ADS V4
User's Manual
Part IV
Engine Dataset

Rev A

May 11, 2022

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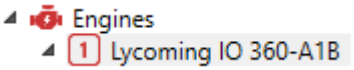
1. Introduction

1.1. The root node Engines

The Engine dataset is created from the root node **Engines**



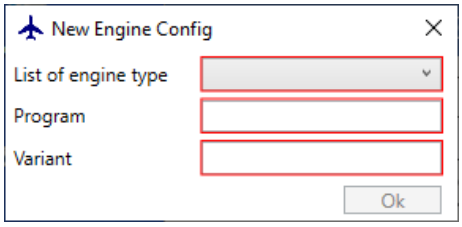
Contextual Menu :	
Right click :	
New Engine	To create a new Engine dataset in the current session
Open Engine	To load an Engine dataset in the current session
Duplicate Engine	To duplicate an Engine dataset and load it in the current session

Several engine datasets may be loaded in the same session

1 ...	The engine datasets that will be loaded in the current session
2 ...	
3 ...	
4 ...	

1.2. To Create a new engine dataset in the current session

Commands :	
Right click :	
New Engine	To create a new Engine in the current session

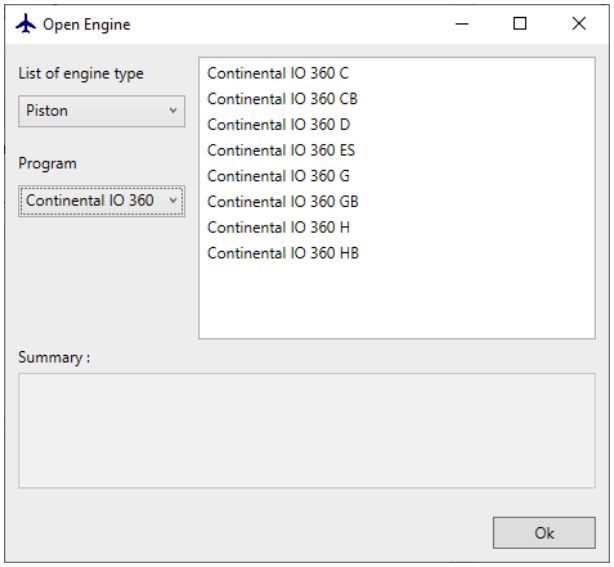


1. Enter
    a) The Engine Type (Piston)
    b) The name of the Engine Program (Lycoming IO 360)
    c) The name of the Engine Variant (A1B)
2. Click on OK

The New Engine dataset is displayed in the TreeView

1.3. To Load an engine dataset in the current session

Commands :	
Right click :	
Open Engine	To load an Engine in the current session



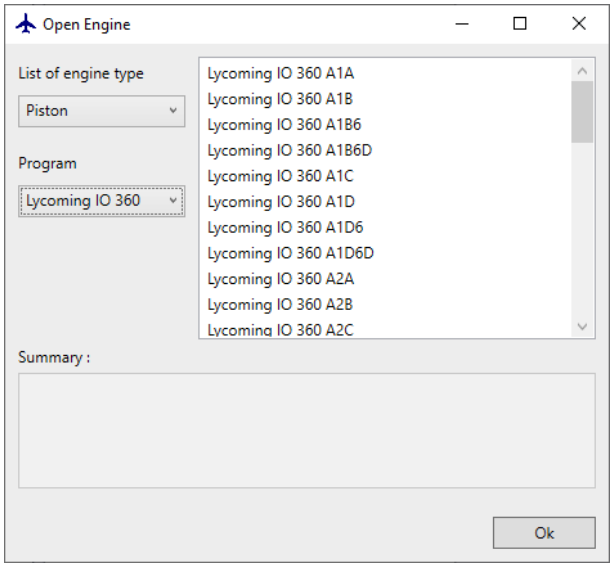
1. Select
   a) Type
   b) Program

   to filter the list
2. Double click on the name of the Engine **or** click on the name then click on OK

