Designation: F747 – 15

Standard Terminology Relating to Amusement Rides and Devices[1]

This standard is issued under the fixed designation F747; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This terminology is a repository of terms approved by Committee F24 and its subcommittees. Reproducing terms approved within all other individual F24 standards and guides, this terminology will provide a single location where terms related to amusement rides and devices are freely accessible to the public, committee members and can be maintained, updated and utilized as effective communication tools. Although published alphabetically, terms unique to a specific F24 standard or guide are indicated as such by the reference which follows the applicable term.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F2137 Practice for Measuring the Dynamic Characteristics of Amusement Rides and Devices

F2374 Practice for Design, Manufacture, Operation, and Maintenance of Inflatable Amusement Devices

F2376 Practice for Classification, Design, Manufacture, Construction, and Operation of Water Slide Systems

F2970 Practice for Design, Manufacture, Installation, Operation, Maintenance, Inspection and Major Modification of Trampoline Courts

3. Terminology

acceleration, impact—those accelerations with duration of less than 200 ms.

acceleration, sustained—those accelerations with duration greater than or equal to 200 ms.

accepted engineering practice—that which conforms to accepted principles, tests, or standards of nationally recognized technical or scientific authorities.

aerial trekking course—self-guided aerial adventure course containing elements intended to be obstacles.

air-supported structure—an amusement device that incorporates a structural and mechanical system and employs a high-strength fabric or film that achieves its strength, shape, and stability by pretensioning with internal air pressure, all of which are intended to provide an enclosed area for the self enjoyment of those so confined within.

aliasing—a phenomenon associated with sampled data systems, wherein a signal containing significant energy at frequencies greater than one half of the system sample frequency manifests itself in the sampled data as a lower frequency (aliased) signal. Aliasing can be avoided only by limiting the frequency content of the signal prior to the sampling process. Once a signal has been aliased, it is not possible to reconstruct the original signal from the sampled data.

amusement railway ride—an amusement ride that may have multiple vehicles (for example, locomotive(s), coach(es), etc.) linked together, at least one of which has on board mechanical propulsion that has an on board operator(s), utilizing flanged wheels on railroad type rails with a gauge of 12 in. or greater, that is insular to national regulations, which is designated by the Designer/Engineer as an amusement railway ride.

amusement ride or amusement device—a device or combination of devices or elements that carry, convey, or direct a person(s) over or through a fixed or restricted course or within a defined area, for the primary purpose of amusement or entertainment.

assembly area—a designated area primarily used for mounting or dismounting the trampoline court.

automatic mode—ability, after initialization, of the amusement ride or device to start, operate, move, etc. with limited or no operator intervention.

calibration constant—the arithmetic mean of the sensitivity coefficients, evaluated at frequencies that are evenly spaced on a logarithmic scale between FL and FH.

calibration value—the ratio of the reference calibration system output, in engineering units relevant to the transducer, to

[1] This terminology is under the jurisdiction of ASTM Committee F24 on Amusement Rides and Devices and is the direct responsibility of Subcommittee F24.20 on Specifications and Terminology.

Current edition approved Oct. 1, 2015. Published November 2015. Originally approved in 1982. Last previous edition approved in 2014 as F747 – 06 (2014). DOI: 10.1520/F0747-15.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

the data channel output, in volts, as measured at constant excitation frequency and amplitude.

canopy tour—aerial adventure course which provides patron access to the canopy of a forest.

carnival—a mobile enterprise principally devoted to offering amusement or entertainment to the public in, upon, or by means of portable amusement rides or devices or temporary structures in any number or combination, whether or not associated with other structures or forms of public attraction.

challenge course—guided aerial adventure course containing elements intended to be obstacles.

channel frequency class (CFC)—a frequency response envelope that conforms to Fig. 1 and is referred to by the value FH in hertz. The CFC frequency response envelope is defined by the boundaries shown in Fig. 1 and the following characteristic frequencies:

F_L—Pass band lower limit (hertz). Always equal to zero (0.0) hertz.

F_H—Pass band upper limit (hertz). The CFC designator.

