



WORLDWIDE  
**FLIGHT SAFETY  
CONFERENCE**

**BANGKOK 2018**  
27<sup>TH</sup> – 28<sup>TH</sup> JUNE

**ATR**  
PROPELLING THE NEXT CONNECTION

# Engine Fire Warning During Steep Slope Descent In Landing Configuration

Publication of OEB n°32  
AOM: 42/72/2017/07 issue 1

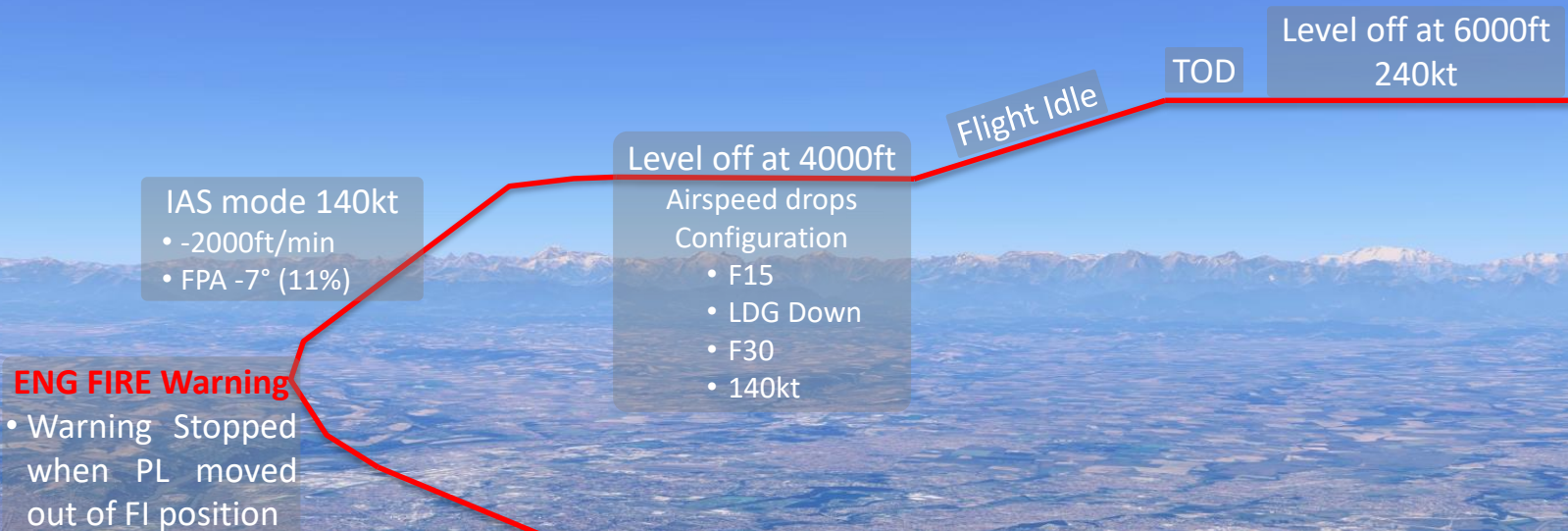


**Jérôme PFEIFFER**  
Flight Safety Director  
Accident Investigator

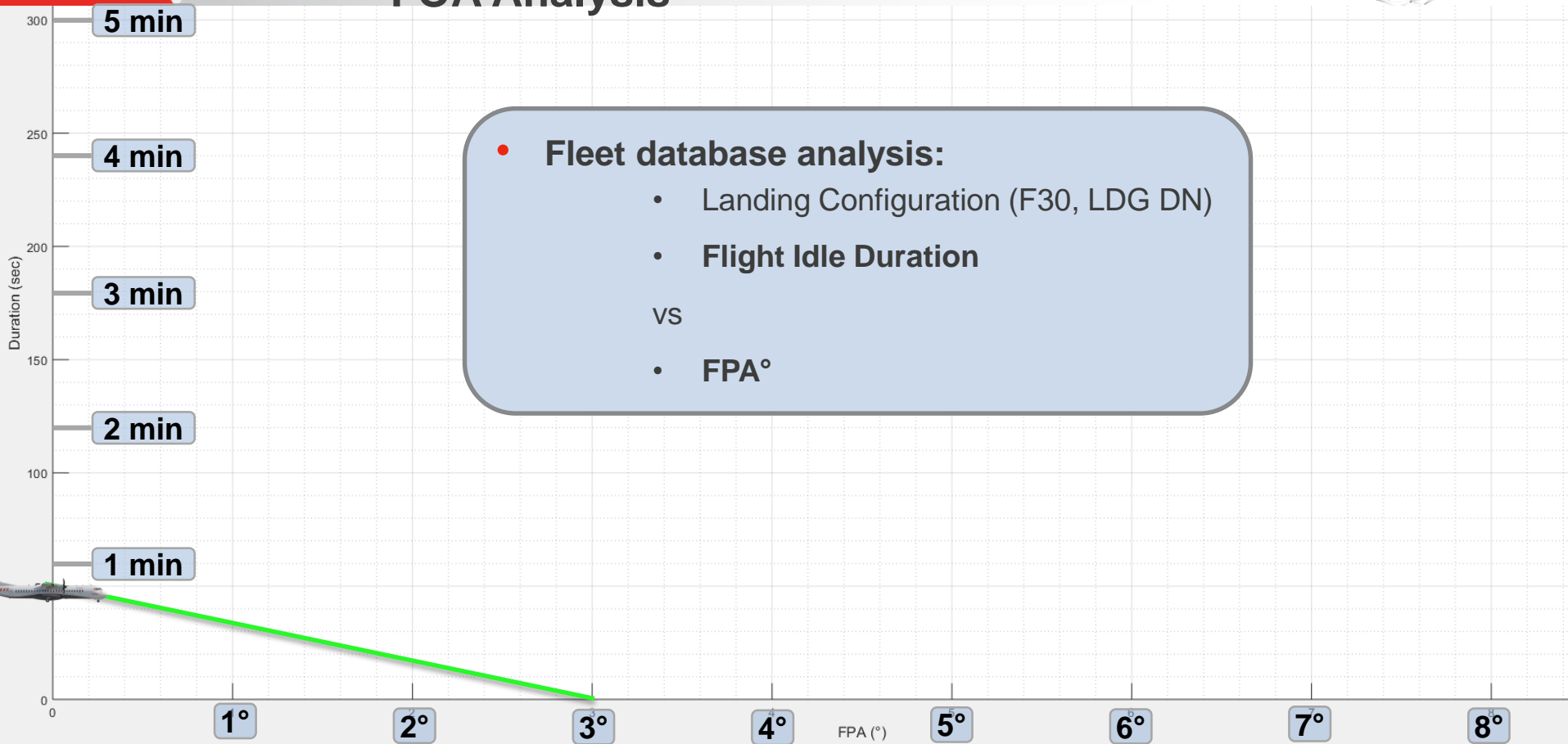
# Engine Fire Warning Events

- **17 Engine Fire Warning events reviewed in similar conditions since 2015**
  - **During steep slope descent at low speed**
    - Around 130 kt to final approach speed
    - Descent Flight Path Angle  $>5.5^\circ$  (9.6%) and Descent Rate  $>2000\text{ft}/\text{min}$
    - Pitch attitude  $> -7^\circ$
  - **In landing configuration**
    - Gear Down, Flaps 30 or 35 set at high altitude (above 4000ft)
  - **Power Levers maintained at Flight Idle: Average 2min in FI**
  - **No traces of Fire**

