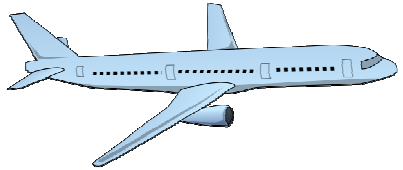
ALD Ltd.

MSG-3 Analysis

FOR MSI

28-10-00
Fuel Storage System

Effectivity: Xwing Fighter Spaceship
Revision: 3
Date: 08/27/09



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HISTORY OF CHANGES

Revision	Revision Date	Prepared By Validated By	Description Of Changes

LIST OF DOCUMENTS

Reference	Version/Issue	Title

FORM 0	MAINTENANCE SIGNIFICANT ITEM SELECTION (MSI)	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

ATA Number	Description	Selection Criteria				MSI?	Highest Manageable Level	Remarks
		Could failure be Undetectable or not likely to be detected by the operating crew during normal duties?	Could failure Affect safety (on Ground or in Flight), including Safety/emergency System or Equipment?	Could Failure have Significant Operational Impact?	Could Failure have Significant Economic Impact?			
28-10-00	Fuel Storage System	Yes	No	Yes	No	Yes	28-10-00	
28-10-01	Fuselage tank	No	No	Yes	No	Yes	28-10-00	
28-10-03	Refueling pilot valve	No	No	No	No	No		
28-10-04	Drain valve-Center tank/collector box	Yes	No	No	Yes	Yes	28-10-00	
28-10-05	Pressure refueling adapter	No	No	No	No	No		
28-10-06	Check valve-flapper	No	Yes	No	Yes	Yes	28-10-00	
28-10-07	Interconnect valves	Yes	Yes	No	Yes	Yes	28-10-00	
28-10-08	Wing drain valve	No	No	No	No	No		
28-10-09	Wing float vent valve	No	No	Yes	No	Yes	28-10-00	
28-10-10	Center tank transfer jet pump	Yes	No	No	Yes	Yes	28-10-00	
28-10-11	Wing tank transfer jet pump	Yes	No	No	Yes	Yes	28-10-00	
28-10-12	Transfer inline check valve	No	No	No	No	No		

FORM 1	SYSTEM BREAKDOWN & FUNCTIONAL DESCRIPTION	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

FORM 2	COMPONENTS - MAINTAINABILITY DATA	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

ATA Number	Component	QPA	Supplier	Part Number
28-10-00	Fuel Storage System	1		
28-10-01	Fuselage tank	1		XXYYZZXX-ZZ
28-10-03	Refueling pilot valve	1		XXYYZZXX-ZZ
28-10-04	Drain valve-Center tank/collector box	1		XXYYZZXX-ZZ
28-10-05	Pressure refueling adapter	1		XXYYZZXX-ZZ
28-10-06	Check valve-flapper	1		XXYYZZXX-ZZ
28-10-07	Interconnect valves	1		XXYYZZXX-ZZ
28-10-08	Wing drain valve	1		XXYYZZXX-ZZ
28-10-09	Wing float vent valve	1		XXYYZZXX-ZZ
28-10-10	Center tank transfer jet pump	1		XXYYZZXX-ZZ
28-10-11	Wing tank transfer jet pump	1		XXYYZZXX-ZZ
28-10-12	Transfer inline check valve	1		XXYYZZXX-ZZ

FORM 3	COMPONENTS - RELIABILITY DATA	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

ATA Number	Component	Reliability Data		
		Similar to (A/P)	Historical MTBUR	Predicted MTBUR
28-10-00	Fuel Storage System		0.0000	0.0000
28-10-01	Fuselage tank		0.0000	0.0000
28-10-03	Refueling pilot valve		0.0000	0.0000
28-10-04	Drain valve-Center tank/collector box		0.0000	0.0000
28-10-05	Pressure refueling adapter		0.0000	0.0000
28-10-06	Check valve-flapper		0.0000	0.0000
28-10-07	Interconnect valves		0.0000	0.0000
28-10-08	Wing drain valve		0.0000	0.0000
28-10-09	Wing float vent valve		0.0000	0.0000
28-10-10	Center tank transfer jet pump		0.0000	0.0000
28-10-11	Wing tank transfer jet pump		0.0000	0.0000
28-10-12	Transfer inline check valve		0.0000	0.0000

FORM 4	SYSTEM DESIGN FEATURES	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

The complexity of a fuel system varies from the small, home-built a/c with no system complexity, up to the modern fighter were the fuel system may be critical for center of gravity (CG) reasons and therefore, very extensive, with triple redundancy.
Most combat a/c fuel systems consist of several tanks for reasons of space, slosh, CG management or safety. The general layout may consist of one or more boost pumps that feed the engine/engines from a collector tank, usually a fuselage tank placed close to the CG. The collector tank is replenished by a fuel transfer system, which pumps fuel from the source tanks. Source tanks may be other fuselage, wing or drop tanks. The system may be pressurized to avoid cavitation in pumps, spontaneous fuel boiling at high altitude
or to aid or provide the means for fuel transfer. The a/c fuel system may consist of several sub systems that. The ones discussed here are:

- Engine Feed System
- Fuel Transfer System
- Pressurization and Vent System
- Refueling System, Ground and Air to Air

Other systems that might be identified, and that are described in [11] Gavel, are:

- Measurement and Management System
- Fire Prevention and Explosion Suppression System
- Cooling System where the fuel serves as a heat sink to other systems

According to [4] Raymer, there are three main types of fuel tank: discrete, bladder and integral tanks. The discrete tank is a separate fuel container similar to the fuel tank of a car. Discrete tanks are usually used only for small general aviation or home built a/c.
The bladder tank is a shaped rubber bladder placed in a fuselage cavity. The rubber is thick and may cause a fuel loss of about 10%. The bladder may also be made selfsealing, which makes it even thicker. Bladder tanks are often difficult to use in cavities with a complex structural arrangement such as wing tanks.
Integral tanks are cavities within the airframe structure that are sealed to form fuel tanks. Bladder tanks have historically been considered less prone to leakage, which explains the willingness to pay the weight penalty. As the technique for integral tank manufacture has improved, the leakage problem is now less troublesome and integral tanks are the predominant type in modern a/c design. There are, however, modern applications of bladder tanks, for instance cargo bay installation in tanker a/c intended for air-to-air refueling. The fuel tank
layout of the JAS 39 Gripen is shown in Figure 24. Note the lack of fuel in the engine region.