F_N—The corner or knee of the frequency response envelope. Always equal to or greater than 1.667 × FH.

F_S—The minimum sample frequency for a sampled data system that corresponds to the designated CFC. Always equal to or greater than 12 × FH.

DISCUSSION—FL, FH, FN, and FS are always specified in hertz. While the characteristics of the CFC may be applied to individual components of a data channel, the CFC is, by definition, the frequency response envelope of the entire data channel from the mounted transducer to the final representation of the acquired data.

circular ride—an amusement ride whose motion is primarily rotary in a fixed or variable plane from horizontal to 45° above horizontal.

concession go-kart—an amusement ride or device, which meets all of the following specifications: the device is a single vehicle, unattached to other vehicles or a common frame system, which is powered without connection to a common energy source, which is driver controlled with respect to acceleration, speed, braking, and steering, which operates within the containment system of a defined track, and which simulates competitive motor sports, which is used by members of the general public for a fee. A concession go-kart has a maximum capacity of two persons and no cargo capacity.

DISCUSSION—This definition specifically excludes similar go-kart devices that are intended for use as competitive (racing) karts or similar go-kart devices intended for ownership and use by private owners. This definition specifically excludes devices, such as electronically or rail guided amusement rides and bumper cars or other similar amusement motor sports devices that operate under circumstances where there is no defined direction of travel.

concession go-kart attendant—the person or persons whose duties may include but are not limited to the instruction, dispatch, and limitation of ride duration of persons driving concession go-karts.

containment system—a device installed on the concession go-kart track, which defines the boundaries of the track, and whose primary purpose is to contain the vehicles within the defined boundary.

control access system—a device, barrier or mechanism that prohibits unauthorized activation of a ride or device control system.

control station—a location where buttons, switches or other controls are provided for the purpose of operating ride equipment.

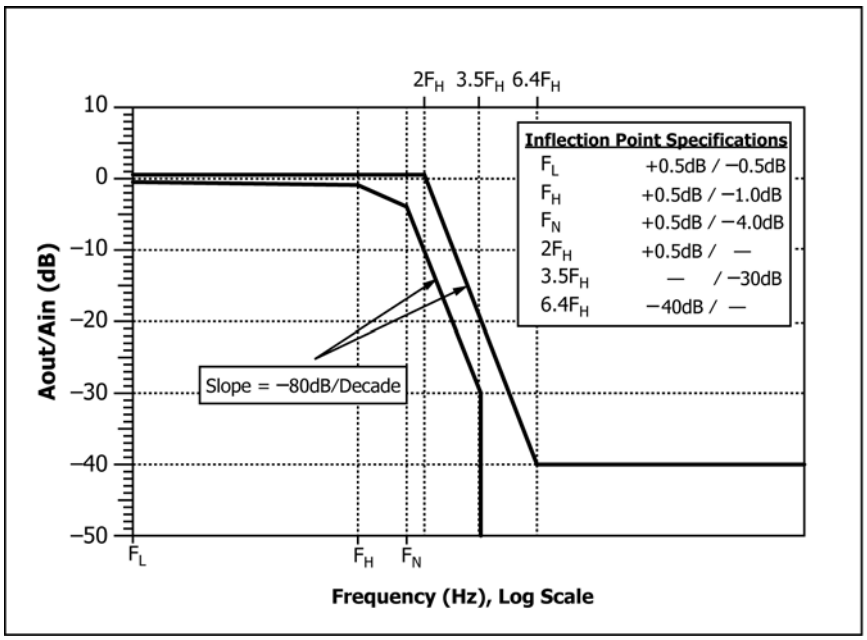

FIG. 1 Frequency Response Envelope

coordinate system—three orthogonal axes that intersect at an origin whose positive directions correspond to the right-hand rule.

measurement coordinate system—a coordinate system that provides the reference axes and sign convention for the test data record(s).

patron coordinate system—a coordinate system that is fixed with respect to the human upper torso and oriented as in Fig. 2.

vehicle coordinate system—a coordinate system that is fixed with respect to the ride or device being tested.