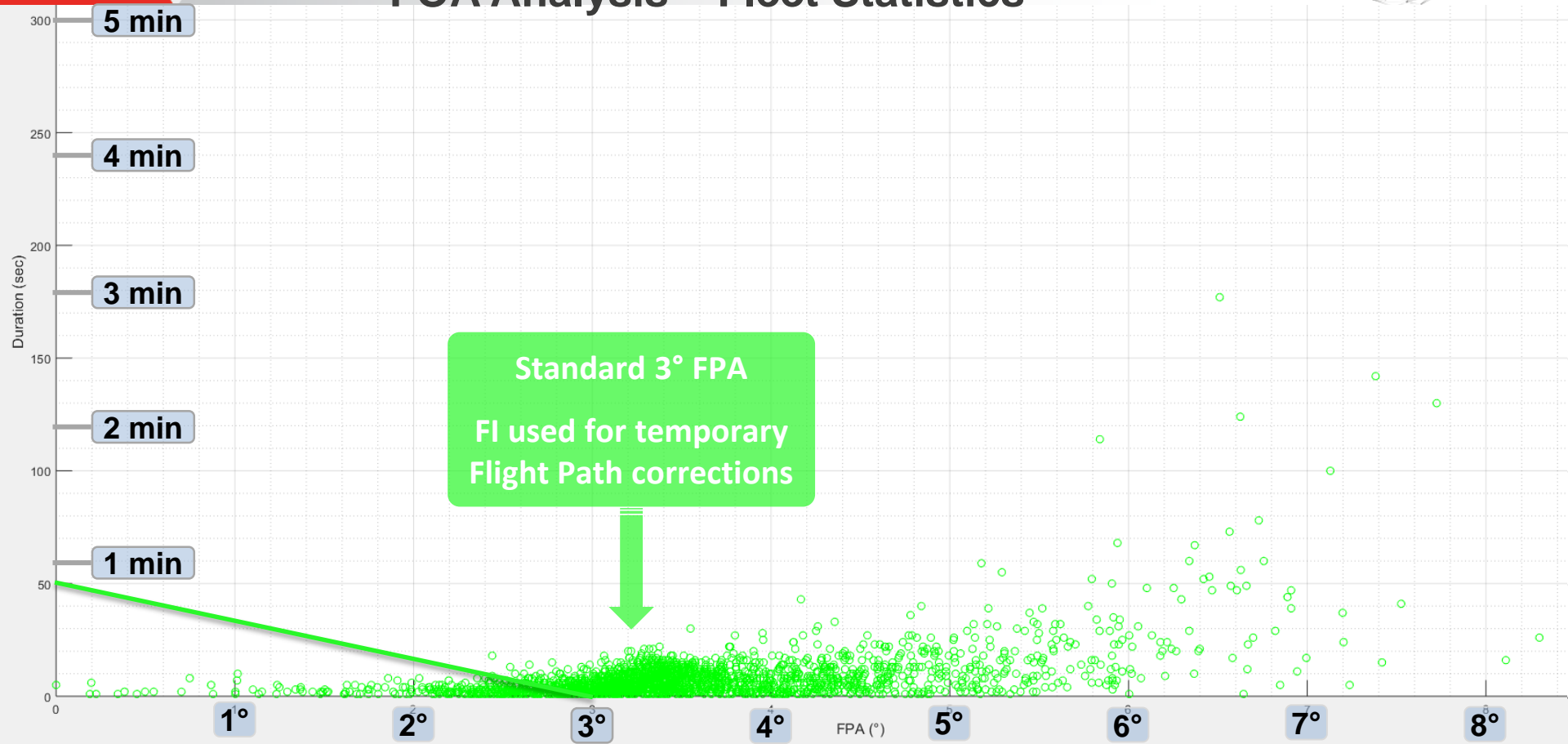
# Typical Event



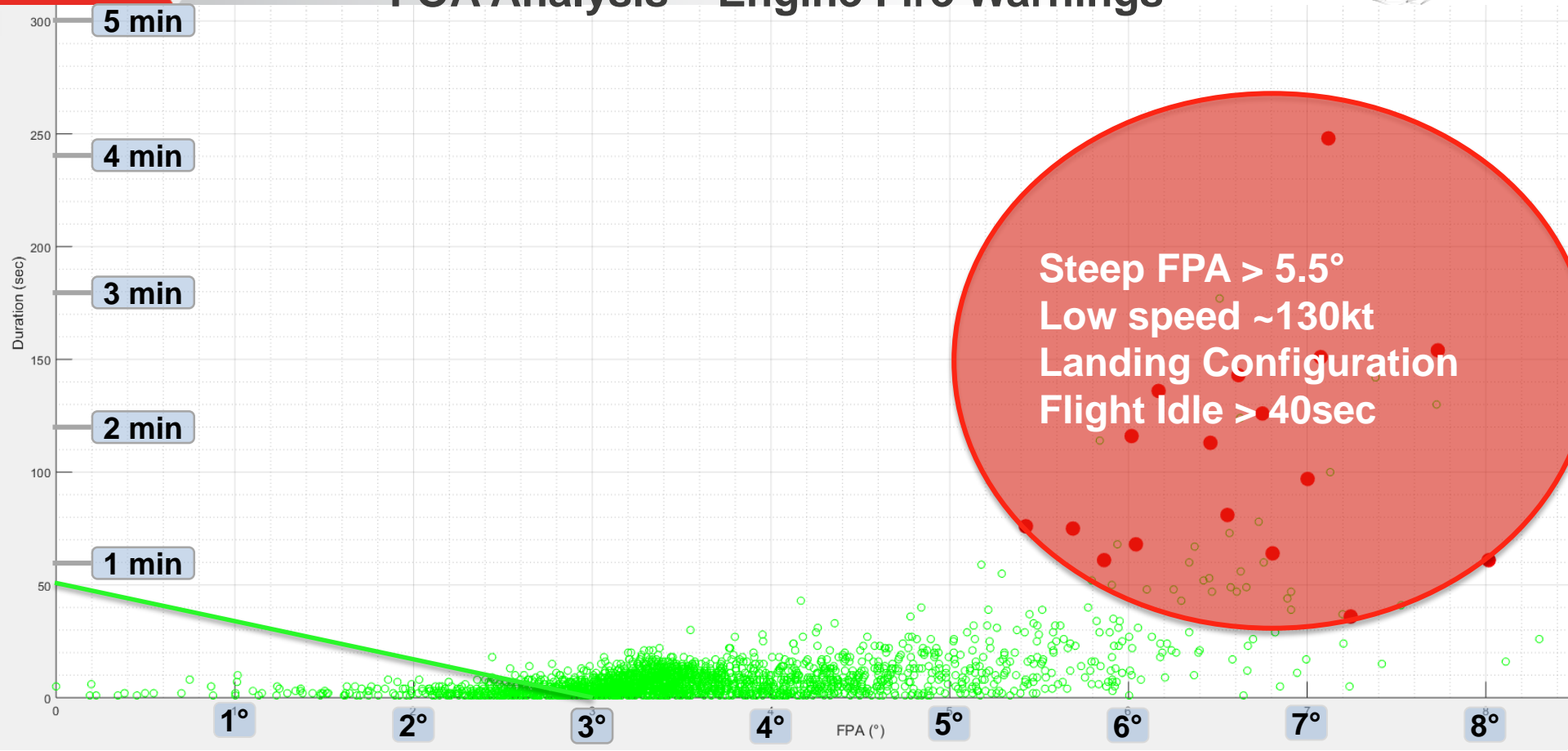
# FOA Analysis



# FOA Analysis – Fleet Statistics



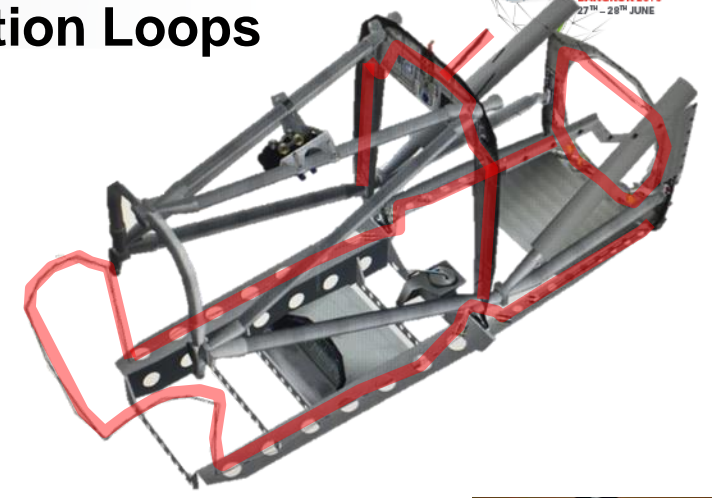
