

# Introduction to XML Schema Document (XSD) visualization

## Part II: HTML documentation

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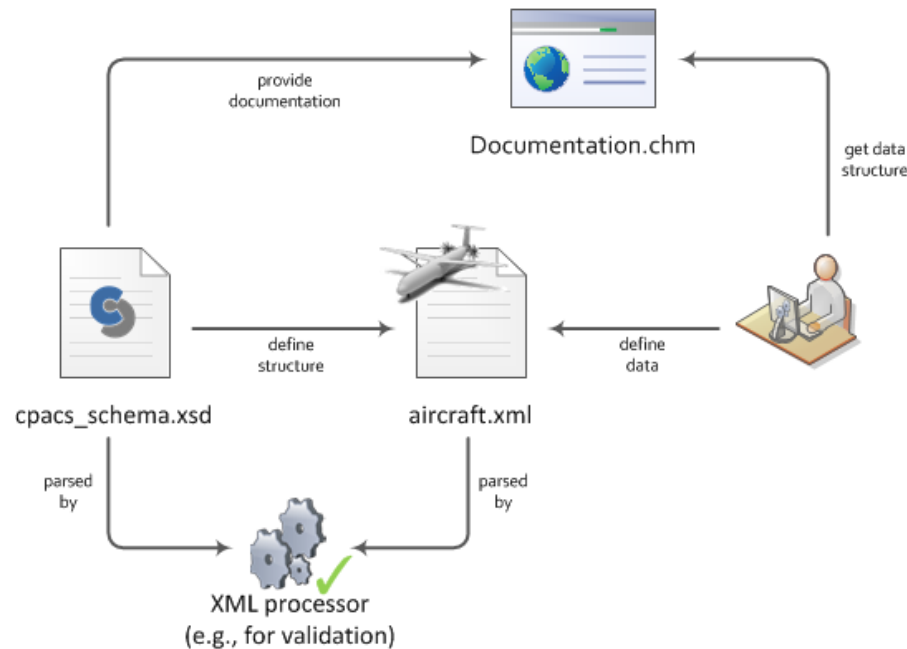
DLR Institute of System Architectures in Aeronautics  
Hamburg

A large, high-resolution image of the Earth as seen from space, showing the curvature of the planet, blue oceans, white clouds, and green landmasses. The image occupies the right half of the slide.

Knowledge for Tomorrow

# What is a schema?

- A schema\* is itself an XML file (\*.xsd), which defines the rules/syntax how a CPACS file (\*.xml) may be structured:
    - how often and in which order may elements appear
    - what is the type of elements (string, double, complex type with sub-elements, etc.)
- summarized as *type* of an *element* 🧩



```

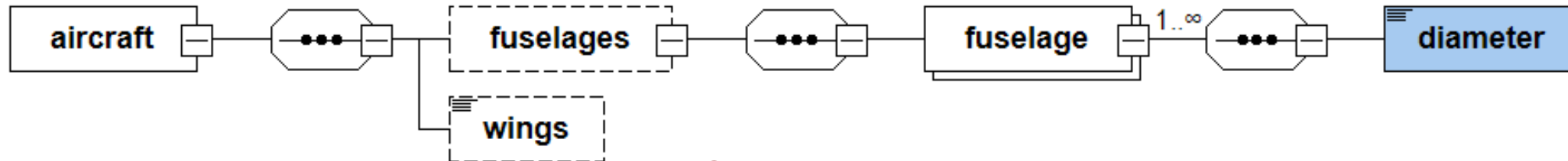
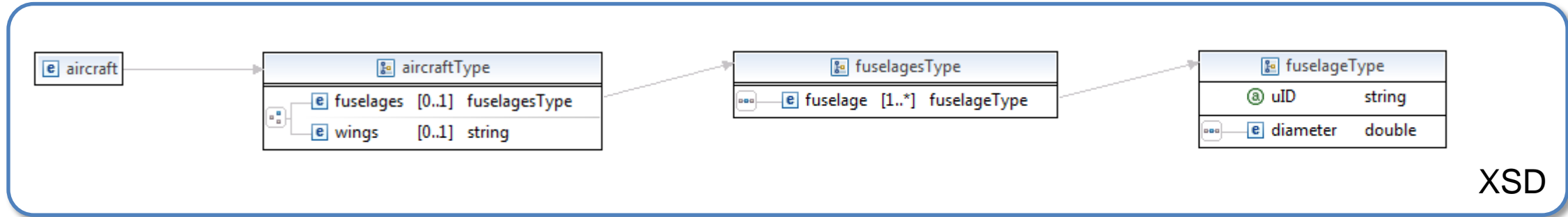
- <xsd:complexType name="aircraftType">
-   <xsd:annotation>
-     <xsd:appinfo>
-       <sd:schemaDoc>
-         <ddue:summary>
-           <ddue:para>aircraftType</ddue:para>
-         </ddue:summary>
-         <ddue:remarks>
-           <ddue:para>Aircraft type, containing all the aircraft models</ddue:para>
-         </ddue:remarks>
-       </sd:schemaDoc>
-     </xsd:appinfo>
-   </xsd:annotation>
-   <xsd:complexContent>
-     <xsd:extension base="complexType">
-       <xsd:sequence>
-         <xsd:element maxOccurs="unbounded" name="model" type="aircraftModelType" />
-       </xsd:sequence>
-     </xsd:extension>
-   </xsd:complexContent>
- </xsd:complexType>

```

\*) in IT called *schema* and not *scheme*..