The selected Engine dataset is displayed in the TreeView

1.4. To duplicate an Engine dataset and load it in the current session

Commands :	
Right click :	
Duplicate Engine	To duplicate an Engine dataset and load it in the current session



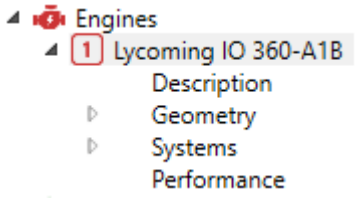
1. Select
   a) Type
   b) Program

   to filter the list
2. Double click on the name of the Engine dataset **or** click on the name then click on OK

One copy of the selected Engine dataset is displayed in the TreeView

2. Description

The structure of the engine dataset is well defined. The data are put together according to the subitem to which they belong.



Subitems:	
Description	General information about the engine
Geometry Tails	Data relative to the engine geometry
Systems	Data relative to the engine systems
Performance	Data relative to the engine performance

IMPORTANT TO READ: all branches of the Tree View, all contextual menus, all properties may not be visible simultaneously. It depends among other on engine's type (piston, electric, turbofan…).

2.1. Piston (Lycoming IO 360-A1B)

Root branch of the current dataset. The header is the concatenation of the Program Name and the Variant.

Properties :		
General	Model	Lycoming IO 360-A1B
	Program	Lycoming IO 360
	Variant	A1B
	Manufacturer	Manufacturer
Is Used on…	Fixed Wing	Specifies if it is used on fixed wing Aircraft
	Rotary Wing	Specifies if it is used on rotary wing Aircraft

Commands :		
Right click :		
Duplicate		To duplicate the current dataset
Remove		To remove the current dataset from the current session
Save		To save the current dataset
Save As		To save the current dataset and change its name

2.1.1. Description

Properties :		
General	Number of Cylinders	Number of Cylinders
	Type	Engine Type: - 2 Stroke - 2 Stroke Diesel - 4 Stroke - 4 Stroke Diesel

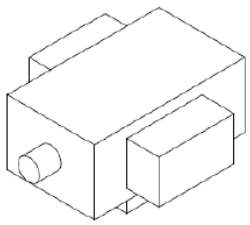
2.1.2. Geometry

Subitems:	
Engine Envelope	Geometry of the engine envelope

Properties :		
Dimensions	Height	Total height
	Length	Total length
	Width	Total width
Weight	Dry Weight	Dry Weight

2.1.2.1. *Engine Envelope*

The envelope of any engine is made from basic shapes like prisms, cylinders or cones. The shapes are located at a given position from a reference. Additional information about the engine envelope is available in the Technical Note TN02-191



Data relative to the engine envelope

Subitems:	
#C	List of cylinders
#P	List of prisms

Contextual Menu :	
Right click :	
Add New Cylinder to Engine Envelope	To add a new cylinder to the engine envelope
Add New Prism to Engine Envelope	To add a new prism to the engine envelope
	To open a technical note

2.1.2.1.1. #C1 - Cn

Data relative to the geometry of one cylinder

Properties :		
Geometry (Cylinder)	Diameter	Diameter
	Length	Length
Position	Dx	Distance between the reference and the front face of the cylinder (X+)
	Dy	Distance between the reference and the longitudinal axis of the cylinder (Y+)
	Dz	Distance between the reference and the longitudinal axis of the cylinder (Z+)
Contextual Menu :		
Right click :		
Remove		To remove the current cylinder from the engine envelope

2.1.2.1.2. #P1 - Pn

Data relative to the geometry of one prism

Properties :		
Geometry (Cylinder)	Height	Maximum height
	Length	Maximum length
	Width	Maximum Width
Position	Dx	Distance between the reference and the front face of the prism (X+)
	Dy	Distance between the reference and the right lateral face of the prism (Y+)
	Dz	Distance between the reference and the upper face of the prism (Z+)
Contextual Menu :		
Right click :		
Remove		To remove the current prism from the engine envelope