FORM 4	SYSTEM DESIGN FEATURES	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

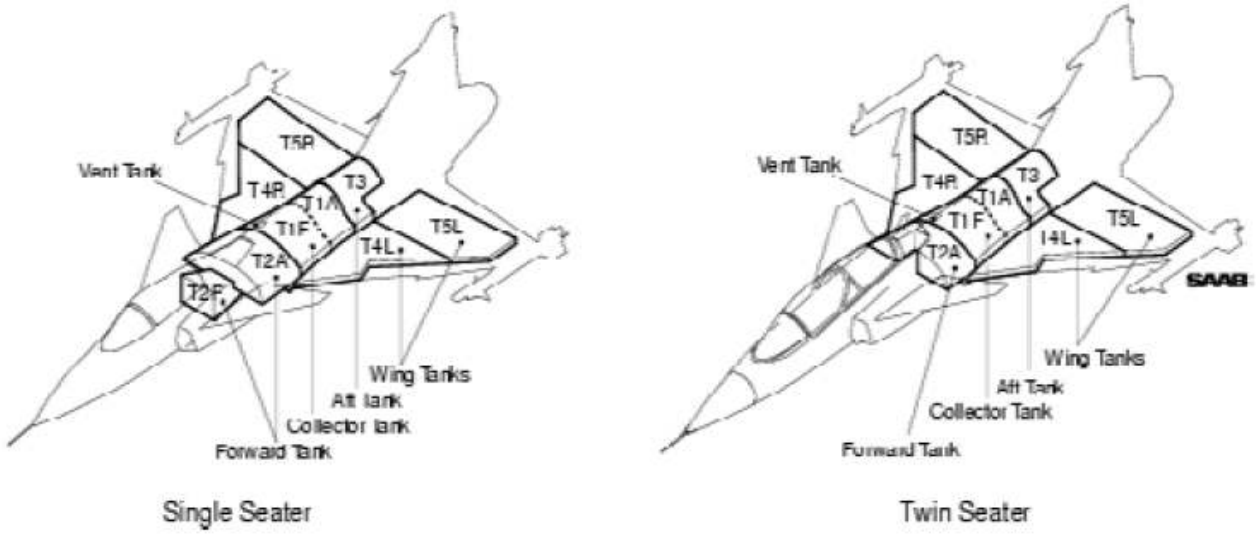
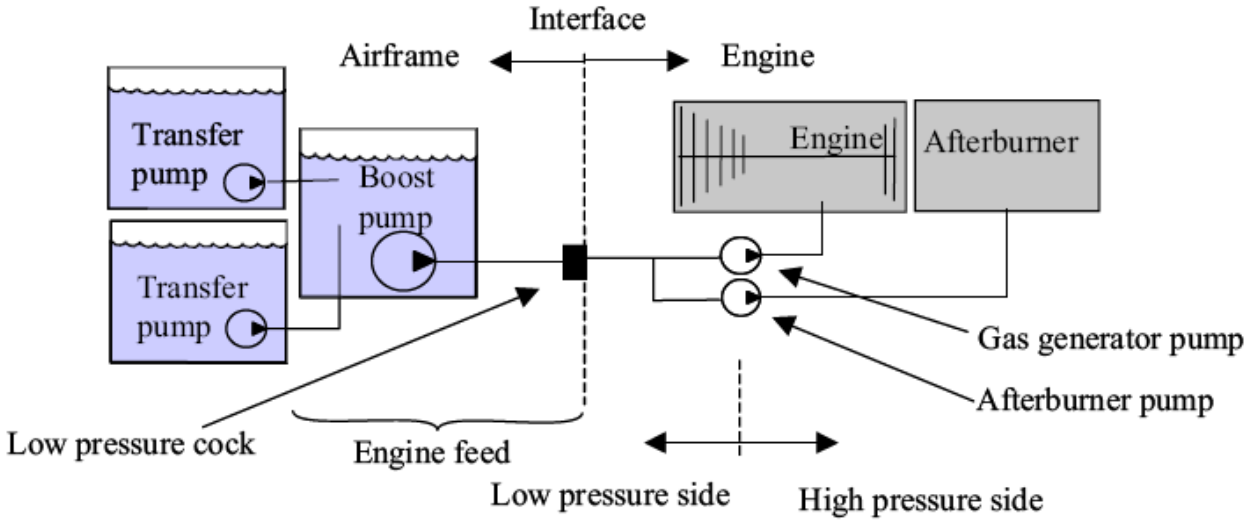


Figure 24: *Location of fuel tanks in JAS 39 Gripen.*

The engine feed is by far the most important task of the fuel system. The objective of the engine feed (which is considered part of the airframe and is not to be confused with the engine's own internal fuel system) is to boost the pressure in order to avoid cavitation in the engine system. The engine and airframe interface is often defined as shown in Figure 25, where the engine feed system is considered to consist of the engine feed tank, the boost pump, and the engine feed pipe.

FORM 4	SYSTEM DESIGN FEATURES	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**



The availability of fuel to the engine(s) should be required for all conditions in the air vehicle operational envelope and known extreme conditions, according to [5]. Even though there are a number of ways to deal with this, it is most often ensured by a double-ended boost pump installed in a negative g compartment as shown Figure 26.

FORM 4	SYSTEM DESIGN FEATURES	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

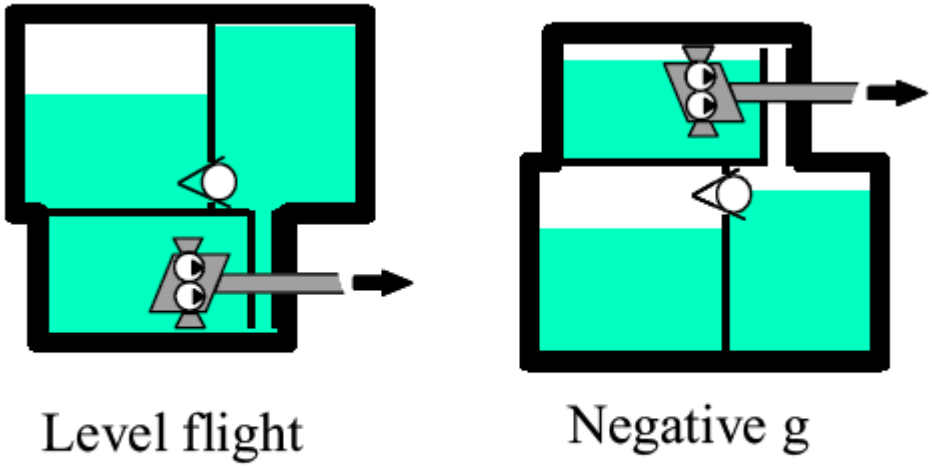


Figure 26: *Negative g tank with double ended boost pump.*

The simplest way of transferring fuel is by gravity. This method is used in general aviation and commercial a/c depending on the tank configuration. An example of an a/c with gravity transfer is Saab 2000, shown in Figure 27, where the dihedral aids the transfer of fuel from the outboard to the inboard tank.

