STATUTORY INSTRUMENTS
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STATUTORY INSTRUMENTS SUPPLEMENT

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S T A T U T O R Y I N S T R U M E N T S

2020 No. 16.

THE CIVIL AVIATION (UNITS OF MEASUREMENT FOR AIR AND GROUND OPERATIONS) REGULATIONS, 2020

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STATUTORY INSTRUMENTS

2020 No. 16.

The Civil Aviation (Units of Measurement for Air and Ground Operations) Regulations, 2020

(Under sections 34(2) and 61of the Civil Aviation Act, Cap 354)

IN EXERCISE of the powers conferred upon the Minister by sections 34(2) and 61 of the Civil Aviation Authority Act, Cap 354, and on the recommendation of the Uganda Civil Aviation Authority, these Regulations are made this19th day of October 2019.

PART I — PRELIMINARY

1. Title

These Regulations may be cited as the Civil Aviation (Units of Measurement for Air and Ground Operations), 2020.

2. Application

These Regulations shall apply to all aspects of international civil aviation air and ground operations.

3. Interpretation

In these Regulations, unless the context otherwise requires -

"ampere (A)" means that constant electric current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed 1 metre apart in a vacuum, would produce between the parallel conductors a force equal to 2 × 10–7 newton per metre of length;

"candela (cd)" means the luminous intensity, in the perpendicular direction, of a surface of 1/600 000 square metre of black body at the temperature of freezing platinum under a pressure of 101 325 newtons per square metre;

"celsius temperature (t°C)" means the Celsius temperature is equal to the difference t°C = T-T0 between two thermodynamic temperatures T and T0 where T0 equals 273.15 Kelvin;

"coulomb (C)" means the quantity of electricity transported in 1 second by a current of 1 ampere;

"degree Celsius (°C)" means the special name for the unit Kelvin for use in stating values of Celsius temperature;

"farad (F)" means the capacitance of a capacitor between the plates of which there appears a difference of potential of 1 volt when it is charged by a quantity of electricity equal to 1 coulomb;

"foot (ft)" means the length equal to 0.304 8 metre exactly;

"General conference of Weights and Measures (CGPM)" means the primary intergovernmental treaty organization responsible for the SI and ensuring that the SI is widely disseminated and modifying it as necessary so that it reflects the latest advances in science and technology;

"Gray (Gy)" means the energy imparted by ionizing radiation to a mass of matter corresponding to 1 joule per kilogram;

"Henry (H)" means the inductance of a closed circuit in which an electromotive force of 1 volt is produced when the electric current in the circuit varies uniformly at a rate of 1 ampere per second;

"Hertz (Hz)" means the frequency of a periodic phenomenon of which the period is 1 second;

"human performance" means human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations;

"International System of Units (SI)" means a complete, coherent system which includes three classes of unit's base units, supplementary units and derived units;

"Joule (J)" means the work done when the point of application of a force of 1 Newton is displaced a distance of 1 metre in the direction of the force;

"Kelvin (K)" means a unit of thermodynamic temperature which is the fraction 1/273.16 of the thermodynamic temperature of the triple point of water;

"kilogram (kg)" means the unit of mass equal to the mass of the international prototype of the kilogram;

"Knot (kt)" means the speed equal to 1 nautical mile per hour;

"litre (L)" means a unit of volume restricted to the measurement of liquids and gases which is equal to 1 cubic decimeter;

"Lumen (lm)" means the luminous flux emitted in a solid angle of 1 steradian by a point source having a uniform intensity of 1 candela;

"Lux (lx)" means the illuminance produced by a luminous flux of 1 lumen uniformly distributed over a surface of 1 square metre;

"metre (m)" means the distance travelled by light in a vacuum during 1/299 792 458 of a second;

"Mole (mol)" means the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon-12;

"Nautical mile (NM)" means the length equal to 1,852 metres exactly;

"Newton (N)" means the force which when applied to a body having a mass of 1 kilogram gives it an acceleration of 1 metre per second squared;

"Ohm (Ω)" means the electric resistance between two points of a conductor when a constant difference of potential of 1 volt, applied between these two points, produces in this conductor a current of 1 ampere, this conductor not being the source of any electromotive force;

"Pascal (Pa)" means the pressure or stress of 1 newton per square metre;

