AARHUS UNIVERSITET
INGENIØRHØJSKOLEN

System requirement specification (SRS)

Terma case

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Confidential:

This document is confidential between company F and the parties involved in the SPS project. For other parties, it is prohibited to continue reading beyond this point.

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1 Stakeholders

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Company F, Training department	Trainers	201210732@post.au.dk

2 Subcontracter Information

A subcontracter will be used to develop and manufacture the pod and any additional climate control protection as described in Requirement 29 and 41. The subcontracter will be Group G.

3 Revision history

Date	Ver. No	Author	Contact	Description
8-Feb-2014	1.0	-	-	Initial version
11-Feb-2014	1.1	Fatemeh	201210732@iha.dk	Changed 4.9 and ID
11-Feb-2014	1.2	Ivan G.	10454@iha.dk	Changed Req. 27 with updated accelerations levels
11-Feb-2014	1.2	Ivan G.	10454@iha.dk	Added Req. N/A regarding pod temperature exposure
11-Feb-2014	1.2	Ivan G.	10454@iha.dk	Removed Req. 10
11-Feb-2014	1.3	Lars N.	10765@iha.dk	Req. No 7: Specified that the control is to turn ON and OFF the power of the dispenser and MWS
11-Feb-2014	1.3	Lars N.	10765@iha.dk	Req. No 10: Is erased
11-Feb-2014	1.3	Lars N.	10765@iha.dk	Req. No 11: It is specified what data that should be erased.
11-Feb-2014	1.3	Lars N.	10765@iha.dk	Req. No 19: Is erased
11-Feb-2014	1.4	Lasse B.P.	10769@iha.dk	Quality provisions changed to specify verification method for each requirement.
12-Feb-2014	1.4	Lasse B.P.	10769@iha.dk	Training related requirements: training provider specified.
12-Feb-2014	1.5	Lars N.	10765@iha.dk	Req. No 32 is made to a design goal.
12-Feb-2014	1.5	Lars N.	10765@iha.dk	Req. No 33 is erased.
12-Feb-2014	1.5	Lars N.	10765@iha.dk	Req. No 34 is erased.
12-Feb-2014	1.6	Ivan G.	10454@iha.dk	Added subcontracter information section.
12-Feb-2014	1.7	Fatemeh	201210732@iha.dk	Added stakeholder and updated the ID and front page
4-Mar-2014	2.0	Fatemeh	201210732@iha.dk	Front page updated

4 Scope

4.1 Identification

This document applies to the self protection suite to be developed by Terma A/S for the Royal Danish Airforce.
The solution will incorporate a pod and an intelligent cockpit control unit for the F-16 Combat Aircraft. The pod will be able to dispense payloads consisting of chaffs and flares and also host the Missile Warning System (MWS). The solutions will provide warning upon detection of missile threats and be able to automatically dispense payloads in response.

4.2 System overview

The self-protection suite consists of a pod located under the left-hand wing and a cockpit unit connected by existing wiring. The pod is able to intelligently dispense two (2) loads of chaffs and flares simultaneously, and can dispense forwards, downwards and sideways. Furthermore, the pod contains a missile warning system (MWS), which provides the pilot with both visible and audible warnings when threats occur.

The self-protection suite is able to automatically detect threats, and dispense payloads in advance without pilot interaction. The pilot may choose other modes of operation, offering varying degrees of control.

Figure 1: F-16 combat aircraft

4.3 Document overview

The purpose of this document is to specify the requirements for the system 'Self-protection suite for the F-16 combat aircraft'. The specified requirements throughout this document is legally in force in case of any uncertainties between Terma and The Royal Danish Air Force. The document is composed of the the following main sections:

- **Referenced documents:** Other documents that are referenced throughout this document is listed in this section.
- **Requirements:** This is the main section that states all the requirements to the system.
- **Quality provisions:** In this section methods for the verification of each requirement is specified.