FORM 4	SYSTEM DESIGN FEATURES	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

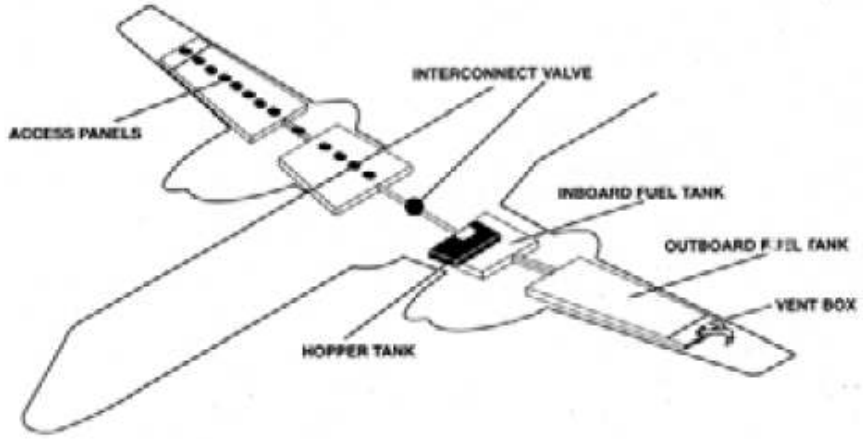


Figure 27: *Dihedral gravity transfer of fuel from outboard to inboard wing tank.*

A more complex method is siphoning, shown in Figure 28, where the source tank is pressurized, thus pushing the fuel to the collector tank. Generally, it is engine bleed air, direct or conditioned by the environmental control system, which supplies the air via a pressure regulator.

FORM 4	SYSTEM DESIGN FEATURES	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

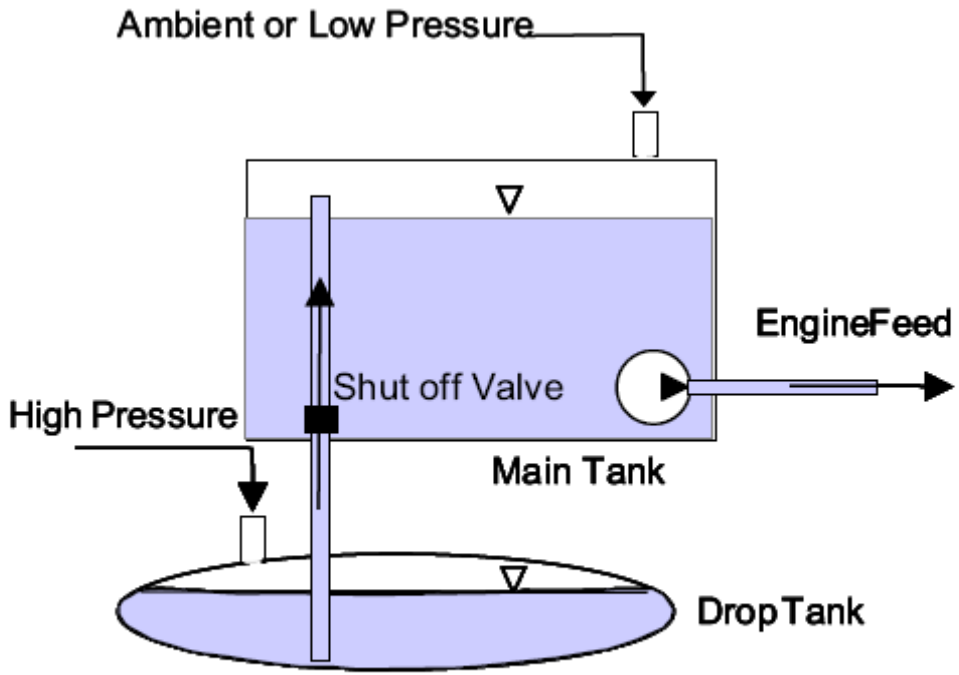


Figure 28: *Siphoning of fuel from drop tank to main tank.*

Pump transfer may be of two principally different types, inline or distributed, see Figure 29. The inline pump is often a centrally placed pump, and transfers fuel from several tanks. This is lightweight and compact but is susceptible to cavitation in suction lines due to pressure drop. Distributed pumps are located in the transfer tank, thus minimizing suction head and cavitation. The fuel transfer system is described in more detail in [13] and also in appended paper [VII].

FORM 4	SYSTEM DESIGN FEATURES	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