"Radian (rad)" means the plane angle between two radii of a circle which cut off on the circumference an arc equal in length to the radius;

"Second (s)" means the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium-133 atom;

"Siemens (S)" means the electric conductance of a conductor in which a current of 1 ampere is produced by an electric potential difference of 1 volt;

"Sievert (Sv)" means the unit of radiation dose equivalent corresponding to 1 joule per kilogram;

"Steradian (sr)" means the solid angle which, having its vertex in the centre of a sphere, cuts off an area of the surface of the sphere equal to that of a square with sides of length equal to the radius of the sphere;

"Tesla (T)" means the magnetic flux density given by a magnetic flux of 1 weber per square metre;

"Tonne (t)" means the mass equal to 1 000 kilograms;

"Volt (V)" means the unit of electric potential difference and electromotive force which is the difference of electric potential between two points of a conductor carrying a constant current of 1 ampere, when the power dissipated between these points is equal to 1 watt;

"Watt (W)" means the power which gives rise to the production of energy at the rate of 1 joule per second;

"Weber (Wb)" means the magnetic flux which, linking a circuit of one turn, produces in it an electromotive force of 1 volt as it is reduced to zero at a uniform rate in 1 second.

PART II — STANDARD APPLICATION OF UNITS OF MEASUREMENT

4. SI units

(1) The International System of Units developed and maintained by the General Conference of Weights and Measures shall be used as the standard system of units of measurement for all aspects of civil aviation air and ground operations.

(2) The prefixes and symbols specified in Table 3-1 in Schedule 1 to these Regulations shall be used to form names and symbols of the decimal multiples and submultiples of SI units.

5. Non-SI units

(1) The non-SI units specified in Table 3-2 in Schedule 2 to these Regulations shall be used in lieu of or in addition to, SI units as primary units of measurement but only as specified in Table 3-4 in Schedule 4 to these Regulations.

(2) The non-SI units specified in Table 3-3 in Schedule 3to these Regulations shall be permitted for temporary use as alternative units of measurement but only for the specific quantities listed in Table 3-4 in Schedule 4 to these Regulations.

6. Application of specific units

(1) The application of units of measurement for certain quantities used in civil aviation air and ground operations is specified in Table 3-4 in Schedule 4 to these Regulations.

(2) The means and provisions for design, procedures and training shall be established for operations in environments involving the use of standard and non-SI alternatives of specific units of measurement, or the transition between environments using different units, with due consideration to human performance.

7. Termination of use of alternative non-SI units

The use in civil aviation operations of the alternative non-SI units including Knot, Nautical Mile and foot shall be terminated on the dates established by International Civil Aviation Organisation (ICAO).

SCHEDULE 1

Regulation 4

TABLE 3-1. SI UNIT PREFIXES

Multiplication factor		*Prefix*	*Symbol*
1 000 000 000 000 000 000	$= 10^{18}$	exa	E
1 000 000 000 000 000	$= 10^{15}$	peta	P
1 000 000 000 000	$= 10^{12}$	tera	T
1 000 000 000	$= 10^{9}$	giga	G
1 000 000	$= 10^{6}$	mega	M
1 000	$= 10^{3}$	kilo	k
100	$= 10^{2}$	hecto	h
10	$= 10^{1}$	deca	da
0.1	$= 10^{-1}$	deci	d
0.01	$= 10^{-2}$	centi	c
0.001	$= 10^{-3}$	milli	m
0.000 001	$= 10^{-6}$	micro	μ
0.000 000 001	$= 10^{-9}$	nano	n
0.000 000 000 001	$= 10^{-12}$	pico	p
0.000 000 000 000 001	$= 10^{-15}$	femto	f
0.000 000 000 000 000 001	$= 10^{-18}$	atto	a

Regulation 5

TABLE 3-2. NON-SI UNITS FOR USE WITH THE SI

Ref. No.	*Quantity*	*Primary unit (symbol)*	*Non-SI alternative unit (symbol)*
1.	***Direction/Space/Time***		
1.1	altitude	m	ft
1.2	area	m^2	
1.3	distance (long)[a]	km	NM
1.4	distance (short)	m	
1.5	elevation	m	ft
1.6	endurance	h and min	
1.7	height	m	ft
1.8	latitude	° ′ ″	
1.9	length	m	
1.10	longitude	° ′ ″	
1.11	plane angle (when required, decimal subdivisions of the degree shall be used)	°	
1.12	runway length	m	
1.13	runway visual range	m	
1.14	tank capacities (aircraft)[b]	L	

