. Variable lift modifier comprising means within the airfoil, or externally adjacent the surface and upstream of the trailing edge, intended to affect a flow characteristic of that portion of the stream of air which is immediately adjacent the surface of the airfoil.
- 204.1 Actively controlled vortex generator:**
This subclass is indented under subclass 204. Subject matter in which the means to effect a change in the boundary layer flow generates vortices in close proximity to the surface of the airfoil.
- 205 With ionic or electrostatic surface:**
This subclass is indented under subclass 204. Boundary layer control means comprising means to create and/or vary an electric field about the airfoil.
- 206 With rotating member:**
This subclass is indented under subclass 204. Boundary layer control means comprising a member attached to the airfoil with its axis substantially perpendicular to the direction of motion of the air stream, and mounted for spinning about that axis.
- 207 With blowing:**
This subclass is indented under subclass 204. Boundary layer control means comprising means within the aircraft to supply high energy air to the air stream.
- 208 And suction:**
This subclass is indented under subclass 207. Blowing means combined with means to remove air from the air stream and draw it into the interior of the airfoil.
- 209 With suction:**
This subclass is indented under subclass 204. Boundary layer control means comprising means within the aircraft to remove air from the air stream and draw it into the interior of the aircraft.
- 210 With nose slot:**
This subclass is indented under subclass 204. Boundary layer control means comprising either an opening through the airfoil adjacent its leading edge, or an auxiliary element adjacent the leading edge for forming a slot therebetween, thus providing for deflection of the flow of the air at the leading edge.
- 211 Having trailing edge flap:**
This subclass is indented under subclass 210. Nose slot control means in combination with a flap, the flap being (1) a section of the airfoil pivoted to the remainder of the airfoil at the trailing edge thereof or (2) an auxiliary element pivotally attached to the airfoil at the trailing edge thereof.
- 212 Having trailing edge flap:**
This subclass is indented under subclass 204. Boundary layer control means in combination with a flap, the flap being (1) a section of the airfoil pivoted to the remainder of the airfoil at the trailing edge thereof, or (2) an auxiliary element pivotally attached to the airfoil at the trailing edge thereof.
- 213 By flap and/or spoiler:**
This subclass is indented under subclass 201. Variable lift modifier comprising (1) a section of the airfoil pivotable relative to a stationary portion thereof, or (2) an auxiliary element pivotally attached thereto, pivoting of the section or auxiliary element effecting a change in contour of the airfoil in sectional view.
- 214 At leading edge:**
This subclass is indented under subclass 213. A flap located at the leading edge of the airfoil.
- 215 At trailing edge:**
This subclass is indented under subclass 213. A flap located at the trailing edge of the airfoil.
- 216 Variable gap type, e.g., 'Fowler Flap':**
This subclass is indented under subclass 215. A flap which moves relative to the airfoil in such a manner as to create a slot with a changeable dimension between itself and the airfoil.

217 Plural, relatively pivotable:

This subclass is indented under subclass 215. A flap and at least one other flap also at the trailing edge, each adapted to swing about an axis substantially perpendicular to the direction of the aircraft's motion, wherein one flap overlies the other and the flaps are rotatable relative one to the other.

218 Area:

This subclass is indented under subclass 201. Variable lift modifier including means to change the surface area of the airfoil to be acted upon by the relatively moving stream of air.

219 Camber:

This subclass is indented under subclass 201. Variable lift modifier including means to change the contour of the airfoil in sectional view.

220 Pilot operated:

This subclass is indented under subclass 75.1. Devices and arrangements comprising an aircraft control system having at least one manually movable part moved by a human pilot for operating or controlling an aircraft.

221 Control System:

This subclass is indented under subclass 220. Apparatus comprising an aeronautical machine having an arrangement of structural and other movable parts, at least one movable part being movably engaged by a human operator for moving a structural part for guiding the aeronautical machine or structure thereby.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclasses 491+ for hand operated control lever and linkage systems.

222 Other than hand or foot actuated:

This subclass is indented under subclass 221. Apparatus wherein the movable part is engaged by an operator's body portion not normally used for controlling an aircraft (i.e., hands or feet).