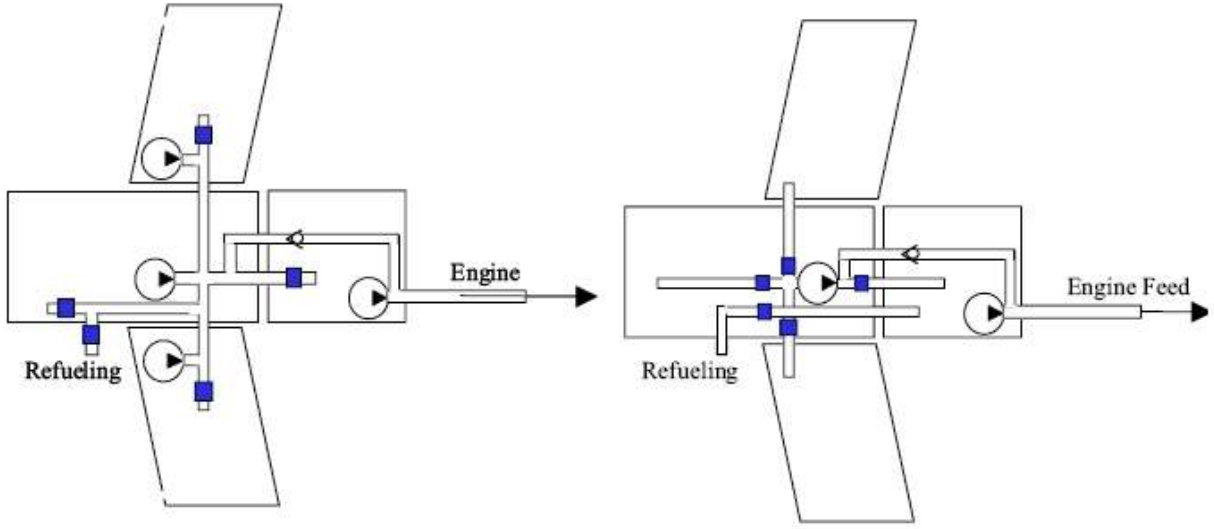


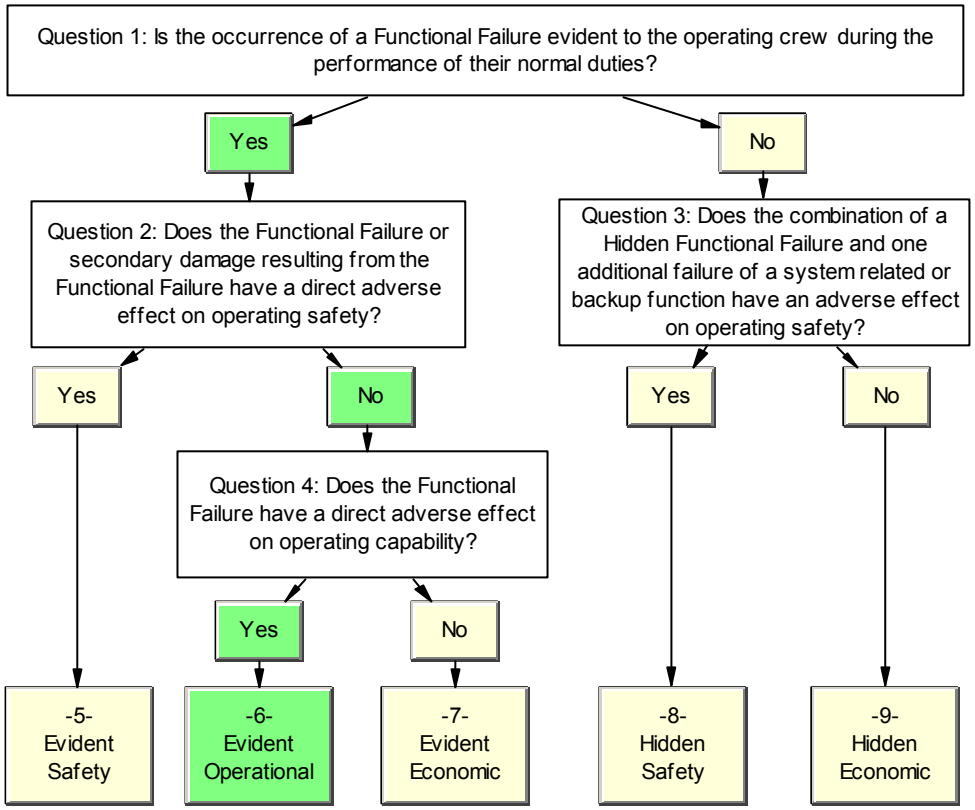
Figure 29: *Pump transfer, distributed at the left and centralized at the right.*

FORM 5	**FUNCTIONAL FAILURE ANALYSIS**	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

F	Function	FF	Functional Failure	FE	Failure Effect	FC	Failure Cause	F-FF-FE-FC
1	Fuel storage	A	Fails to store fuel	1	Fuel leakage	a	Fuel tank leakage	1A1a
						b	Drain valve leakage	1A1b
2	Enable fuel flow in tank from outboard wing inboar	A	Fails to allow flow inboard	1	Loss of redundancy of fuel flow from outboard to inboard in wing tanks. Other valves in wing allow fuel passage inboard	a	Flapper valve failed closed	2A1a
		B	Fails to prevent flow outboard (during maneuvering)	1	Possible shift in fuel distribution in wing during maneuvering	a	Flapper valve failed open	2B1a
3	Vent wing tank in flight and during refueling	A	Fails to vent wing tanks during flight and refuel	1	Loss of wing tank venting redundancy	a	Float vent value (inner or outer wing) stuck closed	3A1a
		B	Fails to prevent fuel entering into vent lines and dumping overboard during maneuvering	1	Fuel may be spilled from vents during maneuvering or refueling	a	Outer wing float valve stuck open	3B1a
4	Allow interconection of wing tanks from both sides	A	Fails to interconnect left and right fuel tanks	1	Inability to balance fuel load	a	Interconnect switch failure	4A1a
		B	Loss of redundant interconnect between left and right tanks	1	Fuel tranfer is slower from one side to the other	a	Interconnect valve failure	4B1a
		C	Fails to indicate interconnect valves in-transit or open	1	Crew unaware of interconnect valve functionality	a	Lighted indicator failure	4C1a

FORM 6	FAILURE EFFECT CATEGORY – Level 1 Analysis	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**
	Function:	**1 Fuel storage**
	Failure:	**A Fails to store fuel**
	Effect:	**1 Fuel leakage**

FAILURE EFFECT CATEGORIZATION



N	Answer	Explanation
1	Yes	Yes, the occurrence of a Functional Failure will be evident to operating crew during the normal performance of their duties. Leakage will be noticed during pre-flight walk round.
2	No	No, the Functional Failure or secondary damage resulting from the Functional Failure will not have a direct adverse effect on operating safety.
3	N/A	Not applicable for category 6
4	Yes	Yes, the Functional Failure will have a direct adverse effect on operating capability

Remarks:	
Selected Failure Effect Category:	**6 - Evident Operational**

FORM 7	TASK SELECTION – Level 2 Analysis	
MSI Number: **28-10-00** Cause Reference: **1A1a** FEC: **6** - **Evident Operational**	ITEM:	**Fuel Storage System**
	Function:	**1 Fuel storage**
	Failure:	**A Fails to store fuel**
	Effect:	**1 Fuel leakage**
	Cause:	**a Fuel tank leakage**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	N/A	Not applicable for category 6
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 6