Specific quantities in Table 3-4 related to	*Unit*	*Symbol*	*Definition (in terms of SI units)*
mass	tonne	t	$1\ t = 10^3\ kg$
plane angle	degree	°	$1° = (\pi/180)\ rad$
	minute	′	$1′ = (1/60)° = (\pi/10\,800)\ rad$
	second	″	$1″ = (1/60)′ = (\pi/648\,000)\ rad$
temperature	degree Celsius	°C	1 unit °C = 1 unit K[c]
time	minute	min	1 min = 60 s
	hour	h	1 h = 60 min = 3 600 s
	day	d	1 d = 24 h = 86 400 s
	week, month, year	—	
volume	litre	L	$1\ L = 1\ dm^3 = 10^{-3} m^3$

SCHEDULE 3

Regulation 5

TABLE 3-3. NON-SI ALTERNATIVE UNITS PERMITTED FOR TEMPORARY USE WITH THE SI

Specific quantities in Table 3-4 related to	*Unit*	*Symbol*	*Definition (in terms of SI units)*
distance (long)	nautical mile	NM	1 NM = 1 852 m
distance (vertical)[a)]	foot	ft	1 ft = 0.304 8 m
speed	knot	kt	1 kt = 0.514 444 m/s

a) altitude, elevation, height, vertical speed.

Regulation 5

TABLE 3-4. STANDARD APPLICATION OF SPECIFIC UNITS OF MEASUREMENT

Ref. No.	*Quantity*	*Primary unit (symbol)*	*Non-SI alternative unit (symbol)*
1.	***Direction/Space/Time***		
1.1	altitude	m	ft
1.2	area	m^2	
1.3	distance (long)[a]	km	NM
1.4	distance (short)	m	
1.5	elevation	m	ft
1.6	endurance	h and min	
1.7	height	m	ft
1.8	latitude	° ′ ″	
1.9	length	m	
1.10	longitude	° ′ ″	
1.11	plane angle (when required, decimal subdivisions of the degree shall be used)	°	
1.12	runway length	m	
1.13	runway visual range	m	
1.14	tank capacities (aircraft)[b]	L	

Table 3-4 Cont.

Ref. No.	Quantity	Primary unit (symbol)	Non-SI alternative unit (symbol)
1.15	time	s min h d week month year	
1.16	visibility[4]	km	
1.17	volume	m^3	
1.18	wind direction (wind directions other than for a landing and take-off shall be expressed in degrees true; for landing and take-off wind directions shall be expressed in degrees magnetic)	°	
2. *Mass-related*			
2.1	air density	kg/m^3	
2.2	area density	kg/m^2	
2.3	cargo capacity	kg	
2.4	cargo density	kg/m^3	
2.5	density (mass density)	kg/m^3	
2.6	fuel capacity (gravimetric)	kg	
2.7	gas density	kg/m^3	
2.8	gross mass or payload	kg t	
2.9	hoisting provisions	kg	
2.10	linear density	kg/m	
2.11	liquid density	kg/m^3	
2.12	mass	kg	
2.13	moment of inertia	$kg \cdot m^2$	
2.14	moment of momentum	$kg \cdot m^2/s$	
2.15	momentum	$kg \cdot m/s$	
3. *Force-related*			
3.1	air pressure (general)	kPa	
3.2	altimeter setting	hPa	
3.3	atmospheric pressure	hPa	
3.4	bending moment	$kN \cdot m$	
3.5	force	N	
3.6	fuel supply pressure	kPa	
3.7	hydraulic pressure	kPa	
3.8	modulus of elasticity	MPa	
3.9	pressure	kPa	
3.10	stress	MPa	
3.11	surface tension	mN/m	
3.12	thrust	kN	
3.13	torque	$N \cdot m$	
3.14	vacuum	Pa	

Table 3-4 Cont.