(1) Note. The movable part may be a seat, a part thereof, or any other appurtenance

engageable by the torso or limbs of an operator.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 515 for knee and elbow operated control lever and linkage systems respectively.

223 With feel:

This subclass is indented under subclass 221. Apparatus wherein the part engaged by the human operator is provided with means for providing a physical sensation to the operator as it is being moved, the sensation generally being proportional to the force acting on the controlled structure (e.g., flaps, elevators, etc.).

224 With locking means:

This subclass is indented under subclass 221. Apparatus comprising a fastening or other holding means for fixedly maintaining a movable aircraft control or other structure at a desired attitude or position.

225 With dual purpose surface structure (e.g., elevons):

This subclass is indented under subclass 221. Apparatus comprising a structural control part movable to perform plural aircraft control modes each of which being normally controlled by a separate structural control part.

(1) Note. Included here are control structures which may have an added or alternative movement to perform the function of another control structure (e.g., an aileron being made to act as a flap).

226 Fluid:

This subclass is indented under subclass 221. Apparatus comprising a fluid pressure device for transmitting movement of the manually movable part of the movable structural part.

227 With electric control:

This subclass is indented under subclass 226. Apparatus wherein electric control circuitry is utilized for the regulation of the fluid power device.

- 228 Electric:**
This subclass is indented under subclass 221. Apparatus comprising electric motive means for transmitting movement of the manually movable part to the movable structural part.
- 229 Dual:**
This subclass is indented under subclass 221. Apparatus comprising means permitting full or partial operation of aircraft control systems from two or more stations in the aircraft.
- 230 With variable output:**
This subclass is indented under subclass 221. Apparatus wherein movable parts have relative movement which varies with respect to an operational parameter to alter the extent of movement of the structural part for a given movement of an operator controlled movable part.
- 231 With interengaging gearing:**
This subclass is indented under subclass 221. Apparatus wherein at least one of the movable parts comprises toothlike or other projections about its periphery for cooperation with complementary surface configurations of another movable part, movement of one of the parts causing movement of the other.
- 232 With cable and linkage:**
This subclass is indented under subclass 221. Apparatus wherein the movable parts comprise at least one elongate flexible member and at least one rodlike member connected thereto movable generally lengthwise for actuating a structural part or parts to guide the aeronautical machine.
- (1) Note. A bellcrank or other lever movable about a pivot is not considered to be linkage for classification here. See subclasses 221 and 231 for such pivoted structure combined with linkage or a cable, respectively, for moving aircraft control structure.
- 233 Cable:**
This subclass is indented under subclass 221. Apparatus wherein the movable parts comprise an elongate flexible member interconnecting a manually movable part and a structural part or a member integral with the structural part.
- 234 Controller:**
This subclass is indented under subclass 220. Apparatus comprising at least one movable part engageable by a human operator for operating the aeronautical machine or structure.
- SEE OR SEARCH CLASS:
74, Machine Element or Mechanism, subclasses 500.5+ for flexible cable transmitters, per se.
- 235 Rudder bar and pedal:**
This subclass is indented under subclass 234. Apparatus comprising foot operated devices for controlling aircraft on land, sea, or in the air.
- 236 Electrical pickup:**
This subclass is indented under subclass 234. Apparatus comprising means whereby movement of the manually engaged part is converted to an electric signal (e.g., strain gauge, inductance coil, switch, etc.).
- 237 Three-way steering, single control:**
This subclass is indented under subclass 234. Apparatus comprises a single movable manually engageable part for controlling the movement of each movable structural part to control yaw, pitch, and roll of the aircraft.
- CROSS-REFERENCE ART COLLECTIONS
- 900 LIGHTWEIGHT, WINGED, AIR VEHICLE (E.G., ULTRALIGHT OR HANG GLIDER):**
Air vehicle (a) built to be very low in weight and (b) supported in flight by an air foil.
- (1) Note. The weight of an ultralight air vehicle is usually less than the 254 pound maximum defined by the Federal Aviation Administration. This art collection may, however, include air vehicles which vary from the standard.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
16, for glider-type airplanes.