Task Number	Type	Description	Interval	Remarks	Zone flag

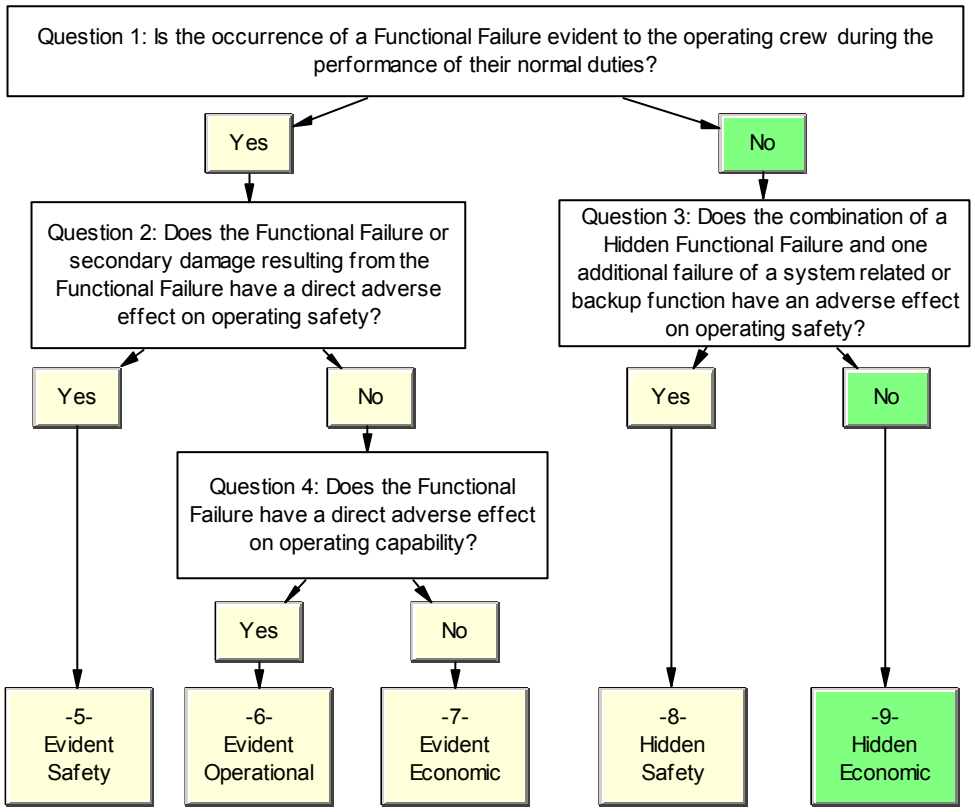
FORM 7	TASK SELECTION – Level 2 Analysis	
MSI Number: **28-10-00** Cause Reference: **1A1b** FEC: **6** - **Evident Operational**	ITEM:	**Fuel Storage System**
	Function:	**1 Fuel storage**
	Failure:	**A Fails to store fuel**
	Effect:	**1 Fuel leakage**
	Cause:	**b Drain valve leakage**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	N/A	Not applicable for category 6
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 6

Task Number	Type	Description	Interval	Remarks	Zone flag

FORM 6	FAILURE EFFECT CATEGORY – Level 1 Analysis	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**
	Function:	**2 Enable fuel flow in tank from outboard wing inboar**
	Failure:	**A Fails to allow flow inboard**
	Effect:	**1 Loss of redundancy of fuel flow from outboard to inboard in wing tanks. Other valves in wing allow fuel passage inboard**

FAILURE EFFECT CATEGORIZATION



N	Answer	Explanation
1	No	No, the occurrence of a Functional Failure will not be evident to the operating crew during the normal performance of their duties
2	N/A	Not applicable for category 9
3	No	No, the combination of a Hidden Functinal Failure and one additional failure of a system related or back-up function will not have an adverse effect on operating safety
4	N/A	Not applicable for category 9

Remarks:	
Selected Failure Effect Category:	**9 - Hidden Economic**

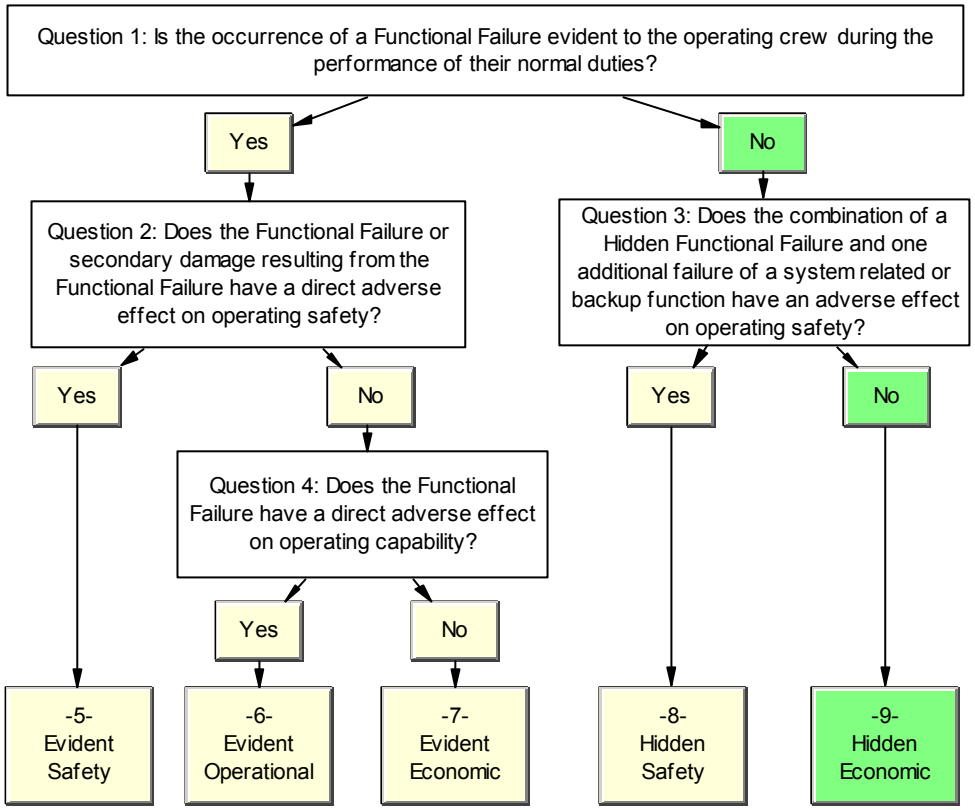
FORM 7	TASK SELECTION – Level 2 Analysis	
MSI Number: **28-10-00** Cause Reference: **2A1a** FEC: **9** - **Hidden Economic**	ITEM:	**Fuel Storage System**
	Function:	**2 Enable fuel flow in tank from outboard wing inboar**
	Failure:	**A Fails to allow flow inboard**
	Effect:	**1 Loss of redundancy of fuel flow from outboard to inboard in wing tanks. Other valves in wing allow fuel passage inboard**
	Cause:	**a Flapper valve failed closed**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	Yes	Yes, a check to verify operation will be applicable and effective
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 9

Task Number	Type	Description	Interval	Remarks	Zone flag
001	OP	Op.check of the wing flapper valves	8 flights		

FORM 6	FAILURE EFFECT CATEGORY – Level 1 Analysis	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**
	Function:	**2 Enable fuel flow in tank from outboard wing inboar**
	Failure:	**B Fails to prevent flow outboard (during maneuvering)**
	Effect:	**1 Possible shift in fuel distribution in wing during maneuvering**

FAILURE EFFECT CATEGORIZATION



N	Answer	Explanation
1	No	No, the occurrence of a Functional Failure will not be evident to the operating crew during the normal performance of their duties
2	N/A	Not applicable for category 9
3	No	No, the combination of a Hidden Functinal Failure and one additional failure of a system related or back-up function will not have an adverse effect on operating safety
4	N/A	Not applicable for category 9