2.1.3. Systems

Data relative to all engine systems

Subitems:	
Fuel	Characteristics of the Fuel System
Cooling	Characteristics of the Cooling System
Gearbox	Characteristics of the Gearbox (if any)
Turbocharger	Characteristics of the Turbocharger (if any)

Properties :		
Configuration	Has Gearbox	Specifies if it has a Gearbox
	Has Turbocharger	Specifies if it has a Turbocharger

2.1.3.1. *Fuel*

Data relative to the Fuel System

Properties :		
Fuel	Type	List of fuels from fuel database

2.1.3.2. *Cooling*

Data relative to the Cooling System

Properties :		
General	Type	Cooling type: - Air - Liquid - Air-Liquid

2.1.3.3. *Gearbox*

Data relative to the Gearbox

Properties :		
Specifications	Gearbox Ratio	Gearbox Ratio

2.1.3.4. *Turbocharger*

Data relative to the Turbocharger

Properties :		
Specifications	Critical Altitude	Critical Altitude, maximum altitude at which an engine can maintain its full rated horsepower.

2.1.4. Performance

Data relative to the engine performance

Properties :		
Mx Continuous Power	Engine Power	Engine Power
	@ Engine rpm	Engine rpm
SFC (Best Economy)	@ 50% Mx BHP	Specific Fuel Consumption @ 50% Mx BHP (best economy mixture setting) @ Mx rpm
	@ 75% Mx BHP	Specific Fuel Consumption @ 75% Mx BHP (best economy mixture setting) @ Mx rpm
	@ 100% Mx BHP	Specific Fuel Consumption @ 100% Mx BHP (best economy mixture setting) @ Mx rpm
SFC (Best Power)	@ 100% Mx BHP	Specific Fuel Consumption @ 50% Mx BHP (best power mixture setting) @ Mx rpm
Overspeed	Is Overspeed Allowed	Specifies if Overspeed is allowed

2.2. Electric (Hacker Q80)

Root branch of the current dataset. The header is the concatenation of the Program Name and the Variant.

Properties :		
General	Model	Hacker Q80
	Program	Hacker
	Variant	Q80
	Manufacturer	Manufacturer
Is Used on…	Fixed Wing	Specifies if it is used on fixed wing Aircraft
	Rotary Wing	Specifies if it is used on rotary wing Aircraft

Commands :		
Right click :		
Duplicate		To duplicate the current dataset
Remove		To remove the current dataset from the current session
Save		To save the current dataset
Save As		To save the current dataset and change its name

2.2.1. Description

Properties :		
General	Type	Engine Type: - AC Induction Motor - AC Synchronous Motor - DC Brushed Motor - DC Brushless Motor
Motor Constants	Internal Resistance	Internal resistance of the motor (Ri)
	Motor Constant	Motor Constant of the motor (Km)
	No-Load Current	No-Load Current of the motor (I0)
	Speed Constant	Speed Constant of the motor (Ks)
Pricing	Price	List price
	Year of Reference	Year of reference

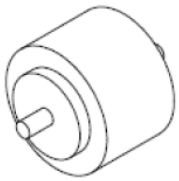
2.2.2. Geometry

Subitems:	
Engine Envelope	Geometry of the engine envelope

Properties :		
Dimensions	Diameter	Diameter (Outside)
	Length	Total length
Weight	Weight	Weight

2.2.2.1. *Engine Envelope*

The envelope of any engine is made from basic shapes like prisms, cylinders or cones. The shapes are located at a given position from a reference. Additional information about the engine envelope is available in the Technical Note TN02-191



Data relative to the engine envelope

Subitems:	
#C	List of cylinders

Contextual Menu :	
Right click :	
Add New Cylinder to Engine Envelope	To add a new cylinder to the engine envelope
	To open a technical note

