

**ATR**



**Flight Safety Conference**

29<sup>th</sup> – 30<sup>th</sup> November 2023

# Managing Your Fuel Policy

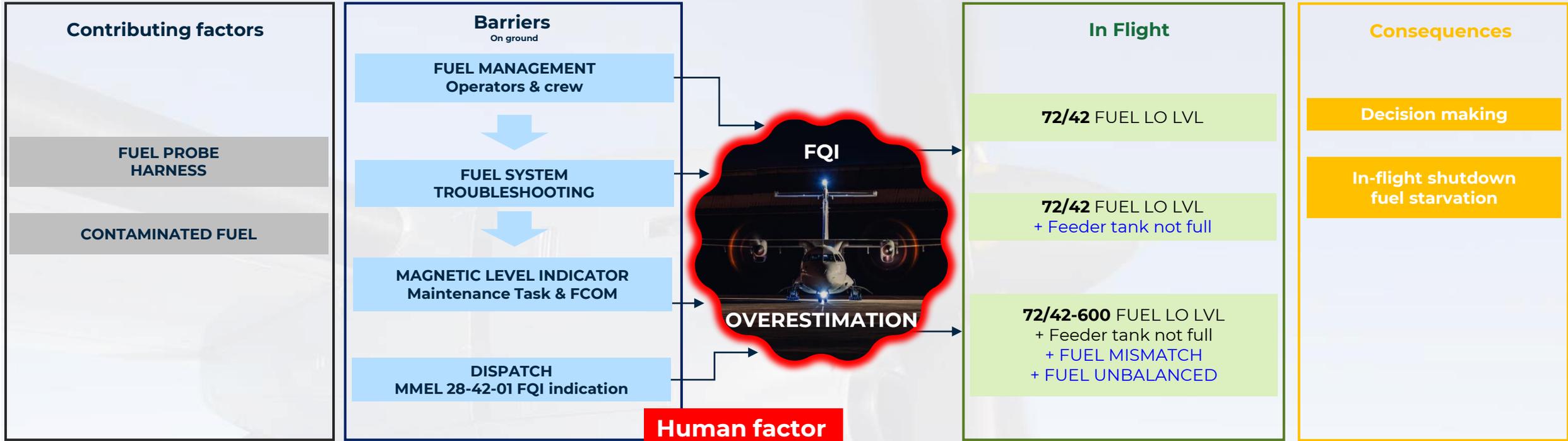
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**Sébastien SELLEM**

Flight Safety Director – Accident/Incident Investigator



# Fuel quantity indicator – fuel overestimation



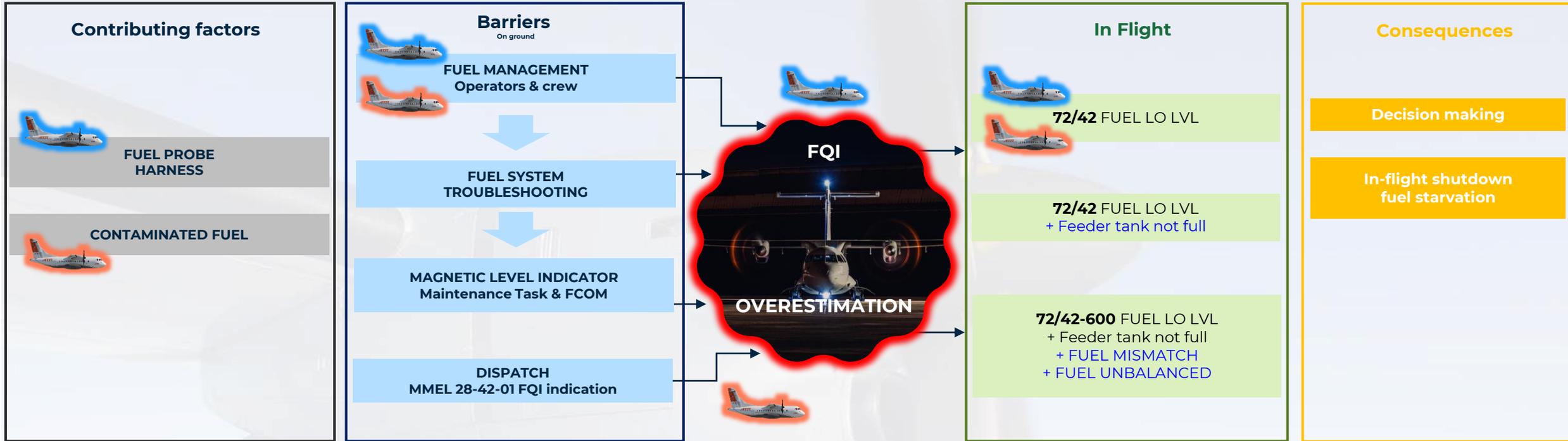
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FUEL MISMATCH  
FUEL UNBALANCED



# Fuel quantity indicator – fuel overestimation



## Annex 13 Serious incident - 2016

ATR42 – Fuel Starvation

The direct cause to the engine 2 flame out was fuel starvation.