Ref. No.	Quantity	Primary unit (symbol)	Non-SI alternative unit (symbol)
4. *Mechanics*			
4.1	airspeed[6]	km/h	kt
4.2	angular acceleration	rad/s^2	
4.3	angular velocity	rad/s	
4.4	energy or work	J	
4.5	equivalent shaft power	kW	
4.6	frequency	Hz	
4.7	ground speed	km/h	kt
4.8	impact	J/m^2	
4.9	kinetic energy absorbed by brakes	MJ	
4.10	linear acceleration	m/s^2	
4.11	power	kW	
4.12	rate of trim	°/s	
4.13	shaft power	kW	
4.14	velocity	m/s	
4.15	vertical speed	m/s	ft/min
4.16	wind speed[7]	m/s	kt
5. *Flow*			
5.1	engine airflow	kg/s	
5.2	engine waterflow	kg/h	
5.3	fuel consumption (specific)		
	piston engines	kg/(kW · h)	
	turbo-shaft engines	kg/(kW · h)	
	jet engines	kg/(kN · h)	
5.4	fuel flow	kg/h	
5.5	fuel tank filling rate (gravimetric)	kg/min	
5.6	gas flow	kg/s	
5.7	liquid flow (gravimetric)	g/s	
5.8	liquid flow (volumetric)	L/s	
5.9	mass flow	kg/s	
5.10	oil consumption		
	gas turbine	kg/h	
	piston engines (specific)	g/(kW · h)	
5.11	oil flow	g/s	
5.12	pump capacity	L/min	
5.13	ventilation airflow	m^3/min	
5.14	viscosity (dynamic)	Pa · s	
5.15	viscosity (kinematic)	m^2/s	
6. *Thermodynamics*			
6.1	coefficient of heat transfer	W/(m^2 · K)	
6.2	heat flow per unit area	J/m^2	
6.3	heat flow rate	W	
6.4	humidity (absolute)	g/kg	

Table 3-4 Cont.

Ref. No.	Quantity	Primary unit (symbol)	Non-SI alternative u (symbol)
6.5	coefficient of linear expansion	$°C^{-1}$	
6.6	quantity of heat	J	
6.7	temperature	°C	
7.	***Electricity and magnetism***		
7.1	capacitance	F	
7.2	conductance	S	
7.3	conductivity	S/m	
7.4	current density	A/m^2	
7.5	electric current	A	
7.6	electric field strength	C/m^2	
7.7	electric potential	V	
7.8	electromotive force	V	
7.9	magnetic field strength	A/m	
7.10	magnetic flux	Wb	
7.11	magnetic flux density	T	
7.12	power	W	
7.13	quantity of electricity	C	
7.14	resistance	Ω	
8.	***Light and related electromagnetic radiations***		
8.1	illuminance	lx	
8.2	luminance	cd/m^2	
8.3	luminous exitance	lm/m^2	
8.4	luminous flux	lm	
8.5	luminous intensity	cd	
8.6	quantity of light	lm · s	
8.7	radiant energy	J	
8.8	wavelength	m	
9.	***Acoustics***		
9.1	frequency	Hz	
9.2	mass density	kg/m^3	
9.3	noise level	$dB^{e)}$	
9.4	period, periodic time	s	
9.5	sound intensity	W/m^2	
9.6	sound power	W	
9.7	sound pressure	Pa	
9.8	sound level	dB^{0}	
9.9	static pressure (instantaneous)	Pa	
9.10	velocity of sound	m/s	
9.11	volume velocity (instantaneous)	m^3/s	
9.12	wavelength	m	

Table 3-4 Cont.

Ref. No.	Quantity	Primary unit (symbol)	Non-SI alternative unit (symbol)
10.	*Nuclear physics and ionizing radiation*		
10.1	absorbed dose	Gy	
10.2	absorbed dose rate	Gy/s	
10.3	activity of radionuclides	Bq	
10.4	dose equivalent	Sv	
10.5	radiation exposure	C/kg	
10.6	exposure rate	C/kg · s	

a) As used in navigation, generally in excess of 4 000 m.
b) Such as aircraft fuel, hydraulic fluids, water, oil and high pressure oxygen vessels.
c) Visibility of less than 5 km may be given in m.
d) Airspeed is sometimes reported in flight operations in terms of the ratio MACH number.
e) A conversion of 1 kt = 0.5 m/s is used in ICAO Annexes for the representation of wind speed.
f) The decibel (dB) is a ratio which may be used as a unit for expressing sound pressure level and sound power level. When used, the reference level must be specified.

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ENG. MONICA AZUBA NTEGE,
Minister of Works and Transport.