2.2.2.1.1. #C1 - Cn

Data relative to the geometry of one cylinder

Properties :		
Geometry (Cylinder)	Diameter	Diameter
	Length	Length
Position	Dx	Distance between the reference and the front face of the cylinder (X+)
	Dy	Distance between the reference and the longitudinal axis of the cylinder (Y+)
	Dz	Distance between the reference and the longitudinal axis of the cylinder (Z+)
Contextual Menu :		
Right click :		
Remove		To remove the current cylinder from the engine envelope

2.2.3. Systems

Data relative to all engine systems

Subitems:	
Gearbox	Characteristics of the Gearbox (if any)

Properties :		
Configuration	Has Gearbox	Specifies if it has a Gearbox

2.2.3.1. *Gearbox*

Data relative to the Gearbox

Properties :		
Specifications	Efficiency	Efficiency
	Gearbox Ratio	Gearbox Ratio

2.2.4. Performance

Data relative to the engine performance

Properties :		
Mx Continuous Power	Engine Power	Engine Power
	@ Current	Supply current
	@ Engine rpm	Engine rpm
	@ Voltage	Supply voltage
	Efficiency	Engine efficiency

2.3. Turbopropeller (PT6A-66D)

Root branch of the current dataset. The header is the concatenation of the Program Name and the Variant.

Properties :		
General	Model	PT6A-66D
	Program	PT6A
	Variant	66D
	Manufacturer	Manufacturer
Is Used on…	Fixed Wing	Specifies if it is used on fixed wing Aircraft
	Rotary Wing	Specifies if it is used on rotary wing Aircraft

Commands :		
Right click :		
Duplicate		To duplicate the current dataset
Remove		To remove the current dataset from the current session
Save		To save the current dataset
Save As		To save the current dataset and change its name

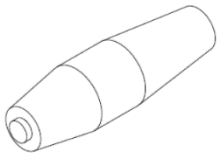
2.3.1. Geometry

Subitems:	
Engine Envelope	Geometry of the engine envelope

Properties :		
Dimensions	Diameter	Diameter (Outside)
	Length	Total length
Weight	Dry Weight	Dry Weight

2.3.1.1. *Engine Envelope*

The envelope of any engine is made from basic shapes like prisms, cylinders or cones. The shapes are located at a given position from a reference. Additional information about the engine envelope is available in the Technical Note TN02-191



Data relative to the engine envelope

Subitems:	
#C	List of cylinders
#Co	List of cones

Contextual Menu :	
Right click :	
Add New Cylinder to Engine Envelope	To add a new cylinder to the engine envelope
Add New Cone to Engine Envelope	To add a new cone to the engine envelope
	To open a technical note

2.3.1.1.1. #C1 - Cn

Data relative to the geometry of one cylinder

Properties :		
Geometry (Cylinder)	Diameter	Diameter
	Length	Length
Position	Dx	Distance between the reference and the front face of the cylinder (X+)
	Dy	Distance between the reference and the longitudinal axis of the cylinder (Y+)
	Dz	Distance between the reference and the longitudinal axis of the cylinder (Z+)
Contextual Menu :		
Right click :		
Remove		To remove the current cylinder from the engine envelope

2.3.1.1.2. #Co1 - Con

Data relative to the geometry of one cone

Properties :		
Geometry (Cone)	Diameter (0)	Front face diameter (located along the longitudinal axis)
	Diameter (1)	Rear face diameter (located along the longitudinal axis)
	Length	Maximum length
Position	Dx	Distance between the reference and the front face of the cone (X+)
	Dy	Distance between the reference and the longitudinal axis of the cone (Y+)
	Dz	Distance between the reference and the longitudinal axis of the cone (Z+)
Contextual Menu :		
Right click :		
Remove		To remove the current prism from the engine envelope

2.3.2. Systems

Data relative to all engine systems

Subitems:	
Fuel	Characteristics of the Fuel System

Properties :		
Configuration	Has Thrust Reverse	Specifies if it has a Thrust Reverse