# FOA Analysis – Engine Fire Warnings



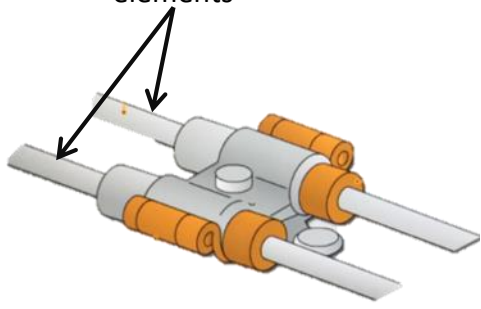
# Nacelle Ventilation



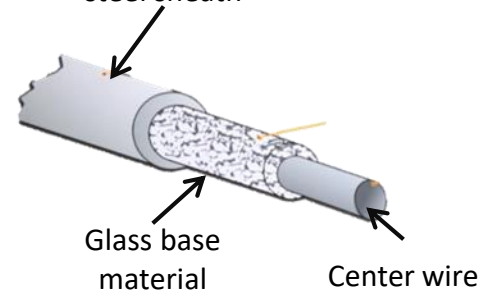
# Engine Fire Warning Detection Loops



Sensing elements

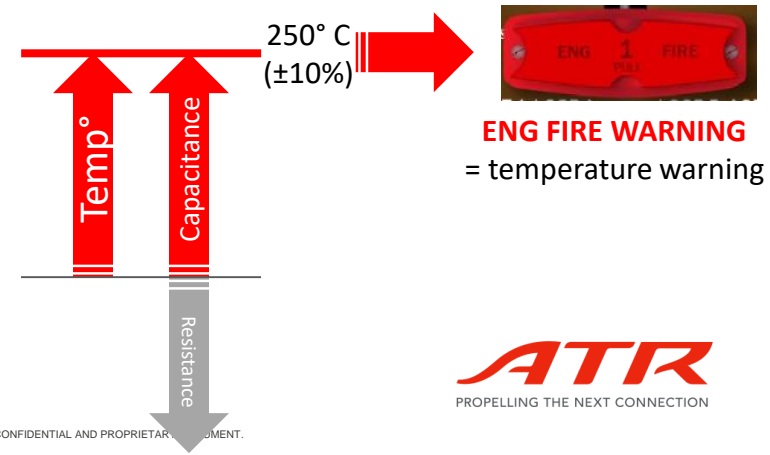


Outer stainless steel sheath

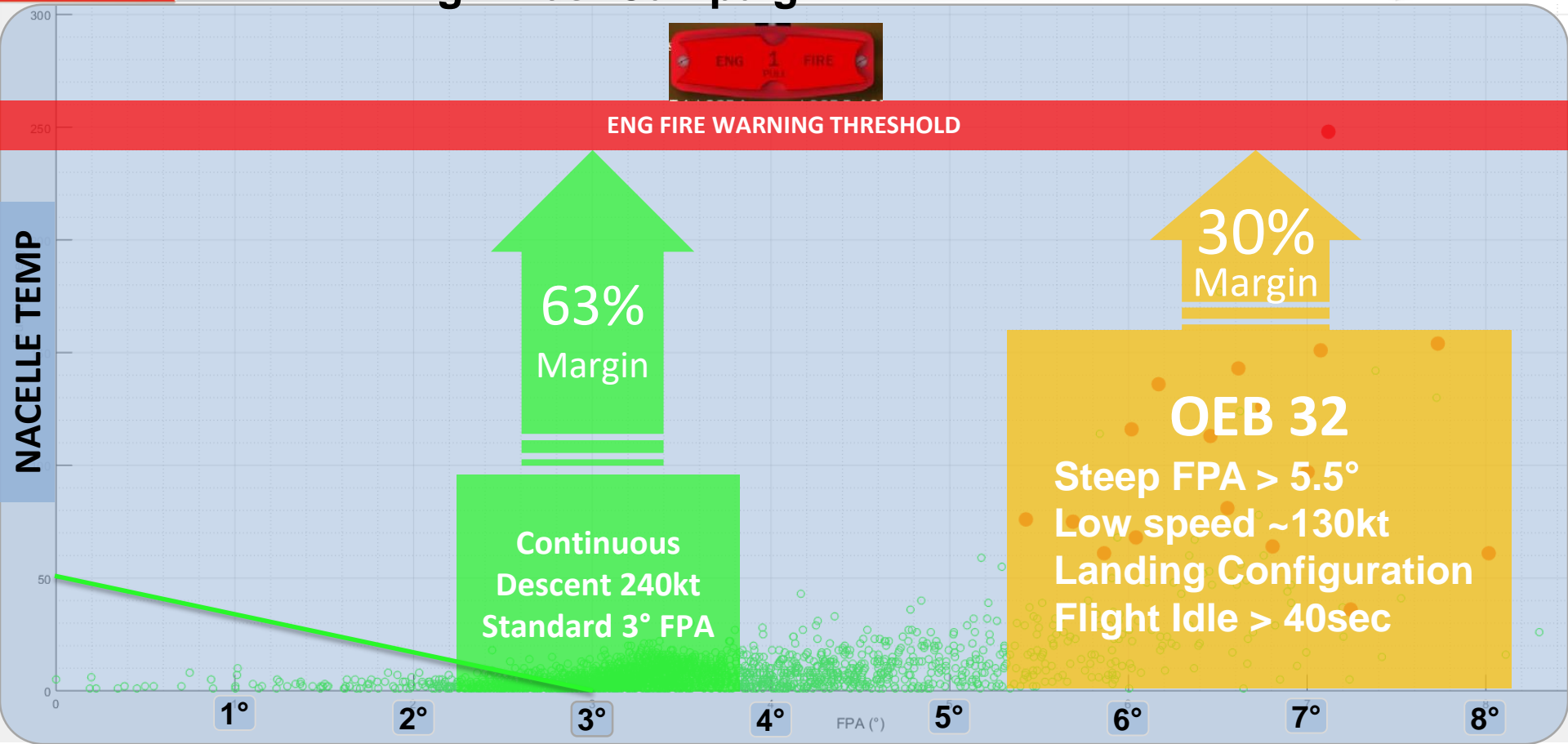


Glass base material

Center wire



# Flight Test Campaign



ENG FIRE WARNING THRESHOLD

63%  
Margin

Continuous  
Descent 240kt  
Standard 3° FPA

30%  
Margin

OEB 32  
Steep FPA > 5.5°  
Low speed ~130kt  
Landing Configuration  
Flight Idle > 40sec

NACELLE TEMP

1°

2°

3°

4°

FPA (°)

