

Terma Case

Subsystem Design Description

Pod for F16 protection suite

To Company: F
From Company: G

Project: System Engineering - Team G
Revision: 1.0.0 Date: 20101008
Document: Subsystem Design Description

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1. Scope

1.1. Identification

This System design description is for a pod that can be attached to the F-16 combat aircraft using standard T-hooks spaced by 13 inches

The pod has three compartments for chaff/flare magazines. Two compartments hold two magazines each and one compartment holds four magazines.

The pod houses an electronic control unit and has suspensions for power/data cable harness, connectors and six sensor units which covers all angles not shaded by the aircraft seen from the pod.

The manufacturer will identify the placement of the six sensors.

The system is able to keep the temperature of the MWS inside the pod below 70 degree Celsius.

The pod structure and attachments is able to withstand high g-forces and high temperatures, experienced in combat situations, especially on the front part of the pod and still be operational.

1.2. System overview

The pod is part of a self protection suite for the F-16 combat aircraft which protects the aircraft against missile attacks. The system is made up of 2 main systems which are:

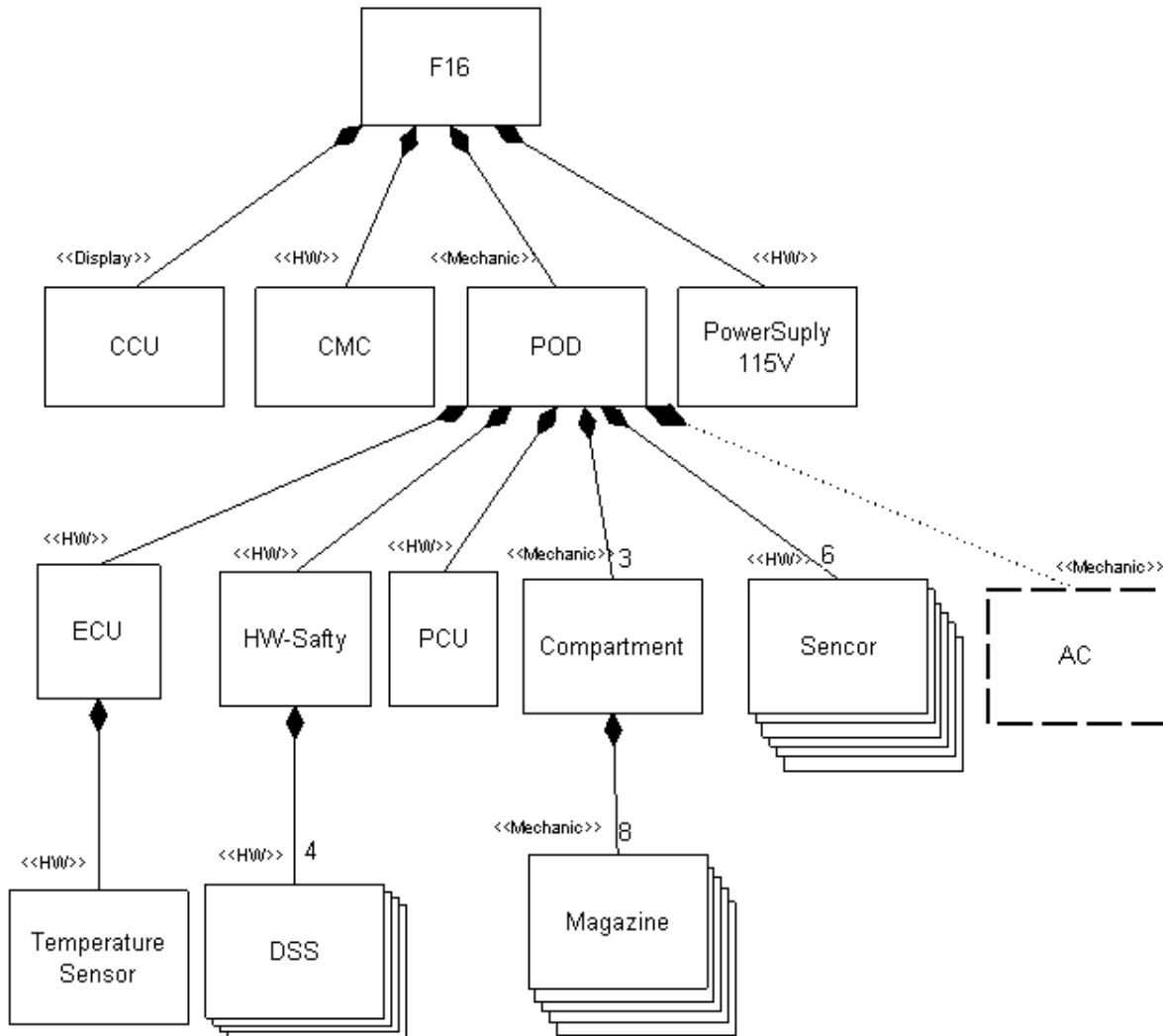
- A cockpit control unit which keeps the state of the system handles communication and controls firing of the magazines.
- A pod which incorporates eight magazines and a missile warning system (MWS) consisting of six sensor and an electronic control unit.