2.3.2.1. *Fuel*

Data relative to the Fuel System

Properties :		
Fuel	Type	List of fuels from fuel database

2.3.3. Performance

Data relative to the engine performance

Subitems:	
Single Point	Single point performance. The performance for other flight conditions are extrapolated from that point

Properties :		
ISA SL Static (Thermodynamic)	ESHP	Maximum power when the engine reaches its limit of temperature or rpm
ISA SL Static (Mx Continuous)	ESHP	Equivalent Shaft Horsepower
	SHP	Shaft Horsepower
	Thrust	Engine Thrust
	@ output rpm	Output rpm (propeller rpm)
ISA SL Static (Mx Takeoff)	ESHP	Equivalent Shaft Horsepower
	SHP	Shaft Horsepower
	Thrust	Engine Thrust
	@ output rpm	Output rpm (propeller rpm)
	For up to…	May be used for up to
ISA SL Static (Mx Reverse)	SHP	Shaft Horsepower
	@ output rpm	Output rpm (propeller rpm)
Variation of Power	Is Correlated from	The power at a given altitude is approximated from the relative density at that altitude to the power of a given exponent. This exponent may be computed from the critical altitude or given by the user
	Critical Altitude	Maximum altitude to deliver full-rated power
	Exponent	Value of the exponent to apply to the relative density at the considered altitude

2.3.3.1. *Single Point*

Data relative to the Single Point Performance

Properties :		
Engine Power & Thrust	ESHP	Equivalent Shaft Horsepower
	SHP	Shaft Horsepower
	Thrust	Engine Thrust
	@ output rpm	Output rpm (propeller rpm)
	Reference altitude	Reference altitude
	Reference ISA Condition	Deviation from International Standard Atmosphere (ISA) Conditions
	Reference Setting	Reference Setting
	Reference Speed	Reference Speed
Specific Fuel Consumption	SFC	Specific Fuel Consumption
	Reference Altitude	Altitude
	Reference ISA Condition (ISA +)	Deviation from International Standard Atmosphere (ISA) Conditions
	Reference Speed	Reference Speed

2.4. Turbofan (CFM56-5A1)

Root branch of the current dataset. The header is the concatenation of the Program Name and the Variant.

Properties :		
General	Model	CFM56-5A1
	Program	CFM56
	Variant	5A1
	Manufacturer	Manufacturer
Is Used on…	Fixed Wing	Specifies if it is used on fixed wing Aircraft
	Rotary Wing	Specifies if it is used on rotary wing Aircraft

Commands :		
Right click :		
Duplicate		To duplicate the current dataset
Remove		To remove the current dataset from the current session
Save		To save the current dataset
Save As		To save the current dataset and change its name

2.4.1. Description

Subitems:	
Fan	Geometry of the Fan

Properties :		
Description	Number of Shafts	Number of Shafts
Combustion Chamber	Is Multiple	Specifies if it has multiple combustion chambers
	Is Single	Specifies if it has a single combustion chamber
Compressor	Is Compressor Axial	Specifies if it has an axial compressor
	Is Compressor Centrifugal	Specifies if it has a centrifugal compressor

2.4.1.1. *Fan*

Properties :		
Description	Number of Stages	Number of stages
Bypass Ratio	BPR	Bypass Ratio

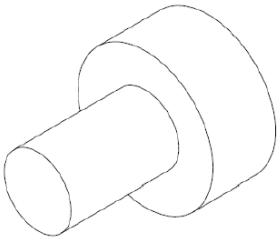
2.4.2. Geometry

Subitems:	
Engine Envelope	Geometry of the engine envelope

Properties :		
Dimensions	Diameter (Fan)	Diameter of the fan
	Length	Total length
Weight	Dry Weight	Dry Weight