# What are elements and types?

## Simplified example similar to CPACS



- **Simple types:** double, string, integer ...
- **Complex types:** specify sub-elements and attributes of elements  
→ used to build hierarchical structure



# HTML documentation

## Where does the content of the documentation come from?

- Content of the CPACS schema (*cpacs\_schema.xsd*) is parsed by *Sandcastle Helpfile Builder* ([see GitHub](#) for more details)
- `<xsd:annotation>` node in the CPACS schema (*cpacs\_schema.xsd*) contains all documentation

```

- <xsd:complexType name="aircraftType">
-   <xsd:annotation>
-     <xsd:appinfo>
-       <sd:schemaDoc>
-         <ddue:summary>
-           <ddue:para>aircraftType</ddue:para>
-         </ddue:summary>
-         <ddue:remarks>
-           <ddue:para>Aircraft type, containing all the aircraft models</ddue:para>
-         </ddue:remarks>
-       </sd:schemaDoc>
-     </xsd:appinfo>
-   </xsd:annotation>
- <xsd:complexContent>
-   <xsd:extension base="complexType">
-     <xsd:sequence>
-       <xsd:element maxOccurs="unbounded" name="model" type="aircraftModelType" />
-     </xsd:sequence>
-   </xsd:extension>
- </xsd:complexContent>
</xsd:complexType>

```

CPACS Documentation

### aircraft Element

aircraftType  
 Namespace: Empty  
 Schema: Empty

▲Type  
 ✎ aircraftType

▲Parents  
 ✎ vehicles ✎ vehiclesType

▲Children

Name	Occurrences	Description
✎ model	[1, *]	aircraftModelType

▲Attributes

Name	Type	Required	Description
✎ externalDataDirectory	✎ string		
✎ externalDataNodePath	✎ string		
✎ externalFileName	✎ string		

▲Remarks  
 Aircraft type, containing all the aircraft models

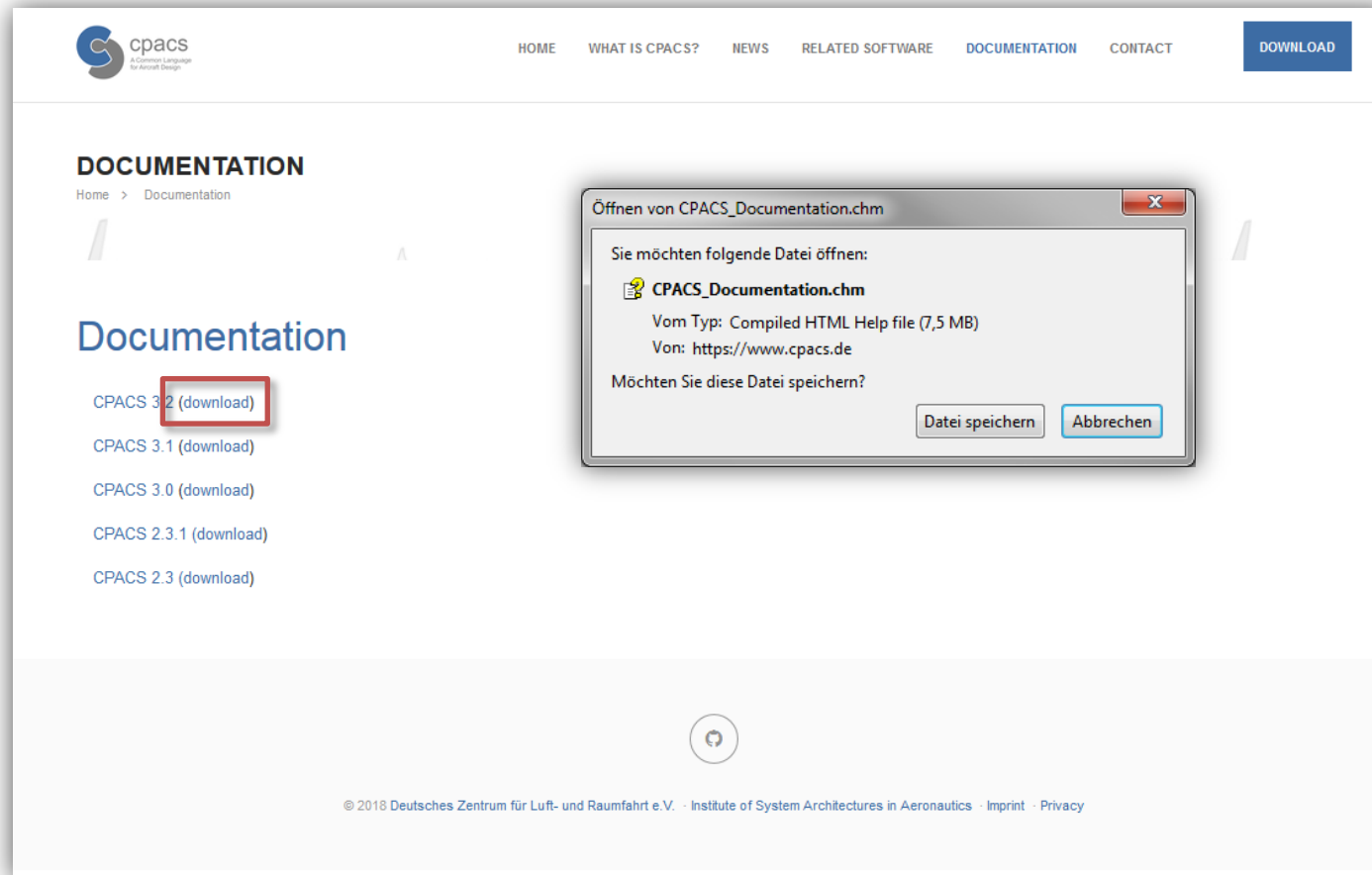
▲See Also  
 Reference  
 ✎ vehiclesType



# HTML documentation

## How to get the documentation?

- Option 1: executable (*CPACS\_Documentation.chm*) at cpacs.de
  - <https://cpacs.de/pages/documentation.html>





# HTML documentation

## How to get the documentation?

- Option 2: online documentation at cpacs.de → <https://cpacs.de/pages/documentation.html>

The screenshot shows the CPACS Documentation website. The main content area is titled 'Documentation' and lists several CPACS versions with download links: CPACS 3.2 (download), CPACS 3.1 (download), CPACS 3.0 (download), CPACS 2.3.1 (download), and CPACS 2.3 (download). A red box highlights the 'CPACS 3.2 (download)' link. A red arrow points from this link to the 'cpacs Element' sidebar on the right. The sidebar contains the following information:

**CPACS Element**  
CPACS root element  
Namespace: Empty  
Schema: Empty

**Type**  
cpacsType

**Children**

Name	Occurrences	Description
All		
airlines	[0, 1]	airlinesType
airports	[0, 1]	airportsType
flights	[0, 1]	flightsType
header		headerType
missionDefinitions	[0, 1]	missionDefinitionsType
studies	[0, 1]	Design study parameters and results.
toolspecific	[0, 1]	toolspecificType
vehicles	[0, 1]	vehiclesType