court attendant—individual trained in facility emergency procedures, familiar with fundamental trampolining and TC foam pit operations, monitoring patrons and responding to TC trampoline, and TC foam pit emergencies.

data channel—the entire instrumentation system for a single channel of data acquisition; from the transducer to the final representation of the data, including all post-acquisition data processing that may alter the amplitude or frequency content of the data.

data channel full scale—the maximum usable value, in units of the physical phenomenon being measured, that may be represented by a data channel. This value is determined by the data channel component with the lowest full-scale range.

designer/engineer—party(s) that establishes and describes the configuration of the amusement ride or device, establishes strength and fatigue life, designs and develops electrical/electronic control systems, and defines inspection criteria.

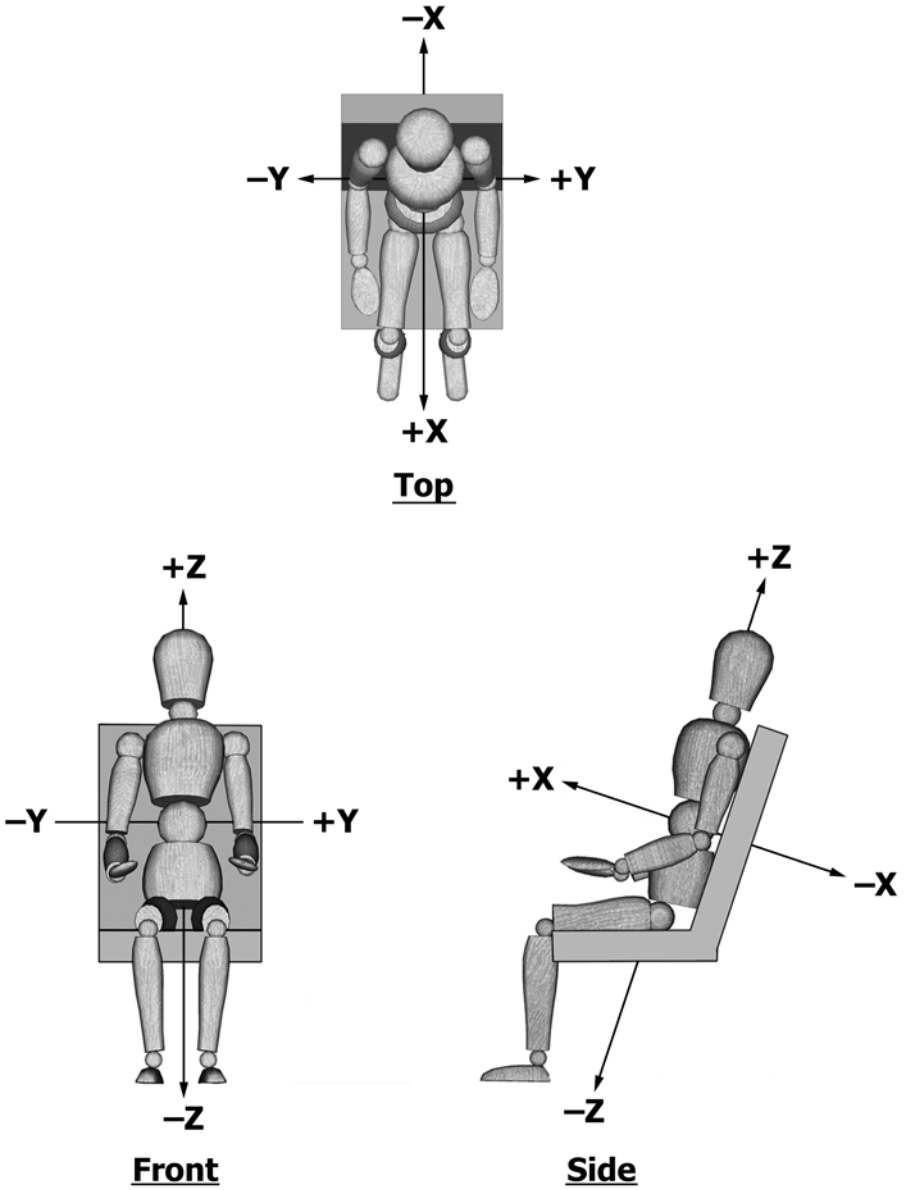

FIG. 2 Patron Coordinate System

dismount platform—any surface for standing, walking, sitting, or climbing, or a flat surface larger than 2.0 in. (51 mm) wide by 2.0 in. (51 mm) long having less than 30° angle from horizontal.

