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Description of conceptual model of requirements

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Activation Statement

An “Activation statement” is a set of “Condition statement” combined with one or more “Logical statement” (e.g., And, Or, Not).

The “Activation statement” describes on one hand, the required temporal information about the “Capability”, and on other hand, the required system structure for which the requirement is applicable. If no “Activation statement” is specified, we shall consider it as an “Anytime” condition for the temporal information and “for all configurations” for the applicability.

e.g. : When the weather is cloudy.

When the button is pressed and if the system state is safety.

For aircraft with more that 350 seats or for aircraft with a minimum mass of 35T.

Property

A “Property” is a combination of a “Value” (a quantity and a type) which evolves in the property’s “Range” (between a minimum value and a maximum value). The “Range” of a “Property” is considered for verification purposes as an operational range and is different from the range of all possible values of the “Property”.

In this model, “Property” is instantiated into “Real Property” and “Desired Property”. The Instantiated “Property” is in link with the context or the system and have an “ident” (identity) attribute.

The “Real Property” is the observed property from which we collect the data for a comparison in a condition statement.

e.g. : the aircraft’s speed

the Airport’s local temperature

The “Desired Property” is a property’s boundary to which we compare the data.

e.g. : 0.8 mach

32°c

To be compared, a “Real Property” and a “Desired Property” shall use the same kind.

Condition statement

The “Condition statement” is made of a conditional operator (e.g., where, for, when, If, ...), concerns a data, the “Real Property”. This property’s data is compared with a “Comparator Operator” word or phrase (e.g., is, is more than, is less than...) to a “Desired Property”.

Note that the “Value” can be either a fixed number, a dynamic parameter, or an enumeration value.

e.g. : When aircraft speed reaches Vto.

While the system state is in operation.

If the sound is more than 80 dB.

Optionally, “Condition” may contain an “Activation Delay” made with a temporal comparator and a value representing a time delay.

e.g. : When the system state is in operation, after a delay of 2 seconds,

Capability

The “Capability” is the observable part of the requirement. It represents what the system is or what the system does. The “Capability” is the simplest, incompressible, and necessary part of the requirement made of a modal verb (mainly shall), a “Verb” (be, do, ...), and an “Object” (the system itself or an external system from the context).

e.g. : The aircraft shall transport people .

The coffee machine shall serve coffee.

The roller blind shall protect users.

Satisfaction Condition Statement

In extension to the “Capability”, we can add “Satisfaction condition statement” that gives more information about the condition that makes the capability acceptable. The “Satisfaction condition statement” reuses the previously described concept “Condition statement” and is applied to either the “Verb” or the “Object” of the capability.

e.g. : The aircraft shall transport **a quantity of 350** peoples.

The coffee machine shall serve **a 55°c coffee in 20 seconds.**

The roller blind shall protect users **from 90 mJ/cm² of sunlight.**