Remarks:	
Selected Failure Effect Category:	**9 - Hidden Economic**

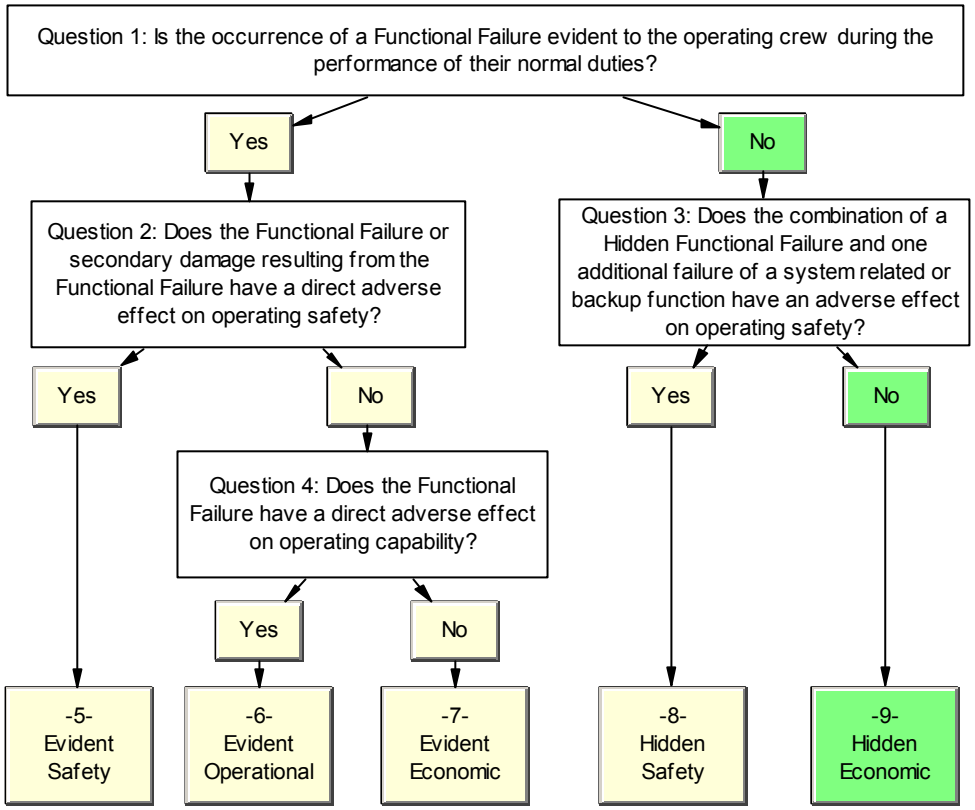
FORM 7	TASK SELECTION – Level 2 Analysis	
MSI Number: **28-10-00** Cause Reference: **2B1a** FEC: **9** - **Hidden Economic**	ITEM:	**Fuel Storage System**
	Function:	**2 Enable fuel flow in tank from outboard wing inboar**
	Failure:	**B Fails to prevent flow outboard (during maneuvering)**
	Effect:	**1 Possible shift in fuel distribution in wing during maneuvering**
	Cause:	**a Flapper valve failed open**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	Yes	Yes, a check to verify operation will be applicable and effective
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 9

Task Number	Type	Description	Interval	Remarks	Zone flag
001	OP	Operational check of the wing flapper valves	8 flights		

FORM 6	FAILURE EFFECT CATEGORY – Level 1 Analysis	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**
	Function:	**3 Vent wing tank in flight and during refueling**
	Failure:	**A Fails to vent wing tanks during flight and refuel**
	Effect:	**1 Loss of wing tank venting redundancy**

FAILURE EFFECT CATEGORIZATION



N	Answer	Explanation
1	No	
2	N/A	Not applicable for category 9
3	No	
4	N/A	Not applicable for category 9

Remarks:	
Selected Failure Effect Category:	**9 - Hidden Economic**

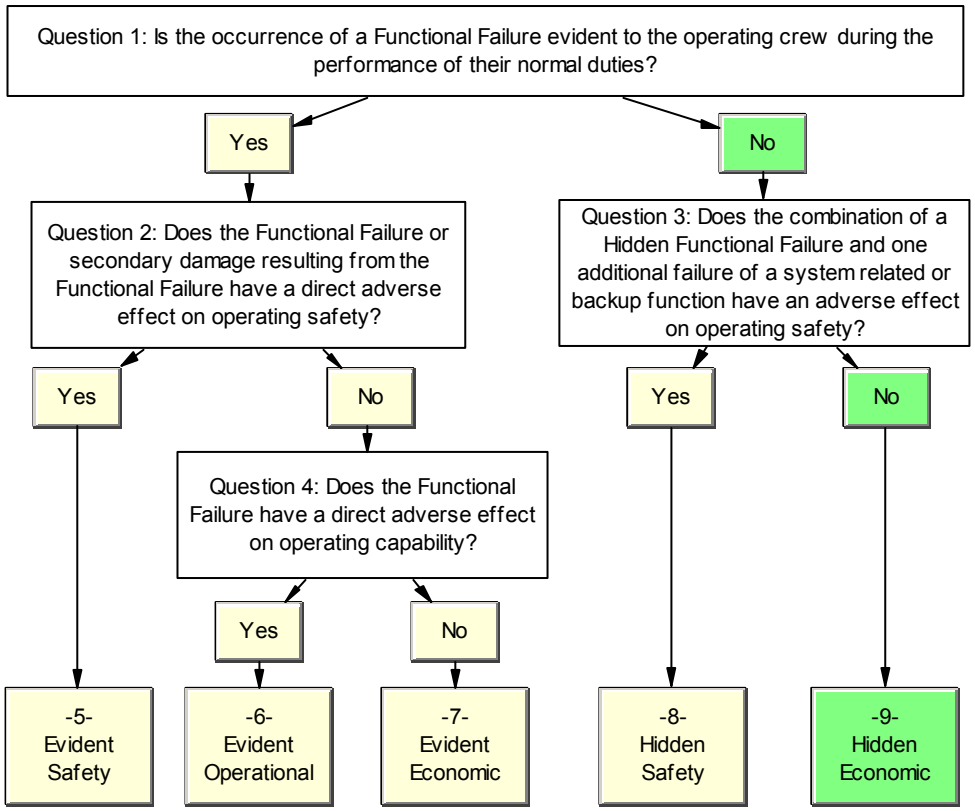
FORM 7	**TASK SELECTION – Level 2 Analysis**	
MSI Number: **28-10-00** Cause Reference: **3A1a** FEC: **9** - **Hidden Economic**	ITEM:	**Fuel Storage System**
	Function:	**3 Vent wing tank in flight and during refueling**
	Failure:	**A Fails to vent wing tanks during flight and refuel**
	Effect:	**1 Loss of wing tank venting redundancy**
	Cause:	**a Float vent value (inner or outer wing) stuck closed**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	Yes	Yes, a check to verify operation will be applicable and effective
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 9