driver—the person who manipulates and controls the direction of travel, braking, and speed of a concession go-kart.

electrical (E)/electronic (E)/programmable electronic systems (PES) (E/E/PES)—when used in this context, electrical refers to logic functions performed by electromechanical techniques, (for example, electromechanical relay, motor driven timers, and so forth), Electronic refers to logic functions performed by electronic techniques, (for example, solid state logic, solid state relay, and so forth), and Programmable Electronic System refers to logic performed by programmable or configurable devices (for example, Programmable Logic Controller (PLC)). Field devices are not included in E/E/PES.

electro-sensitive protective equipment (ESPE)—assembly of devices or components, or both, working together for protective tripping or presence-sensing purposes.

engineer—an engineer as defined by and licensed in accordance with the applicable provincial or territorial statute.

fail-safe—characteristic of an amusement ride or device, or component thereof, that is designed such that the normal and expected failure mode results in a safe condition.

fence—a type of barrier consisting of, but not limited to, posts, boards, wire, stakes, or rails that is used to inhibit patrons from coming into contact with the moving portion or restricted portion of an amusement ride or device.

filter corner frequency (Fn)—with reference to a low-pass filter, Fn is the frequency (specified in Hz) where the frequency response curve of the filter has magnitude of –3 dB.

flat-ride—an amusement ride that operates on a single level whether over a controlled, fixed course or track, or confined to a limited area of operation.

force limiting—when pertaining to restraint devices, a characteristic that, regardless of the amount of force available from the system actuators, limits the amount of force applied to the patron(s).

free-run time—a period of time during the ride cycle when no energy is added to the ride vehicle.

full-scale—the maximum usable value, in units of the physical phenomenon being measured, which may be represented by a data channel or some component thereof.

fun kart—a motorized vehicle with four wheels, sold commercially as consumer goods and intended for private personal recreational use by the consumers for off-road use on suitable terrain, as recommended by the manufacturer.

"g"—the standard acceleration due to gravity at the surface of the earth. Defined as 32.2 ft/s/s or 9.81 m/s/s.

hand mode—ability of the amusement ride or device to start, operate, move, etc. only with operator intervention.

high ride—an amusement ride whose motion is in a fixed or variable plane from horizontal to vertical.

illness—personal discomfort resulting in treatment including a personal illness, food poisoning, drug abuse, toxic inhalation, insect sting, or other similar occurrence.

inflatable amusement device—an amusement ride or device designed for use that may include but not be limited to bounce, climb, slide, or interactive play. They are made of flexible fabric, kept inflated by continuous air flow by one or more blowers, and rely upon air pressure to maintain their shape.

injury—sustained bodily harm resulting in treatment such as trauma, cuts, bruises, burns, and sprains.

installation or erection—the actual act of onsite construction or the physical setting up and making ready for use of a ride or device.

institutional trampoline—a trampoline intended for use in a commercial or institutional facility.

interested party—court of confident jurisdiction, law enforcement agency, or membership/association official to which the operator falls under.

kiddie ride—an amusement ride designed primarily for use by children up to 12 years of age.

landing pool—pool intended to receive riders from a water slide.

landing zone—area in a landing pool intended for receiving riders from a particular slide.

latching—when pertaining to restraint devices, held secure against opening except by intentional action of the patron, operator, or other means. This can include restraints (for example, drop bars) held in place by gravity, detents or other means.

lifeguard—individual specially trained in lifesaving and emergency procedures, responsible for monitoring patrons and responding to aquatic and other emergencies.

locking—when pertaining to restraint devices, held securely against opening except by intentional action of the operator or other means not accessible by the patron.