**Remarks**  
Version: V3.2  
Date: 2020-02-18

# HTML documentation

## How to get the documentation?

- Option 3: latest GitHub build containing the compiled documentation (*CPACS Documentation.chm*)
  - e.g. <https://github.com/DLR-SL/CPACS/releases/tag/v3.2>

Latest release

CPACS 3.2

MarAlder released this on 18 Feb

CPACS 3.2

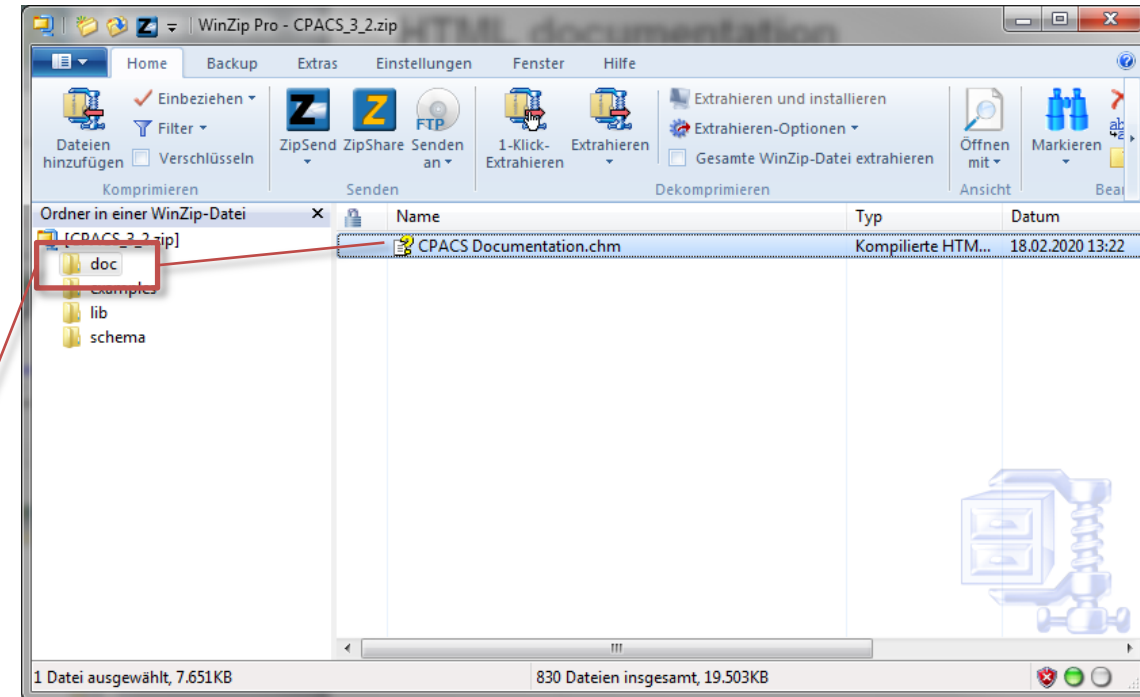
- Replaced tool-specific elements with `xsd:any` element and strict schema request for validation
- UIDs adapted to type `xsd:ID` and `xsd:IDREF`
- UIDs optional for `transformationType` and `pointTypes`
- Replaced `xsd:sequence` elements with `xsd:all` elements where possible
- `cpacsVersion` element set to optional
- `GuideCurves` are now optional for `nacelleCowlType`
- Documentation adaption

All issues for this release can be found online at:

- [CPACS 3.2 Milestone list](#)