1.3. Document overview

The purpose of this document is to present the architectural design of the POD including its interfaces to the level of detail required by the specification.

2. System architectural design

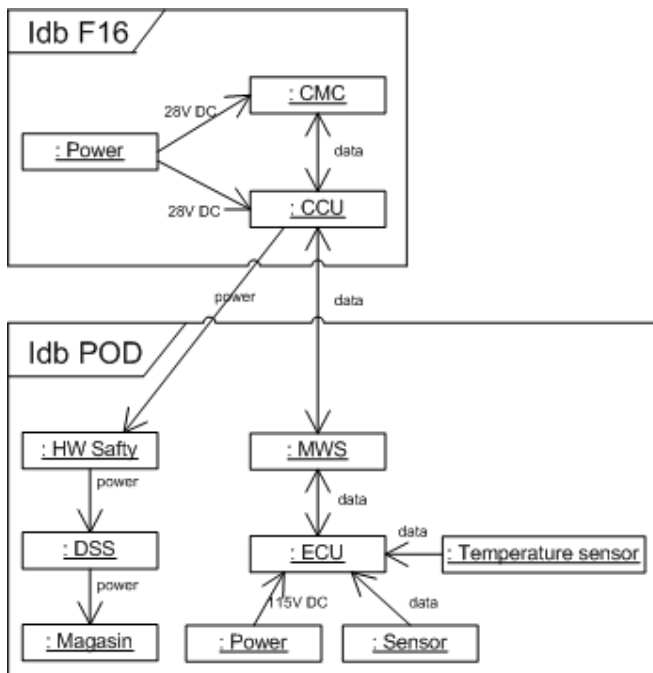
CCU: Cockpit Control Unit
CMC: Craft Mission Computer
PCU: Power Conversion Unit
DSS: Digital Sequencer Switches
AC: Air Condition



3. System components

Components	Description
AC	Air Condition
CCU	Cockpit Control Unit
CMC	Craft Mission Computer
Compartments	Compartments to the magazines
DSS	Digital Sequencer Swiches
ECU	Electronic Control Unit
HW-Saftey	Sequencer controller / enabler
Magazine	Contains payloads
PCU	Power Conversion Unit
POD	The system to be
Sensor	Various sensors
PowerSupply	Existing power supply
Temperature Sensor	-