major modification—any change in either the structural or operational characteristics of the ride or device which will alter its performance from that specified in the manufacturer's design criteria.

manual release—when pertaining to restraint devices, a hand or foot operated mechanism that allows for opening the patron restraint.

manufacturer—party producing the amusement ride or device, performing major modifications and can include the designer/engineer.

minor injuries/illnesses—injuries and illnesses which may or may not require emergency first aid or significant treatment, or both, but cannot be otherwise classified as a serious injury or illness. This category includes incidents where treatment is limited to such things as the dispensation of over-the-counter medication or plastic adhesive strips, cleansing, rest, and other similar duties or assistance.

minor modification—any change that does not alter the structural or operational characteristics of the ride or device nor change its performance from that specified in the manufacturer's design criteria.

nonlinearity—the ratio, in percent, of the maximum difference between a calibration value and the corresponding value determined from the straight line defined by the sensitivity coefficient and zero bias.

operating mode—a defined behavior of an amusement ride or device with a corresponding set of rules or interlocks that are implemented in control systems as required.

operator—the person having direct control of the starting, stopping, or speed of an amusement ride.

operator/attendant—the person who has been properly trained and designated by the owner to direct the operation of the inflatable device.

owner—the person, persons, partnership, company, group, or corporate entity, or agent of a person, who owns, controls, or has the duty to direct or control the operation of a concession go-kart track.

owner/operator—the person or organization having overall control and responsibility for the maintenance, setup, and operation of the inflatable device. F2374

owner/operator—person or organization that is responsible for the maintenance and operation of a water slide system. F2376

owner/operator—person, entity or organization that is responsible for the maintenance and operation of a trampoline court. F2970

passenger—the person who is transported aboard a concession go-kart as a passenger without having control of the direction of travel, braking, and speed of the go-kart.

patron clearance envelope—patron reach envelope plus a margin of 3 in.

patron containment—features in an amusement ride or device that accommodate the patron for the purpose of riding the ride or device. This may include but is not limited to the seats, side walls, walls, or bulkheads ahead of the patron(s), floors, objects within the vicinity of the patron(s), restraint systems, and cages.

patron reach envelope—space a patron could reach during a ride cycle while properly positioned, as defined by the ride analysis, in the amusement ride or device and limited only by the vehicle, seat geometry, and restraint system.

pit—a defined station for the purpose of loading and unloading driver and passenger during the initiation and conclusion of the ride cycle.

previously compliant—amusement ride or device, or major modification to an amusement ride or device, of which the design meets the ASTM Standard in place at the time of its design.

primary circulation area—areas leading directly to the entrance and exit of a ride that are normally traveled by patrons. These areas would not include emergency exit routes, maintenance areas, or other areas not normally on the route of the patron.

prototype—final operational assembly of a newly developed ride or device.

race kart—go-karts designed for the sole purpose of racing on tracks, streets, or other areas of competition, and not to be used by the general public in an amusement facility setting.

reference calibration system—the entire calibration instrumentation system from the reference transducer to the output device that provides the calibration excitation value in engineering units appropriate to the physical phenomenon being measured.

resolution—the lowest magnitude data channel output value that can be identified as non-zero.

restraint—system, device, or characteristic that is intended to inhibit or restrict the movement of the patron(s) while on the amusement ride or device.

ropes course—synonym for a challenge course.

safety net—net that is intended to arrest a falling person.

safety-related control system (SRCS)—an assembly of components that monitor and control the amusement ride or device such that it: (1) mitigates hazards to persons; or (2) has the capability to block or otherwise alter the performance of systems that implement safety features. Components may include without limitation electronic, electric, electromechanical, hydraulic, pneumatic or mechanical devices, or combinations thereof.

sensitivity coefficient—the slope of the straight line representing the best fit, as determined by the method of least squares, to calibration values generated at a single frequency and at various amplitudes within the data channel full scale range. In the special case where only a single calibration value is considered, the sensitivity coefficient and the calibration value will be equal.