The content of this document is strictly confidential and is only supposed to be read by staff possessing the needed security clearance from either Terma or The Royal Danish Airforce.

5 Referenced documents

No references.

6 Requirements

6.1 Required states and modes

Req. No	Requirement	UR ref
1.	The system shall comprise at least three modes, manual, semi-automatic and automatic.	UR-12
2.	Manual mode shall dispense the program selected by the pilot. The pilot may select payload, and dispense direction as defined by UR-2.	UR-12
3.	Semi automatic shall initiate an intelligent threat response upon consent from the pilot	UR-14
4.	Automatic mode shall initiate an intelligent threat response without pilot interaction.	UR-15

6.2 System capability requirements

Req. No	Requirement	UR ref
5.	The pod shall include a minimum of eight standard magazines.	UR-1
6.	The pod shall be able to dispense forwards, downwards and sideways.	UR-2
7.	The cockpit unit shall be able to power ON and OFF the dispensing system and the MWS.	UR-11
8.	The system shall be able to dispense a minimum of two payloads within 0.1 sec.	UR-20
9.	The system shall be able to dispense a pattern of payloads programmable by the customer.	UR-21

6.3 System external interface requirements

Req. No	Requirement	UR ref
11.	The System shall be able to erase prior defense patterns and usage statistics upon receiving the string 'zeroize' from the mission computer.	UR-9

6.4 System internal interface requirements

Req. No	Requirement	UR ref
12.	The cockpit unit shall communicate with the MWS via a MIL-STD-1553-B data bus.	UR-40

6.5 System internal data requirements

Req. No	Requirement	UR ref
13.	Threats shall be transmitted to the aircraft mission computer in body frame format (relative to aircraft) for displaying purposes.	UR-5
14.	Threat information will be provided by the Electronics Control Unit (ECU).	UR-5
15.	The system shall provide the aircraft mission computer with status information and built-in test results.	UR-6
16.	The system shall interface the aircraft intercom system to provide audio cues and warnings.	UR-7
17.	The system status on individual LRU level shall be provided by cockpit unit.	UR-10
18.	The MWS must receive navigation data from the aircraft mission computer with a latency of no more than 10 ms. Navigation data includes aircraft attitude, heading, altitude and GPS data.	No ref.
20.	The cockpit unit shall communicate with the mission computer via a MIL-STD-1553-B data bus.	UR-41

6.6 Adaptation requirements

Req. No	Requirement	UR ref
21.	Introduction of the system may not compromise the operation of the current weapon systems.	UR-3

6.7 Safety requirements

Req. No	Requirement	UR ref
22.	The system shall include a hardware implemented safety interlock to prevent dispensing on ground.	UR-8
23.	The hardware implemented safety lock shall be activated when the landing gear is on the ground.	UR-8

6.8 Security and privacy requirements

Req. No	Requirement	UR ref
24.	The system shall be able to erase sensitive data upon input from a discrete zeroize signal from aircraft.	UR-9
25.	The zeroize signal shall be received by the cockpit unit.	UR-9
26.	The magasines shall be stored at no lower than -10 degrees Celcius and no higher than 70 degrees Celcius.	No ref.

6.9 System environment requirements

Req. No	Requirement	UR ref
27.	The pod structure must be functional when exposed to steady state acceleration levels of 4g forward, 2.5g backward, 22g upward or 10g downward.	UR-30
28.	The total weight of pod cannot exceed 270 kg.	UR-31
29.	The pod shall be operational at temperatures of maximum 134 degree Celcius on outer skin and 152 degree Celcius on leading edge for maximum 3 minutes.	UR-33
41.	The pod shall be operational at temperatures of maximum 95 degrees Celcius on outer skin and 152 degrees Celcius on leading egde for a maximum of 25 minutes.	UR-33

6.10 Computer resource requirements

- **Hardware**

Req. No	Requirement	UR ref
30.	The system shall include a hardware implemented safety interlock to prevent dispensing on ground.	UR-8

- **Software**

Req. No	Requirement	UR ref
31.	The system shall provide a method of loading software to MWS.	UR-16

- **Communication**
  No requirements.