Main contributing factor : **Fuel probe failure**



## Annex 13 Serious incident - 2019

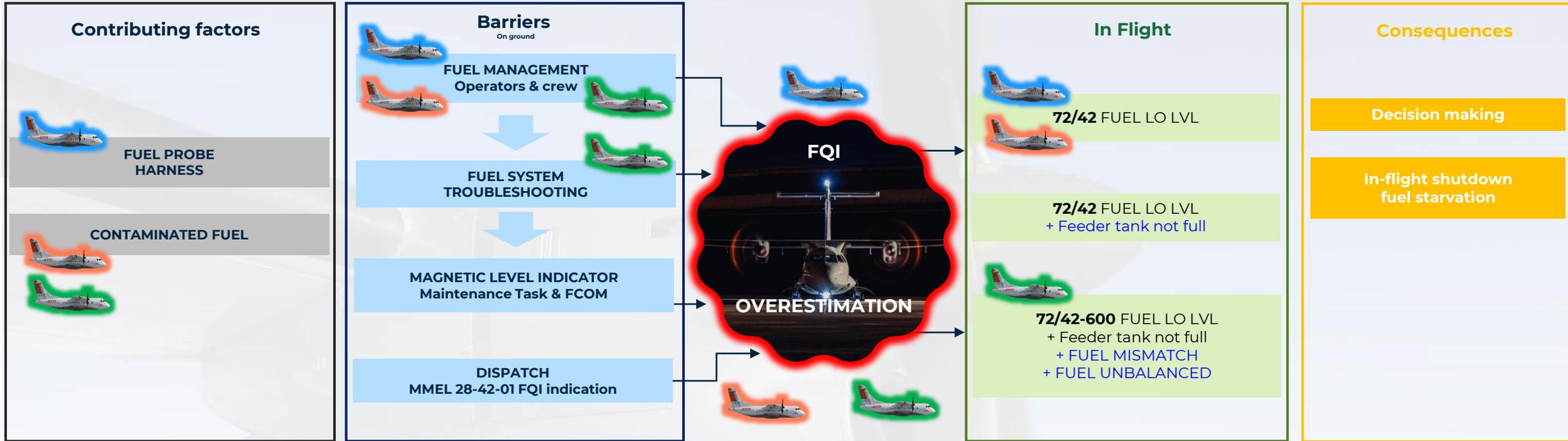
ATR72 – Fuel Starvation

During the approach, left engine failure and after landing, during the taxi, a right engine failure occurred.

Main contributing factor : **under progress**



# Fuel quantity indicator – fuel overestimation



## Annex 13 Serious incident - 2016

ATR42 – Fuel Starvation

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# Maintenance - troubleshooting

## FUEL SYSTEM TROUBLESHOOTING

- **MP - Visual examination of the fuel level with the manual magnetic indicators.**
  - MP ATR-A-12-11-28-00001-310A-A
  - FCOM NOP.NSU.28
- **MP - Functional Test of the Fuel-Tank Quantity Probe**
  - MP ATR-A-28-42-7001001-340A-A
- **Compensator Resistance**
  - CMM 28-42-72
- **Fuel sampling and Boicide Treatment (fuel tanks)**
  - MP ATR-A-12-32-28-00001-377A-A
  - MP ATR-A-28-11-XX-00001-263A-A
- **Engine Fuel and Control – Fuel Flow System Fault**
  - AFI ATR-A-73-31-XX-02002-421A-A



# Before departure – fuel policy

FUEL MANAGEMENT  
Operators & crew

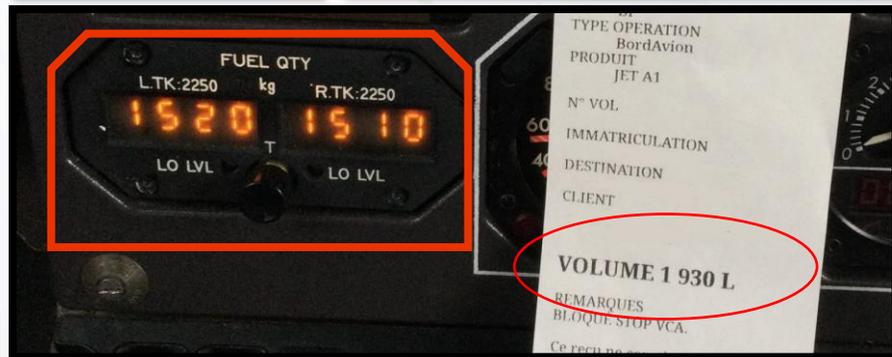
FUEL				
RAMP	USED	REMAINING	PLAN UPLIFT	ACTUAL UPLIFT
3 000 kg	... kg	1 510 kg	1 490 kg	1 525 kg

- Compute Plan UPLIFT

FUEL	
HOTEL+TAXI :	50
) TRIP :+ 1:14	865
CONT :+ 0:05	45
) ALT1 :+ 0:44	657
) ALT2 :+ 0:48	625
FRES :+ 0:30	270
ADDIT :+	0
EXTRA :+	0
TOTAL = 2:37	1886
EXTRA :+	
DISCR :+	
>REQ :=	
BLOCK :=	
SURPL :	



Total fuel departure*	2310 kg
Total fuel arrival*	1520 kg
Hot/after flight uplift	(0 kg) 0 ltrs
Density	0.79



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## FLIGHT PLAN:

Check flight plan (FPL).