2.4.2.1. *Engine Envelope*

The envelope of any engine is made from basic shapes like prisms, cylinders or cones. The shapes are located at a given position from a reference. Additional information about the engine envelope is available in the Technical Note TN02-191



Data relative to the engine envelope

Subitems:	
#C	List of cylinders

Contextual Menu :	
Right click :	
Add New Cylinder to Engine Envelope	To add a new cylinder to the engine envelope
	To open a technical note

2.4.2.1.1. #C1 - Cn

Data relative to the geometry of one cylinder

Properties :		
Geometry (Cylinder)	Diameter	Diameter
	Length	Length
Position	Dx	Distance between the reference and the front face of the cylinder (X+)
	Dy	Distance between the reference and the longitudinal axis of the cylinder (Y+)
	Dz	Distance between the reference and the longitudinal axis of the cylinder (Z+)
Contextual Menu :		
Right click :		
Remove		To remove the current cylinder from the engine envelope

2.4.3. Systems

Data relative to all engine systems

Subitems:	
Air Bleed Extraction	Characteristics of the Air Bleed Extraction System

Properties :		
Systems	Has Air Bleed Extraction	Specifies if it has an Air Bleed Extraction

2.4.3.1. *Air Bleed Extraction*

Data relative to the Air Bleed Extraction System

Properties :		
Air Bleed Extraction	Rating Mx Continuous	Air Bleed Extraction @ Maximum Continuous Rating
	Rating Mx Takeoff	Air Bleed Extraction @ Maximum Takeoff Rating

2.4.4. Temperature Limits

Data relative to limits of temperature

Subitems:	
Flat Rating	Flat Rating Temperature

Properties :		
Flat Rating	Is Flat Rated	Specifies if it is Flat Rated

2.4.4.1. *Flat Rating*

Data relative to the flat rating

Properties :		
Flat Rating Temperature	Setting Mx Continuous	Flat rating temperature @ Maximum Continuous Setting (Deviation from ISA)
	Setting Mx Takeoff	Flat rating temperature @ Maximum Takeoff Setting (Deviation from ISA)

2.4.5. Performance

Data relative to the engine performance

Subitems:	
Single Point	Single point performance. The performance for other flight conditions are extrapolated from that point

Properties :		
ISA Sea-Level Static Thrust	Mx Continuous	Thrust @ Maximum Continuous setting
	Mx Takeoff	Thrust @ Maximum Takeoff setting
	For up to…	Maximum duration @ Maximum Takeoff setting

2.4.5.1. *Single Point*

Data relative to the Single Point Performance

Properties :		
Engine Thrust	Thrust	Engine Thrust
	@ output rpm	Output rpm (propeller rpm)
	Reference altitude	Reference altitude
	Reference ISA Condition	Deviation from International Standard Atmosphere (ISA) Conditions
	Reference Mach Number	Reference Mach Number
	Reference Setting	Reference Setting
Specific Fuel Consumption	SFC	Specific Fuel Consumption
	Reference Altitude	Altitude
	Reference ISA Condition (ISA +)	Deviation from International Standard Atmosphere (ISA) Conditions
	Reference Mach Number	Reference Mach Number

2.5. Turbojet (PW-1120)

Root branch of the current dataset. The header is the concatenation of the Program Name and the Variant.

Properties :		
General	Model	PW-1120
	Program	PW
	Variant	1120
	Manufacturer	Manufacturer
Is Used on…	Fixed Wing	Specifies if it is used on fixed wing Aircraft
	Rotary Wing	Specifies if it is used on rotary wing Aircraft

Commands :		
Right click :		
Duplicate		To duplicate the current dataset
Remove		To remove the current dataset from the current session
Save		To save the current dataset
Save As		To save the current dataset and change its name

2.5.1. Description

Properties :		
Description	Number of Shafts	Number of Shafts
Combustion Chamber	Is Multiple	Specifies if it has multiple combustion chambers
	Is Single	Specifies if it has a single combustion chamber
Compressor	Is Compressor Axial	Specifies if it has an axial compressor
	Is Compressor Centrifugal	Specifies if it has a centrifugal compressor
Time Between Overhaul	TBO	Time Between Overhaul