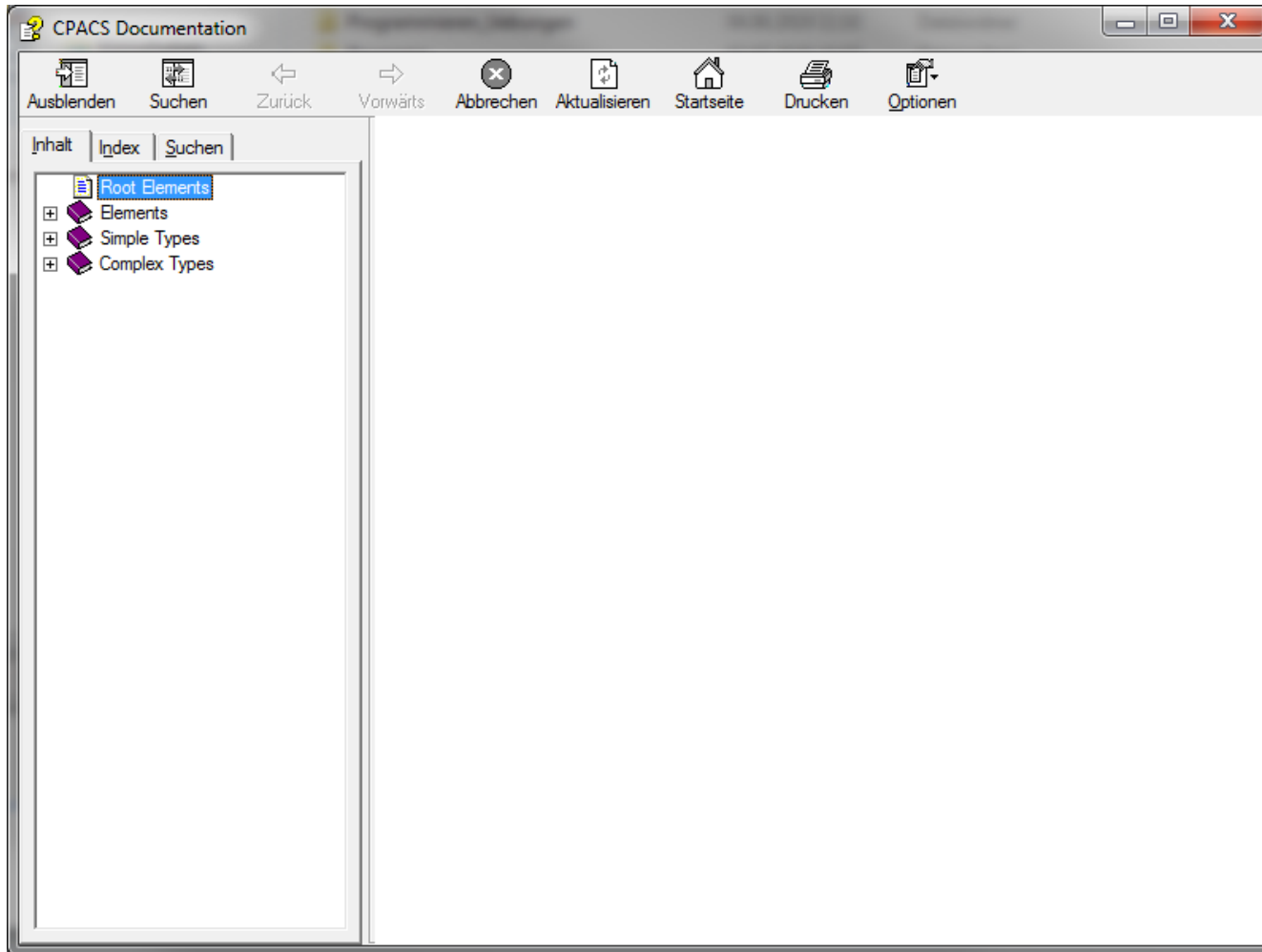
Assets 3

- CPACS\_3.2.zip 8.83 MB
- Source code (zip)
- Source code (tar.gz)



# HTML documentation

## How to get the documentation?

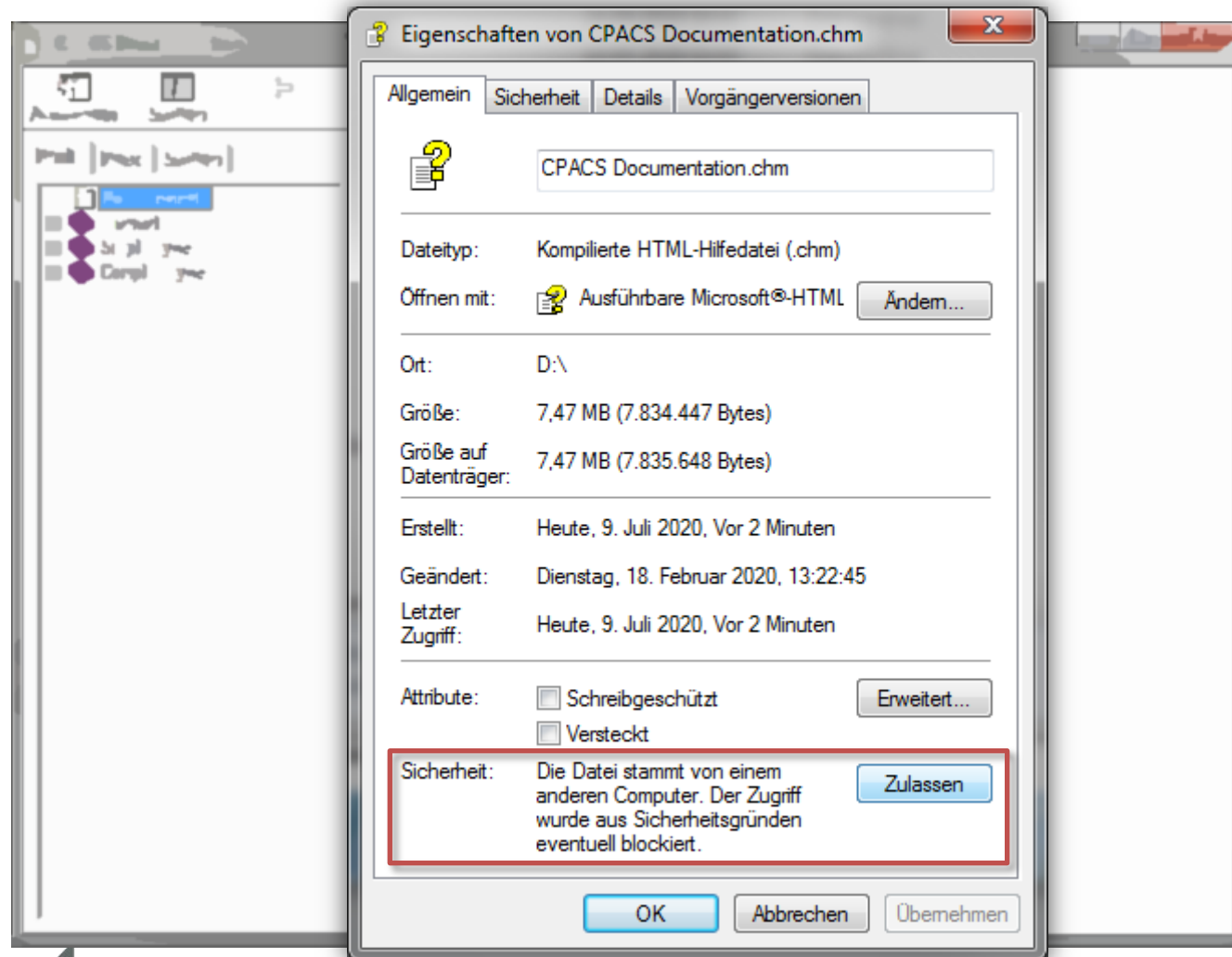


- The actual content might not be displayed (only empty white background)



# HTML documentation

## How to get the documentation?



- The actual content might not be displayed (only empty white background)
- Right click on *CPACS Documentation.chm* and allow the content from another computer to be accessed