Task Number	Type	Description	Interval	Remarks	Zone flag
002	OP	Operational check of wing tank float valves	8 flights		

FORM 6	FAILURE EFFECT CATEGORY – Level 1 Analysis	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**
	Function:	**3 Vent wing tank in flight and during refueling**
	Failure:	**B Fails to prevent fuel entering into vent lines and dumping overboard during maneuvering**
	Effect:	**1 Fuel may be spilled from vents during maneuvering or refueling**

FAILURE EFFECT CATEGORIZATION



N	Answer	Explanation
1	No	
2	N/A	Not applicable for category 9
3	No	
4	N/A	Not applicable for category 9

Remarks:	
Selected Failure Effect Category:	**9 - Hidden Economic**

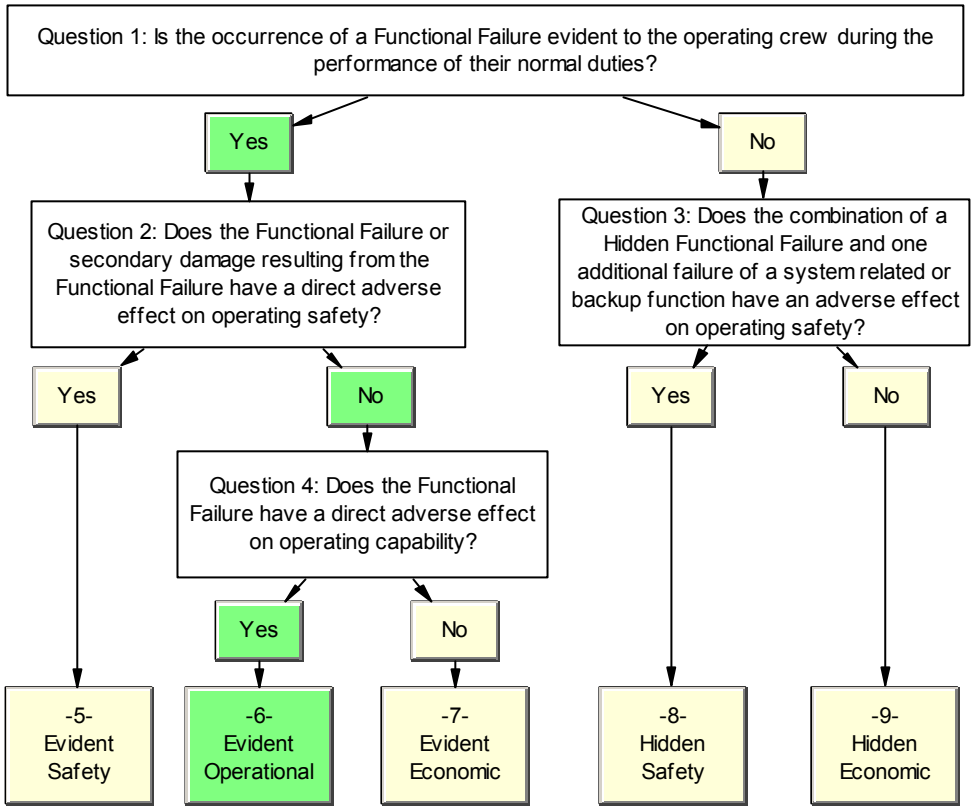
FORM 7	**TASK SELECTION – Level 2 Analysis**	
MSI Number: **28-10-00** Cause Reference: **3B1a** FEC: **9** - **Hidden Economic**	ITEM:	**Fuel Storage System**
	Function:	**3 Vent wing tank in flight and during refueling**
	Failure:	**B Fails to prevent fuel entering into vent lines and dumping overboard during maneuvering**
	Effect:	**1 Fuel may be spilled from vents during maneuvering or refueling**
	Cause:	**a Outer wing float valve stuck open**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	Yes	Yes, a check to verify operation will be applicable and effective
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 9

Task Number	Type	Description	Interval	Remarks	Zone flag
002	OP	Operational check of wing tank float valves	8 flights		

FORM 6	FAILURE EFFECT CATEGORY – Level 1 Analysis	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**
	Function:	**4 Allow interconection of wing tanks from both sides**
	Failure:	**A Fails to interconnect left and right fuel tanks**
	Effect:	**1 Inability to balance fuel load**

FAILURE EFFECT CATEGORIZATION



N	Answer	Explanation
1	Yes	
2	No	
3	N/A	Not applicable for category 6
4	Yes	

Remarks:	
Selected Failure Effect Category:	**6 - Evident Operational**

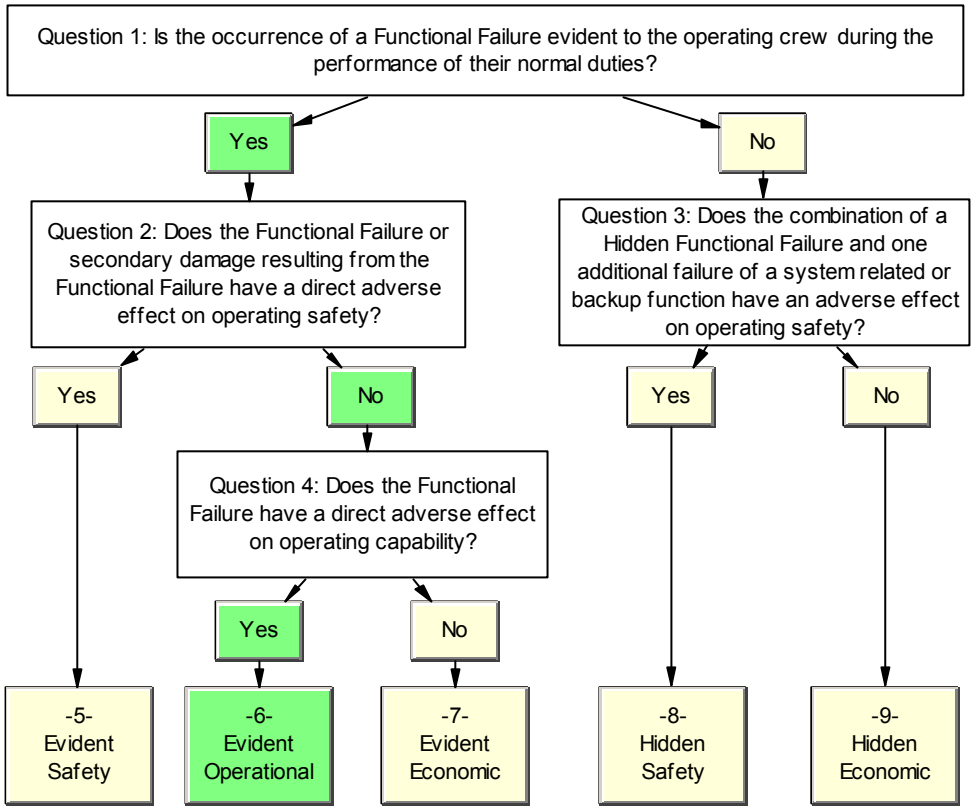
FORM 7	TASK SELECTION – Level 2 Analysis	
MSI Number: **28-10-00** Cause Reference: **4A1a** FEC: **6** - **Evident Operational**	ITEM:	**Fuel Storage System**
	Function:	**4 Allow interconection of wing tanks from both sides**
	Failure:	**A Fails to interconnect left and right fuel tanks**
	Effect:	**1 Inability to balance fuel load**
	Cause:	**a Interconnect switch failure**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	N/A	Not applicable for category 6
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 6