4. Interface design



5. Requirements traceability

Requirement	System components												
	AC	CCU	CMC	Compartments	DSS	ECU	HW-Safty	Magasine	PCU	POD	Sensor	PowerSupply	Temperature Sensor
UFR-1				x									
UFR-2				x									
UFR-3				x									
UFR-4				x									
UFR-5										x			
UFR-6													
UFR-7													
UFR-8													
UFR-9						x							
Etc.													
Etc.													
UFR-10													
UFR-11													
UFR-12													
UFR-13													
UFR-14													
PR-1										x			
PR-2										x			
PR-3										x			
PR-4										x			
PR-5											x		
ER-1										x			
ER-2										x			
ER-3										x			
IR-1													
IR-2									x				
IR-3						x							
IR-4						x							
IR-5													
IR-6													
IR-7									x				
IR-8													
IR-9									x				

6 Requirements

6.1 Functional requirements

UFR-1	The pod shall have Three compartments for dispenser magazines.
UFR-2	The pod shall have one compartment for two magazines facing forward. $\Psi = 15^\circ \phi = 15^\circ \theta = 15^\circ$. Se figure 1.
UFR-3	The pod shall have one compartment for four magazines facing sideward. $\Psi = 90^\circ \phi = 15^\circ$. Se figure 1.
UFR-4	The pod shall have one compartment for two magazines facing downwards. $\phi = 90^\circ \theta = 90^\circ$. Se figure 1.
UFR-5	The dimensions of the pod shall comply to the standard FP42f
UFR-6	All electrical connections shall be accessible from the outside to ease the attachment of the pod to the aircraft and for testing on ground when not attached.
UFR-7	If active cooling or other power consuming entities other than the contractor supplied MWS and DDSs are required, the total power consumption of these shall not exceed 300W at 115VAC 400Hz.
UFR-8	The POD shall comply with all F-16 requirements for aerodynamics and radar reflections as specified by the F-16 POD standard FP42f.
UFR-9	The ECU shall perform the built in test that is supported by this Government Furnished Equipment (GFE).
UFR-10	The ECU shall report the status information available for this Government Furnished Equipment (GFE).
UFR-11	<p>The POD shall supply the status of the following LRUs:</p> <ul style="list-style-type: none"> ☐ The Sensors ☐ The ECU <p>INFO: The Magazines and DSS are not seen as LRUs and also do not have status reporting capabilities.</p> <p>INFO: It is assumed that the ECU has the ability to deliver this information.</p>
UFR-12	The status reported by the POD as a whole shall be:

	1. POD internal temperature 2. ECU operational status (OK, ERROR) INFO: It is assumed that the ECU has the ability to deliver this information. INFO: It is assumed that the ECU has a temperature sensor inside the POD and is able to deliver its reading on the data bus.
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6.2 Performance requirements

PR-1	The pod structure shall be without any failures after being exposed to a steady state acceleration of 5g fore.
PR-2	The pod structure shall be without any failures after being exposed to a steady state acceleration of 2.5g aft.
PR-3	The pod structure shall be without any failures after being exposed to a steady state acceleration of 25g up.
PR-4	The pod structure shall be without any failures after being exposed to a steady state 7 acceleration of 11g down.
PR-5	The six sensors shall be located to cover all angles which are not shaded by the aircraft. (See Ref-2)

6.3 Environment requirements

ER-1	The pod structure shall be operational at temperatures of 95°C on the outer skin 102°C on the leading edge for 25 minutes.
ER-2	The pod structure shall be operational at temperatures of 134°C on the outer skin 151°C on the leading edge for 3 minutes.
ER-3	The system shall be able to keep the temperature inside the MWS below 70°C.

6.4 Interface requirements

IR-1	The attachment to the aircraft shall comply to standard PM11b.
IR-2	The pod shall provide a EPC17d connector for 115VAC/400Hz power.
IR-3	The pod shall provide a EDC29b connector for the data connection.
IR-4	The pod shall provide a EDWC7f connector for discrete wires.
IR-5	The dispenser magazine compartments shall interface to the magazines according to standard DM30p.
IR-7	Power consumption of the pod shall not exceed 700W.
IR-9	The system shall be able to supply the GEF (MWS) with maximum 85W from a 28VDC power source and a maximum of 100W from an 115VAC 400Hz power source.