# HTML documentation

CPACS Documentation

## aircraft Element

aircraftType

Namespace: Empty

Schema: Empty

### Type

aircraftType

### Parents

vehicles vehiclesType

### Children

Name	Occurrences	Description
model	[1, *]	aircraftModelType

### Attributes

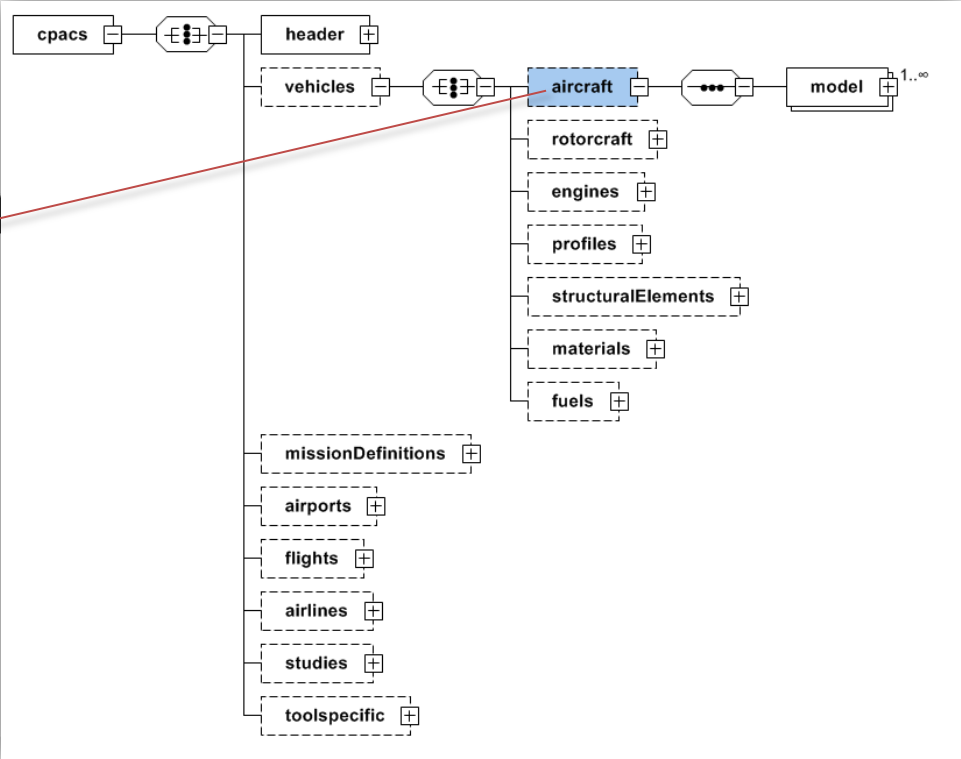
Name	Type	Required	Description
externalDataDirectory	string		
externalDataNodePath	string		
externalFileName	string		

### Remarks

Aircraft type, containing all the aircraft models

### See Also

Reference  
vehiclesType



# HTML documentation

## aircraft Element

aircraftType

Namespace: Empty

Schema: Empty

### Type

aircraftType

type of the element

### Parents

vehicles vehiclesType

### Children

Name	Occurrences	Description
model	[1, *]	aircraftModelType

### Attributes

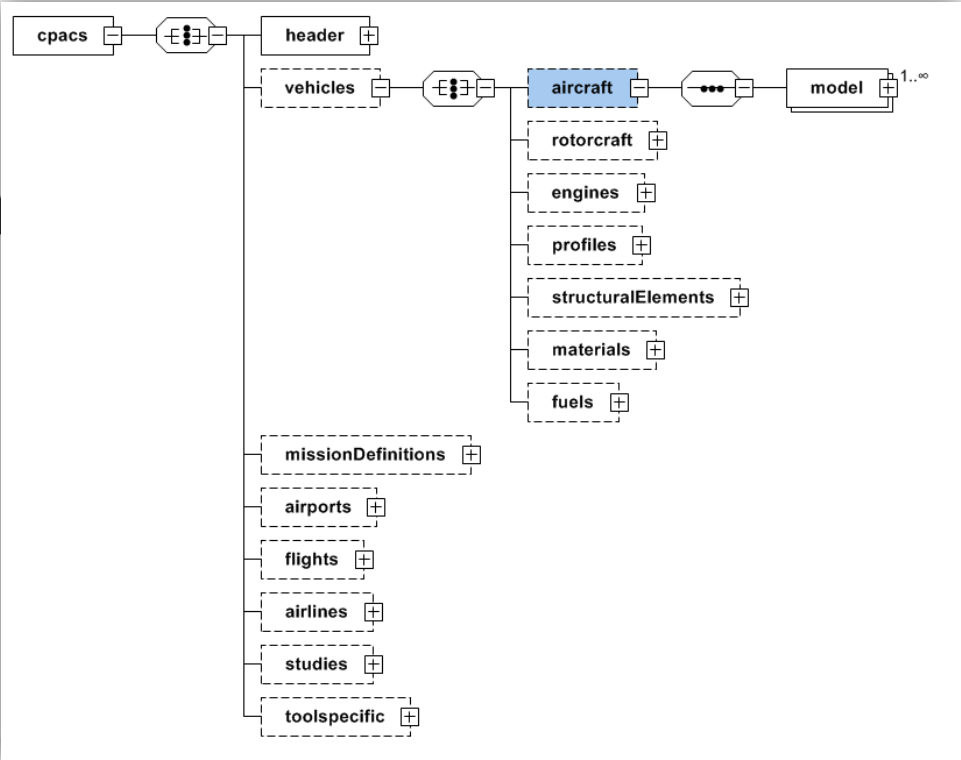
Name	Type	Required	Description
externalDataDirectory	string		
externalDataNodePath	string		
externalFileName	string		

### Remarks

Aircraft type, containing all the aircraft models

### See Also

Reference  
vehiclesType



# HTML documentation

CPACS Documentation

aircraft Element

aircraftType

Namespace: Empty

Schema: Empty

Type

aircraftType

Parents

vehicles vehiclesType

Children

Name	Occurrences	Description
model	[1, *]	aircraftModelType

## Attributes

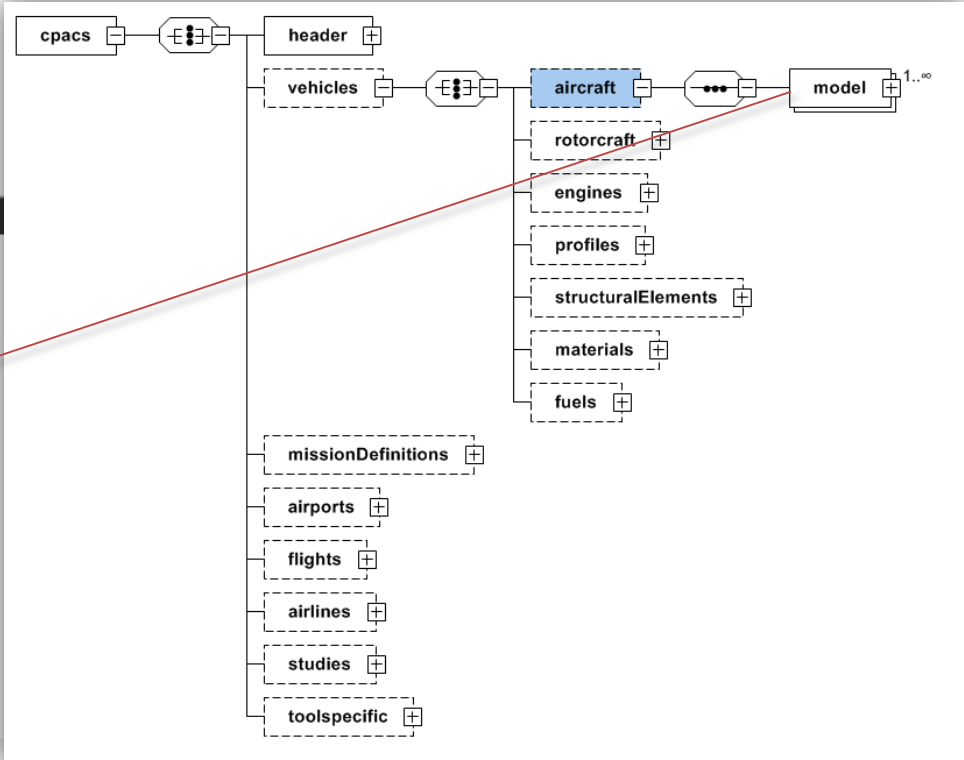
Name	Type	Required	Description
@ externalDataDirectory	string		
@ externalDataNodePath	string		
@ externalFileName	string		