6.11 System quality factors

6.11.1 Design goals

The system is critical and must be reliable.

6.12 Design and construction constraints

Req. No	Requirement	UR ref
35.	The physical dimensions of the pod cannot exceed 0.5×0.5×5 meter.	No ref.

6.13 Personnel-related requirements

Req. No	Requirement	UR ref
36.	The aircraft has to be loaded with the payloads before takeoff.	No ref.

6.14 Training-related requirements

Req. No	Requirement	UR ref
37.	Pilots must be educated in handling the system from the cockpit.	No ref.
38.	Technicians must be educated in maintenance of the system.	No ref.

Training will be provided by the Company F Training department.

6.15 Logistics-related requirements

Req. No	Requirement	UR ref
39.	The chaffs and flares shall be transported in accordance to Military Standard Transportation and Movement Procedures (MILSTAMP).	No ref.

6.16 Packaging requirements

Req. No	Requirement	UR ref
40.	The chaffs and flares shall be labeled and packed in acordance to MIL-STD-2073-1E	No ref.

7 Quality provisions

7.1 Required states and modes

Req. No	Quality provision	UR ref
1.	Verified by inspection.	UR-12
2.	Verified by test.	UR-13
3.	Verified by test.	UR-14
4.	Verified by test.	UR-15

7.2 System capability requirements

Req. No	Quality provision	UR ref
5.	Verified by inspection.	UR-1
6.	Verified by demonstration	UR-2
7.	Verified by test.	UR-11
8.	Verified by test.	UR-20
9.	Verified by test.	UR-21

7.3 System external interface requirements

Req. No	Quality provision	UR ref
11.	Verified by test.	UR-9

7.4 System internal interface requirements

Req. No	Quality provision	UR ref
12.	Verified by test.	UR-40

7.5 System internal data requirements

Req. No	Quality provision	UR ref
13.	Verified by test.	UR-5
14.	Verified by test.	UR-5
15.	Verified by test.	UR-6
16.	Verified by test.	UR-7
17.	Verified by test.	UR-10
18.	Verified by test.	No ref.
20.	Verified by test.	UR-41

7.6 Adaptations requirements

Req. No	Quality provision	UR ref
21.	Verified by demonstration.	UR-3

7.7 Safety requirements

Req. No	Quality provision	UR ref
22.	Verified by test.	UR-8
23.	Verified by test.	UR-8

7.8 Security and privacy requirements

Req. No	Quality provision	UR ref
24.	Verified by test.	UR-9
25.	Verified by test.	UR-9
26.	Verified by test.	No ref.

7.9 System environment requirements

Req. No	Quality provision	UR ref
27.	Verified by test.	UR-30
28.	Verified by inspection.	UR-31
29.	Verified by test.	UR-33
XX.	Verified by test.	UR-XX

7.10 Computer resource requirements

- **Hardware**

Req. No	Quality provision	UR ref
24.	Verified by inspection.	UR-8

- **Software**

Req. No	Quality provision	UR ref
31.	Verified by demonstration.	UR-16

- **Communication**
  No requirements.

7.11 System quality factors

No requirements to verify.

7.12 Design and construction constraints

Req. No	Quality provision	UR ref
35.	Verified by inspection.	No ref.

7.13 Personnel-related requirements

Req. No	Quality provision	UR ref
36.	Verified by demonstration.	No ref.

7.14 Training-related requirements

Req. No	Quality provision	UR ref
37.	Verified by test.	No ref.
38.	Verified by test.	No ref.

7.15 Logistics-related requirements

Req. No	Quality provision	UR ref
39.	Verified by inspection.	No ref.

7.16 Packaging requirements

Req. No	Quality provision	UR ref
40.	Verified by inspection.	No ref.