serious injuries/illnesses—a personal injury/illness that results in death, dismemberment, significant disfigurement, permanent loss of the use of a body organ, member, function, or system, a compound fracture, or other significant injury/illness that requires immediate admission and overnight hospitalization and observation by a licensed physician.

service proven—an amusement ride, device, or major modification to an amusement ride or device of which (1) unit(s)

have been in service to the public for a minimum of five years, and (2) unit(s) that have been in service have done so without any significant design related failures or significant design related safety issues that have not been mitigated.

service proven practice—a policy or procedure used in association with an amusement ride or device, which (1) has been in service to the public for a minimum of five years, and (2) has done so without any significant safety related issues that have not been mitigated.

standardized amusement ride characterization test (SARC Test)—an instrumented test of an amusement ride or device that is done in conformance to the general specifications of this standard and the particular specifications of Section 12. F2137

supervising companion—a person on a ride or device who is qualified by a reasonable age or other means to understand rider instructions, assist a patron or child under 48 in. in height in complying with rider instructions, and who meets all other criteria for riding.

suspension system—bed-supporting system made up of elastic devices that connect the bed to the frame, for example, steel extension springs.

sustained wind speed—a wind speed determined by averaging the observed wind speed in the area of operation rounded to the nearest whole mile per hour over a 1 to 10 min period.

test data record—the uninterrupted time record of data channel value(s) that results from a data acquisition session. the length of a data acquisition session is not specified. The data acquisition session is considered complete (or interrupted) when data is not recorded for a time interval longer than the sampling period of the data recorder. Both a strip chart paper record and a computer data file containing periodically sampled data channel values are typical forms of a test data record.

test documentation—the entire body of documentation pertaining to a test performed in compliance with this practice, including, but not limited to, the test data record(s), data channel specifications and other test specifications, and information as provided in this practice (see Section 11 and 12.1.9). F2137

track—a defined path for the operation of concession go-karts that is hard surfaced and fitted with a containment system to define the path of travel.

trampoline court or TC—a defined area comprising one or more institutional trampolines or a series of institutional trampolines.

trampoline court bed or TC bed—flexible surface which the user contacts in the course of bouncing on a trampoline.

trampoline court foam pit or TC foam pit—a combination style dismount pit designed with a rebound device, covered with loose impact absorbing blocks.

trampoline court trampoline or TC trampoline—rebound device activated by vertical or lateral jumping used in a trampoline court.

transducer—the device at the front end of the data channel that converts a physical phenomenon, such as acceleration, to a calibrated electrical signal that may be input to the remainder of the data channel.

transverse sensitivity—the sensitivity of a rectilinear transducer to excitation along an axis that is perpendicular to its nominal sensitive axis.

Type AP-A track—active main lines; any track where the operating speed exceeds walking speed.

Type AP-B track—active passing tracks, loading tracks, classification yard tracks, and storage tracks; all other tracks (both active and inactive) that are not previously identified as Type AP-A track; tracks having an occasional use or a foreseeable need.

Type AP-C track—inactive track with no current operation requirements.

unscheduled cessation—a rare, unusual, or irregular stopping of an amusement ride operation, intentional or otherwise, that is considered abnormal or potentially hazardous in nature, or both, due to its cause, method, or result.

use case—a purpose for which equipment is used by persons or external systems. Examples of common use cases include but are not limited to entertaining patrons, supporting routine maintenance, and programming for creative intent. Use cases and operating modes may or may not have a one-to-one correspondence.

user—a participant in the use of the inflatable device as defined by the manufacturer.

walking speed—less than 5 ft (1.5 m) per second.

zero bias—the magnitude of the data channel output when the transducer input is zero or static.

zip line—an aerial adventure course element over an open span consisting of an inclined wire or fiber rope on which harnessed patron(s) suspended from a pulley or trolley are able to traverse with the primary force for propulsion being gravity.

zone of operator awareness—area defined by the sights, sounds, and other stimuli an operator can reasonably be expected to monitor from their specified location(s) relative to the amusement ride or device that they are operating. The zone of operator awareness could include multiple, noncontiguous portions of a ride-vehicle path. Information provided by remote audio or video monitoring devices may be part of the zone of operator awareness.