## Remarks

Aircraft type, containing all the aircraft models

## See Also

Reference  
vehiclesType



child element



# HTML documentation

CPACS Documentation

aircraft Element

aircraftType

Namespace: Empty

Schema: Empty

Type

aircraftType

Parents

vehicles vehiclesType

Children

Name	Occurrences	Description
model	[1, *]	aircraftModelType

Attributes

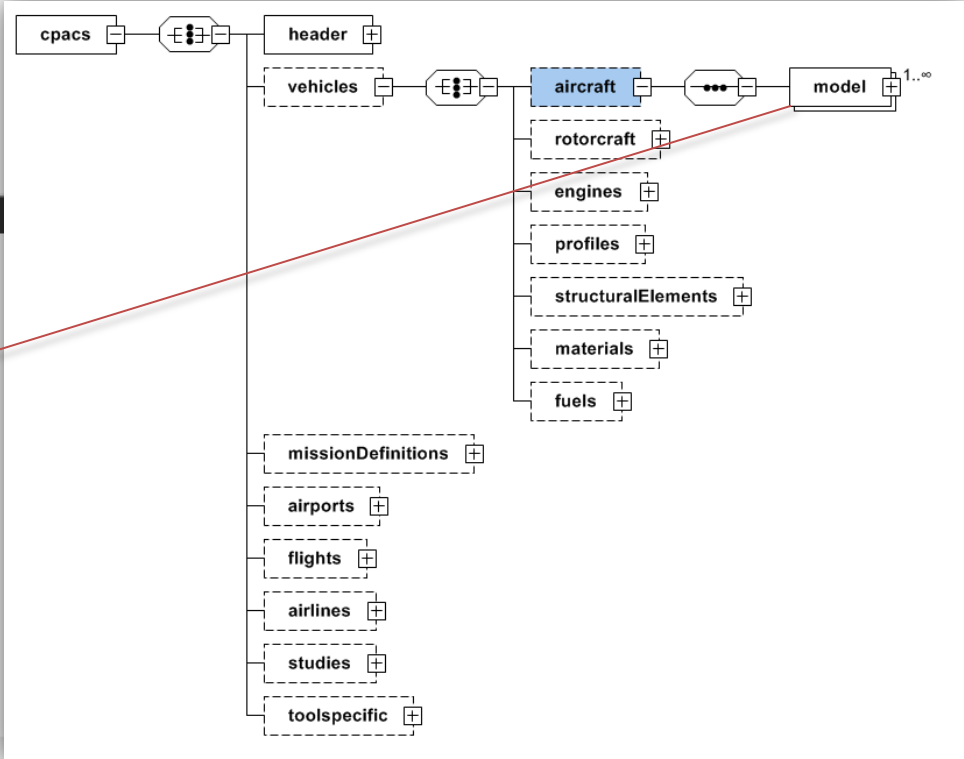
Name	Type	Required	Description
@ externalDataDirectory	string		
@ externalDataNodePath	string		
@ externalFileName	string		

Remarks

Aircraft type, containing all the aircraft models

See Also

Reference  
vehiclesType



occurene of the child element  
**no entry always means: obligatory [1..1]**

# HTML documentation

## aircraft Element

aircraftType

Namespace: Empty

Schema: Empty

### Type

aircraftType

### Parents

vehicles vehiclesType

### Children

Name	Occurrences	Description
model	[1, *]	aircraftModelType

### Attributes

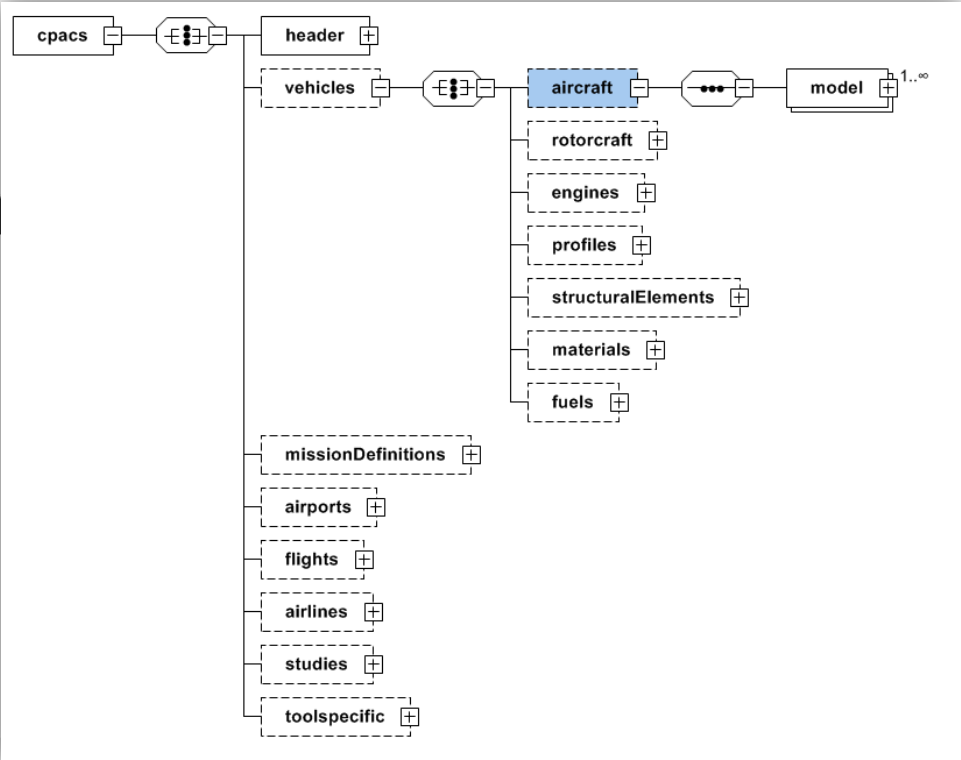
Name	Type	Required	Description
externalDataDirectory	string		
externalDataNodePath	string		
externalFileName	string		