SEE OR SEARCH CLASS:
446, Amusement Devices: Toys, sub-classes 61+ for glider-type toy airplanes.

901 Having delta shaped wing:

This subclass is indented under subclass 900. Subject matter wherein the air foil is a generally triangular-shaped wing.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
16, for glider-type airplanes.

902 Having parachute type wing:

This subclass is indented under subclass 900. Subject matter wherein the air foil is a flexible canopy, without any rigid supporting framework.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
142+, for a safety lowering device in the form of a parachute.

903 Powered:

This subclass is indented under subclass 900. Subject matter wherein the very low weight air vehicle includes its own propulsion means.

904 Miscellaneous hardware or control:

This subclass is indented under subclass 900. Subject matter including (a) a structural element of the very low weight air vehicle, or (b) a device for regulating the movement or direction of the very low weight air vehicle.

905 INFLATABLE EVACUATION SLIDE:

Hollow structure which, when filled with pressurized gas, forms a guideway on which passengers may slip down to rapidly leave an aircraft.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
137.2, for structure on an aircraft which permits passenger or cargo loading or discharging.

SEE OR SEARCH CLASS:

182, Fire Escape, Ladder, or Scaffold, particularly subclasses 48+ for a chute or escape tower for personnel, not related to aircraft.

193, Conveyors, Chutes, Skids, Guides, and Ways, particularly subclass 25 for flexible wall chutes, per se.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for *indented* art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 AIRCRAFT CONTROL:

Foreign Art Collections for devices and arrangements directed to and limited to the controlling of aircraft in flight.

FOR 101 Flutter prevention:

This foreign art collection was derived from an undefined alpha subclass. Consult the documents contained herein to clarify or interpret the title and scope of this foreign art collection.

FOR 102 Fluid:

Foreign Art Collections for systems for automatically controlling aircraft by means of hydraulic or pneumatic apparatus.

FOR 103 Airfoil construction:

Foreign Art Collections for construction of airfoil elements.

FOR 104 SPACECRAFT:

Foreign Art Collections for comprising a machine or structure especially designed for travel in the upper reaches of and/or beyond the atmosphere of a celestial body, (e.g., earth).

FOR 105 Exterior surface air resistance heat control:

This foreign art collection was derived from an undefined alpha subclass. Consult the documents contained herein to clarify or interpret the title and scope of this foreign art collection.

FOR 106 Space station:

Foreign Art Collections for apparatus wherein the machine or structure is orbitally maintained in the upper reaches of or beyond the earth's atmosphere to which other machine or structures may rendezvous and lock and subsequently be launched therefrom.

FOR 107 Reentry vehicle:

Foreign Art Collections for apparatus wherein the machine or structure is provided with control means enabling return of the machine or structure to the surface of the earth.

FOR 108 Rendezvous:

Foreign Art Collections for apparatus wherein the machine or structure includes means whereby it may be brought either into proximity to or fixed engagement with complimentary means on another machine or structure traveling in upper reaches or and/or beyond the atmosphere of a celestial body.

FOR 109 Manned:

Foreign Art Collections for apparatus wherein the machine or structure includes a life support system for a person or other living sentient being.

FOR 110 Environmental control:

Foreign Art Collections for apparatus wherein the life support system for the machine or structure comprises means for sustaining, preserving, protecting or otherwise enhancing the life or the living conditions respectively of the person or living sentient being.

FOR 111 With propulsion:

Foreign Art Collections for apparatus wherein there is provided means to cause motion of the machine or structure to which it is attached.

FOR 112 With solar panel:

Foreign Art Collections for apparatus provided with a member having a surface portion for receiving incident light, the energy of which being converted to another energy form, e.g., electrical.

FOR 113 Spaceship control:

Foreign Art Collections for system wherein the aircraft is capable of movement outside of earth's atmosphere as well as flight there within, and wherein such movement or flight is regulated by governing the direction or action of propulsive units on the aircraft.

FOR 114 By vortex generator or dissipater:

Foreign Art Collections for lift modification devices designed to create or disperse a swirling air flow, this flow either circulating about the surface of the airfoil or flowing radially therefrom.

END