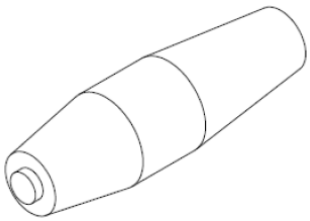
2.5.2. Geometry

Subitems:	
Engine Envelope	Geometry of the engine envelope

Properties :		
Dimensions	Diameter	Diameter (Outside)
	Length	Total length
Weight	Dry Weight	Dry Weight

2.5.2.1. *Engine Envelope*

The envelope of any engine is made from basic shapes like prisms, cylinders or cones. The shapes are located at a given position from a reference. Additional information about the engine envelope is available in the Technical Note TN02-191



Data relative to the engine envelope

Subitems:	
#C	List of cylinders
#Co	List of cones

Contextual Menu :	
Right click :	
Add New Cylinder to Engine Envelope	To add a new cylinder to the engine envelope
Add New Cone to Engine Envelope	To add a new cone to the engine envelope
	To open a technical note

2.5.2.1.1. #C1 - Cn

Data relative to the geometry of one cylinder

Properties :		
Geometry (Cylinder)	Diameter	Diameter
	Length	Length
Position	Dx	Distance between the reference and the front face of the cylinder (X+)
	Dy	Distance between the reference and the longitudinal axis of the cylinder (Y+)
	Dz	Distance between the reference and the longitudinal axis of the cylinder (Z+)
Contextual Menu :		
Right click :		
Remove		To remove the current cylinder from the engine envelope

2.5.2.1.2. #Co1 - Con

Data relative to the geometry of one cone

Properties :		
Geometry (Cone)	Diameter (0)	Front face diameter (located along the longitudinal axis)
	Diameter (1)	Rear face diameter (located along the longitudinal axis)
	Length	Maximum length
Position	Dx	Distance between the reference and the front face of the cone (X+)
	Dy	Distance between the reference and the longitudinal axis of the cone (Y+)
	Dz	Distance between the reference and the longitudinal axis of the cone (Z+)
Contextual Menu :		
Right click :		
Remove		To remove the current prism from the engine envelope

2.5.3. Temperature Limits

Data relative to limits of temperature

Subitems:	
Flat Rating	Flat Rating Temperature

Properties :		
Flat Rating	Is Flat Rated	Specifies if it is Flat Rated

2.5.3.1. *Flat Rating*

Data relative to the flat rating

Properties :		
Flat Rating Temperature	Setting Mx Continuous	Flat rating temperature @ Maximum Continuous Setting (Deviation from ISA)
	Setting Mx Takeoff	Flat rating temperature @ Maximum Takeoff Setting (Deviation from ISA)

2.5.4. Performance

Data relative to the engine performance

Subitems:	
Single Point	Single point performance. The performance for other flight conditions are extrapolated from that point

Properties :		
ISA Sea-Level Static Thrust	Mx Continuous	Thrust @ Maximum Continuous setting
	Mx Takeoff	Thrust @ Maximum Takeoff setting
	For up to…	Maximum duration @ Maximum Takeoff setting

2.5.4.1. *Single Point*

Data relative to the Single Point Performance

Properties :		
Engine Thrust	Thrust	Engine Thrust
	Reference altitude	Reference altitude
	Reference ISA Condition	Deviation from International Standard Atmosphere (ISA) Conditions
	Reference Mach Number	Reference Mach Number
	Reference Setting	Reference Setting
Specific Fuel Consumption	SFC	Specific Fuel Consumption
	Reference Altitude	Altitude
	Reference ISA Condition (ISA +)	Deviation from International Standard Atmosphere (ISA) Conditions
	Reference Mach Number	Reference Mach Number