### Remarks

Aircraft type, containing all the aircraft models

### See Also

Reference  
vehiclesType



short description of the element  
(sometimes just contains the type's name)



# HTML documentation

## aircraft Element

aircraftType

Namespace: Empty

Schema: Empty

### Type

aircraftType

### Parents

vehicles vehiclesType

### Children

Name	Occurrences	Description
model	[1, *]	aircraftModelType

### Attributes

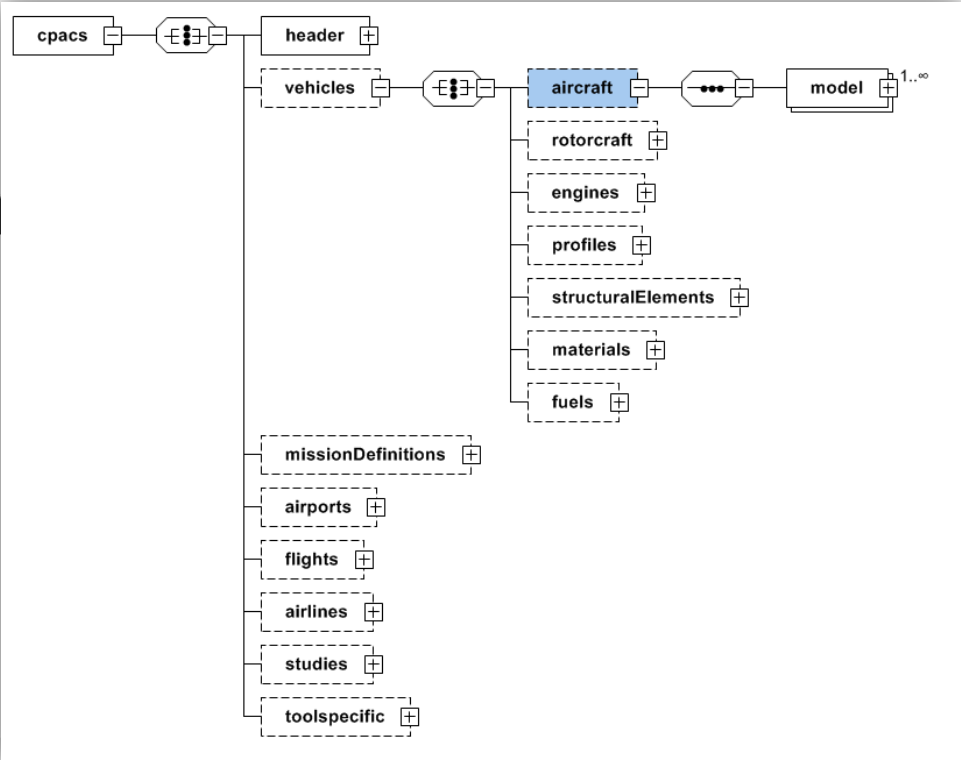
Name	Type	Required	Description
externalDataDirectory	string		
externalDataNodePath	string		
externalFileName	string		

### Remarks

Aircraft type, containing all the aircraft models

### See Also

Reference  
[vehiclesType](#)



list of available attributes



# HTML documentation

## aircraft Element

aircraftType

Namespace: Empty

Schema: Empty

### Type

aircraftType

### Parents

vehicles vehiclesType

### Children

Name	Occurrences	Description
model	[1, *]	aircraftModelType

### Attributes

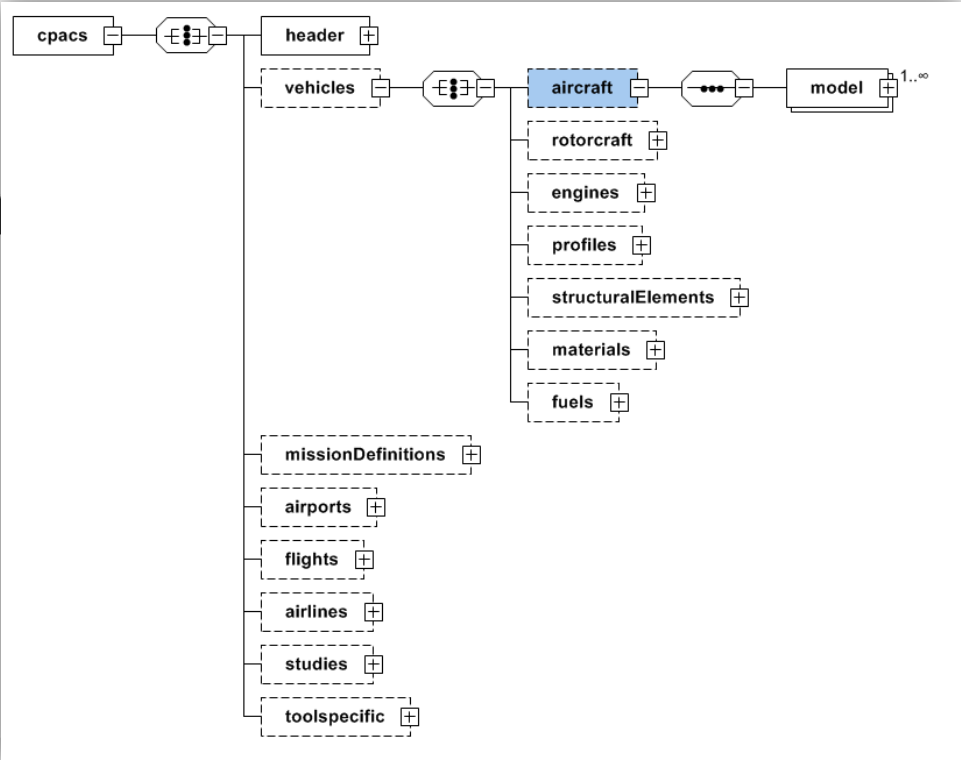
Name	Type	Required	Description
@ externalDataDirectory	string		
@ externalDataNodePath	string		
@ externalFileName	string		