Task Number	Type	Description	Interval	Remarks	Zone flag

FORM 6	FAILURE EFFECT CATEGORY – Level 1 Analysis	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**
	Function:	**4 Allow interconection of wing tanks from both sides**
	Failure:	**B Loss of redundant interconnect between left and right tanks**
	Effect:	**1 Fuel tranfer is slower from one side to the other**

FAILURE EFFECT CATEGORIZATION



N	Answer	Explanation
1	Yes	
2	No	
3	N/A	Not applicable for category 6
4	Yes	

Remarks:	
Selected Failure Effect Category:	**6 - Evident Operational**

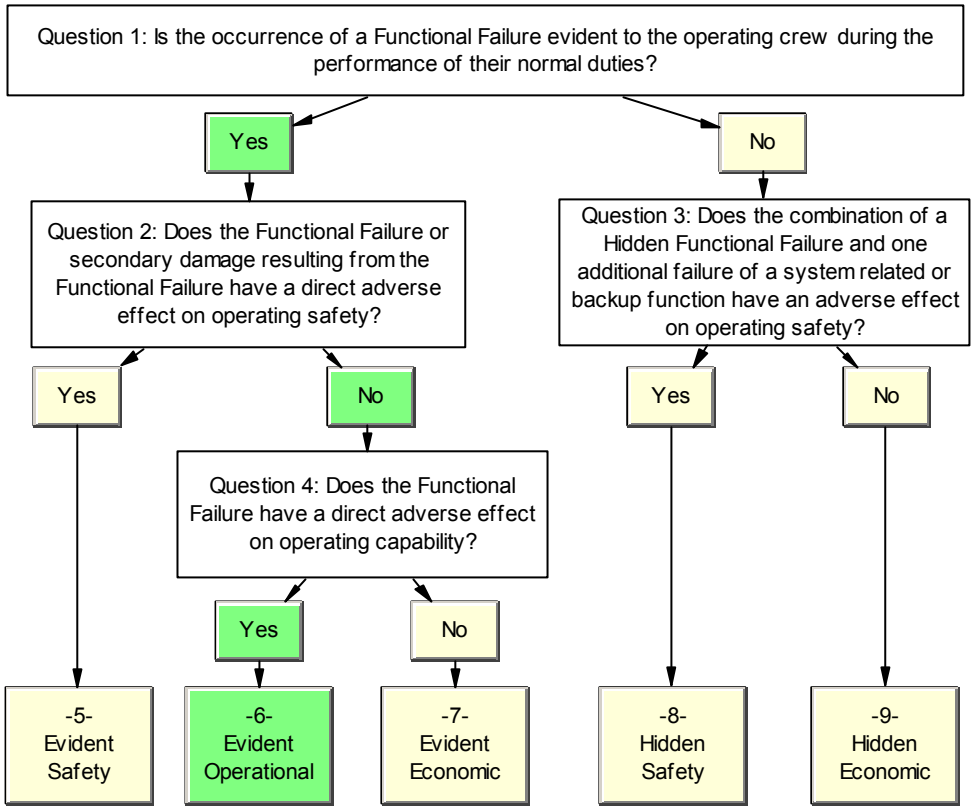
FORM 7	TASK SELECTION – Level 2 Analysis	
MSI Number: **28-10-00** Cause Reference: **4B1a** FEC: **6** - **Evident Operational**	ITEM:	**Fuel Storage System**
	Function:	**4 Allow interconection of wing tanks from both sides**
	Failure:	**B Loss of redundant interconnect between left and right tanks**
	Effect:	**1 Fuel tranfer is slower from one side to the other**
	Cause:	**a Interconnect valve failure**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	N/A	Not applicable for category 6
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 6

Task Number	Type	Description	Interval	Remarks	Zone flag

FORM 6	FAILURE EFFECT CATEGORY – Level 1 Analysis	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**
	Function:	**4 Allow interconection of wing tanks from both sides**
	Failure:	**C Fails to indicate interconnect valves in-transit or open**
	Effect:	**1 Crew unaware of interconnect valve functionality**

FAILURE EFFECT CATEGORIZATION



N	Answer	Explanation
1	Yes	
2	No	
3	N/A	Not applicable for category 6
4	Yes	

Remarks:	
Selected Failure Effect Category:	**6 - Evident Operational**

FORM 7	TASK SELECTION – Level 2 Analysis	
MSI Number: **28-10-00** Cause Reference: **4C1a** FEC: **6** - **Evident Operational**	ITEM:	**Fuel Storage System**
	Function:	**4 Allow interconection of wing tanks from both sides**
	Failure:	**C Fails to indicate interconnect valves in-transit or open**
	Effect:	**1 Crew unaware of interconnect valve functionality**
	Cause:	**a Lighted indicator failure**

Category					Task Questions	Answer	Explanation
A	A	A	A	A	Is the lubrication or servicing task applicable and effective?	No	
			B	B	Is a check to verify operation applicable and effective?	N/A	Not applicable for category 6
B	B	B	C	C	Is an inspection or functional check to detect degradation of the function (potential failure) applicable and effective?	No	
C	C	C	D	D	Is a restoration task to reduce the failure rate applicable and effective?	No	
D	D	D	E	E	Is a discard task to avoid failures or to reduce the failure rate applicable and effective?	No	
E			F		Is there a task or combination of tasks that are applicable and effective?	N/A	Not applicable for category 6

Task Number	Type	Description	Interval	Remarks	Zone flag

FORM 8	MAINTENANCE TASK SUMMARY	
MSI Number: **28-10-00**	ITEM:	**Fuel Storage System**

Task Number	Type	Task Description	Interval	Remarks	FEC	F-FF-FE-FC
001	OP	Op.check of the wing flapper valves	8 flights		9	2A1a
001	OP	Operational check of the wing flapper valves	8 flights		9	2B1a
002	OP	Operational check of wing tank float valves	8 flights		9	3A1a
002	OP	Operational check of wing tank float valves	8 flights		9	3B1a