## TECH LOG:

Check tech log & FQI.

## PLAN UPLIFT:

Captain requested block fuel at 3 000 kg.

## FUEL TANKER:

Check fuel Liter to Kg

$1930 \text{ L (tanker)} \times 0.79 \text{ (fuel density)} = 1525 \text{ kg}$

## FQI vs ACTUAL FUEL:

Actual:  $1 525 \text{ kg} + 1 510 \text{ kg} = 3 035 \text{ kg}$

FQI: 3030 kg

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# After landing

FUEL				
RAMP	USED	REMAINING	PLAN UPLIFT	ACTUAL UPLIFT
3030 kg	775kg		... kg	... kg

- FUEL USED vs FUEL QUANTITY INDICATION



$$373 \text{ kg (Left FF)} + 402 \text{ (Right FF)} = 775 \text{ kg}$$
$$3\ 030 \text{ kg} - 775 \text{ kg} = 2\ 255 \text{ kg}$$

## FUEL USED:

Check Fuel USED

## FUEL REMAINING:

Check FQI.

# After landing

FUEL				
RAMP	USED	REMAINING	PLAN UPLIFT	ACTUAL UPLIFT
3030 kg	775kg	2 255 kg	... kg	... kg

- FUEL USED vs FUEL QUANTITY INDICATION



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## FUEL USED:

Check Fuel USED

## FUEL REMAINING:

Check FQI.

“

<https://safety.atr-aircraft.com/>

**into safety**

**FUEL QUANTITY INDICATION SYSTEM AND FUEL POLICY**  
 By Sébastien SELLEM  
 ATR Flight Safety – Accident /Incident Investigator - Type Rated ATR Pilot.



The ATR fleet has encountered events associated with erroneous fuel quantity indication.

**1. FUEL SYSTEM**

The fuel quantity indicating system informs the crew of the quantity of fuel available in each tank during the flight using 5 (ATR42) or 6 (ATR72) probes per wing tank.



FQI – ATR Legacy



FQI – ATR-600 version

The accuracy on the total fuel indication, on ground, with an attitude within -3° and +1° of pitch and ±2° of roll is:

- ±1 % of full scale near zero level
- ±3 % of full scale at full level.

For all other ground and flight conditions, outside this envelope (pitch and roll) accuracy of fuel indications will be degraded.

**2. REFUELING MANAGEMENT**

By European regulation (CAT.OP.MPA.260), the captain is responsible to verify before each flight that the aircraft carries at least the planned amount of usable fuel to complete the flight safely, considering the expected operating conditions.  
 By European regulation (CAT.OP.MPA.150), the operator shall establish a fuel policy to ensure that every flight carries sufficient fuel for the planned operation.

The following procedure is the expected actions that should be taken by the crew.

# Evolution

CONDITION	VISUAL	AURAL
Fuel quantity indication below 160 kg (352 lb)	- MC light flashing amber - <b>FUEL</b> amber message on CAP - LO LVL amber light on FUEL QTY indicator	SC
Fuel quantity indication below 160 kg (352 lb) - OR - Feeder tank not full	- MC light flashing amber - <b>FUEL</b> amber message on CAP - LO LVL amber light on FUEL QTY indicator	SC



**ATR** ACTIVE | **ATRnavX**

DM status information  
+  
**ON A/C MSN ALL**  
**TASK ATR-A-12-11-28-00001-310A-A**  
Visual Examination of the Fuel Level with the Manual Magnetic Indicators

**NSU.28.3.4 Use of Manual (Magnetic) Indicators**

19 SEP 2017

Each tank is equipped with two indicators:



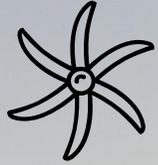
## Retrofit

- MFC S4
- SB ATR42-28-0033
- FQI update

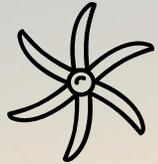
## 2024:

- Create SB ATR72-XX-XXXX
- Review of the MP “Visual Examination of the Fuel Level with the Manual Magnetic Indicator”.
- Review the FCOM accordingly.
- Launch the “Fuel System Measurement Accuracy Characterization”

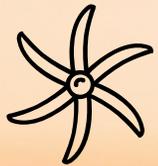
# Conclusion



**Fuel policy is not an option**



**Make sure you have a fuel policy in place**



**Make sure your crews use it**