### Remarks

Aircraft type, containing all the aircraft models

### See Also

Reference  
[vehiclesType](#)



type of the attributes

# HTML documentation

## aircraft Element

aircraftType

Namespace: Empty

Schema: Empty

### Type

aircraftType

### Parents

vehicles vehiclesType

### Children

Name	Occurrences	Description
model	[1, *]	aircraftModelType

### Attributes

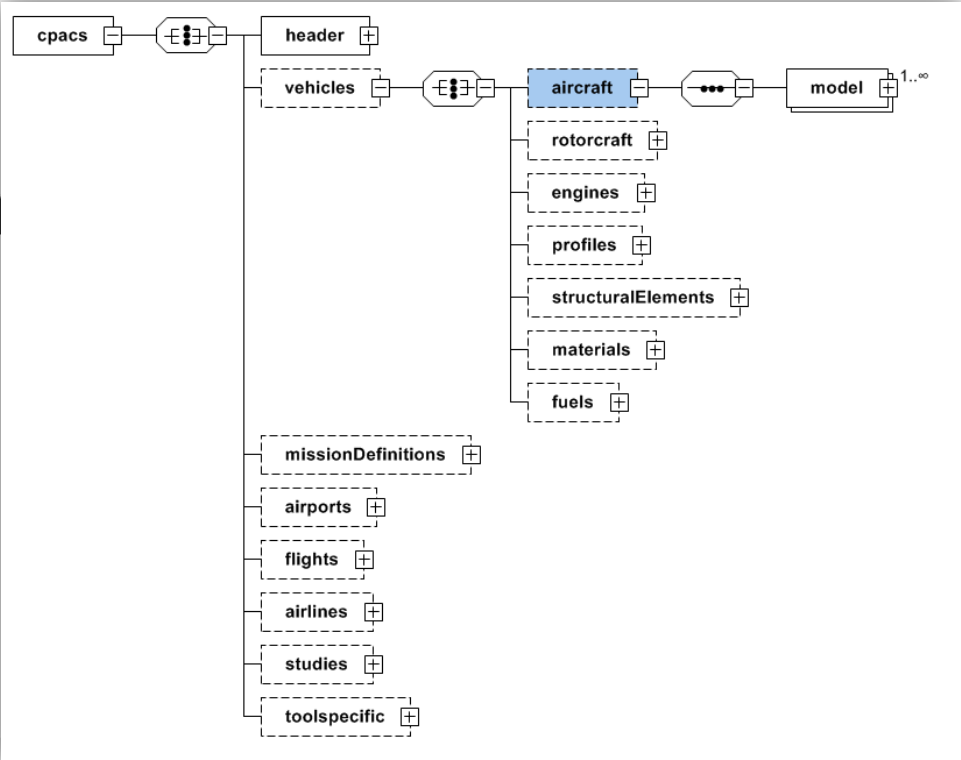
Name	Type	Required	Description
@ externalDataDirectory	string		
@ externalDataNodePath	string		
@ externalFileName	string		

### Remarks

Aircraft type, containing all the aircraft models

### See Also

Reference  
[vehiclesType](#)



occurrence of the attributes  
empty = optional  
“Yes” = required

# HTML documentation

CPACS Documentation

## cpacs Element










CPACS root element

**Namespace:** Empty**Schema:** Empty

### Type

 cpacsType

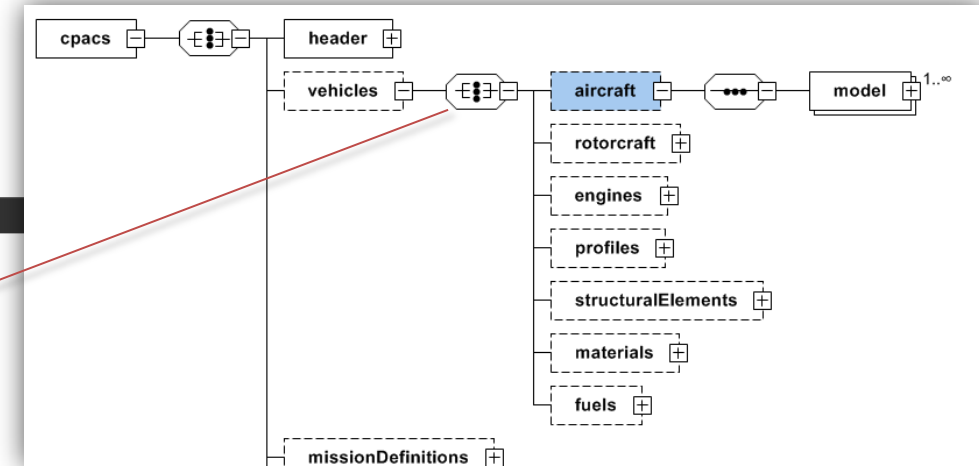
### Children

Name	Occurrences	Description
 All		
 airlines	[0, 1]	airlinesType
 airports	[0, 1]	airportsType
 flights	[0, 1]	flightsType
 header		headerType
 missionDefinitions	[0, 1]	missionDefinitionsType
 studies	[0, 1]	Design study parameters and results.
 toolspecific	[0, 1]	toolspecificType
 vehicles	[0, 1]	vehiclesType

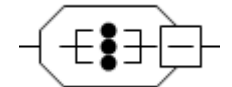
### Remarks

Version  
V3.2Date  
2020-02-18

order of appearance



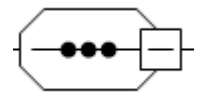
- Sequence is arbitrary (i.e. it does not matter whether *aircraft* is specified first and then *engines* or vice versa)

 All


- Sequence must correspond to the representation in the XSD diagram



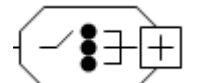
Sequence



- Only one of the nodes may be specified (=choice element):






Choice



# HTML documentation

## Summary

- Navigate through the CPACS hierarchy by clicking on  for parent or child elements
- Check the occurrence (e.g., [0..1], [1..\*], etc.)
- Check order of appearance: 
- Get list of attributes 
- Get further information about the type 