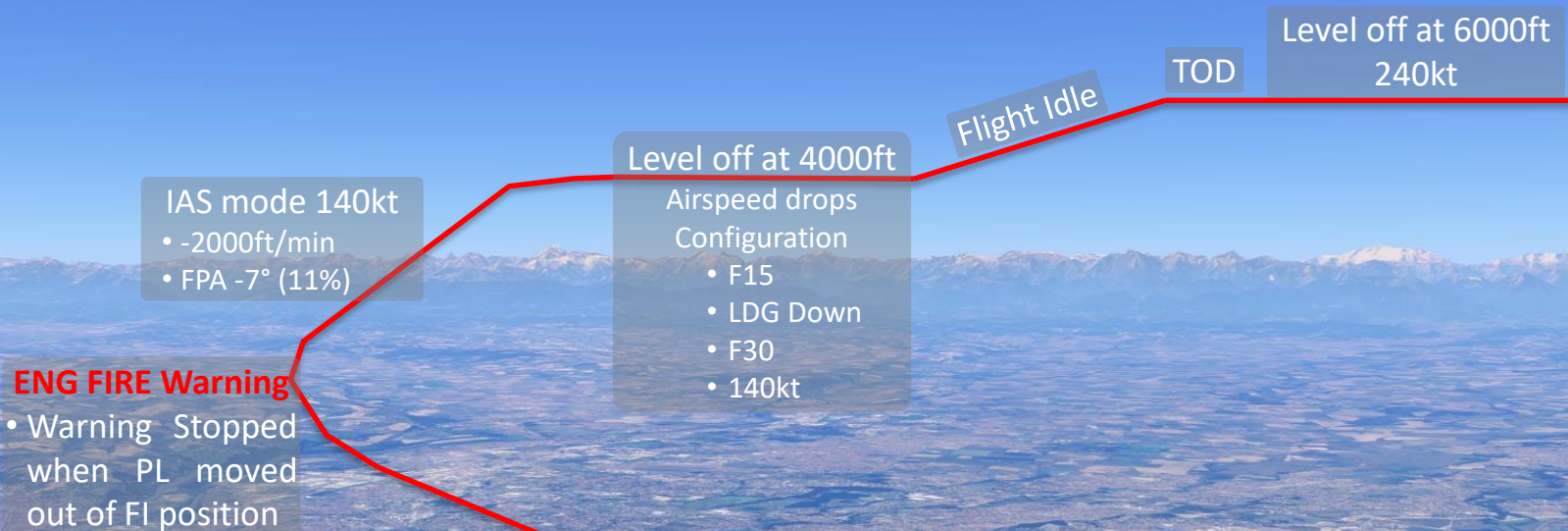
5°

6°

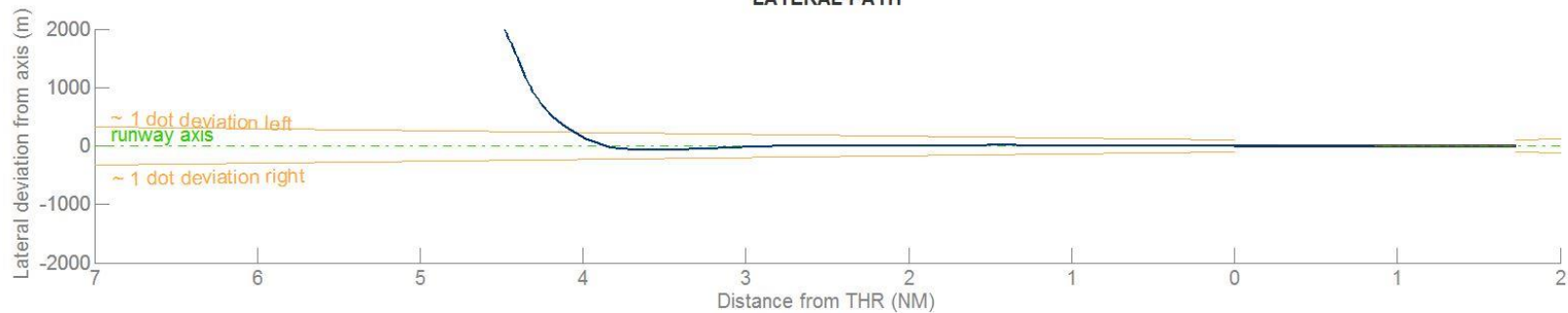
7°

8°

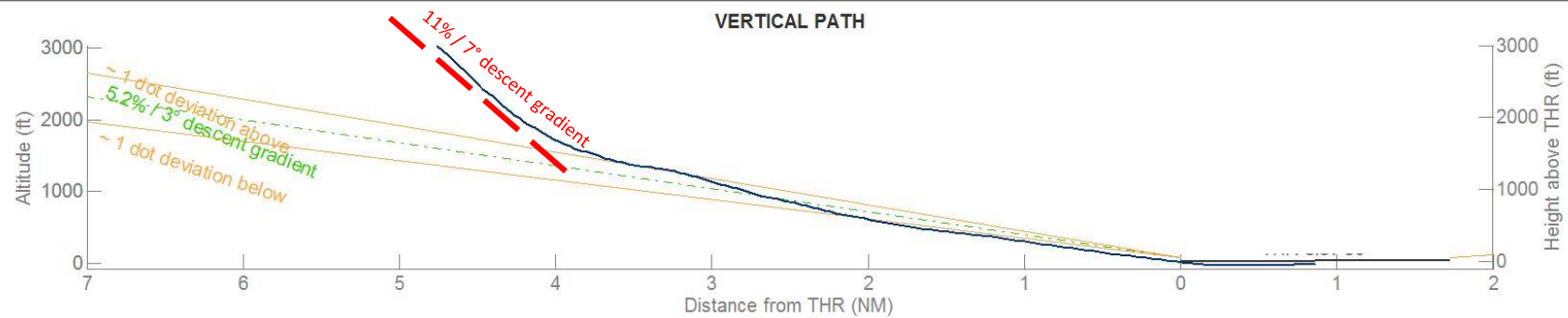
# Typical Event



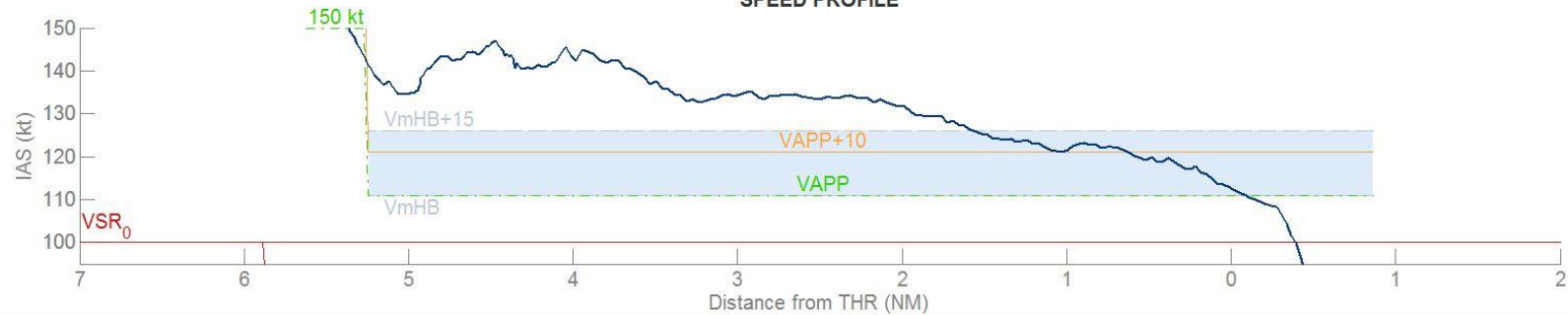
### LATERAL PATH



### VERTICAL PATH



### SPEED PROFILE



# Recommendations

- Unpredictable Vertical Flight Path
- Unstabilised Aircraft Energy State
- No standard stabilisation gates for PM
- High Flight Crew workload to cope with **EMERGENCY**

- Passengers discomfort (15° pitch down attitude)

IAS mode 140kt

- -2000ft/min
- FPA -7° (11%)

ENG FIRE Warning

- Warning Stop
- when PL moved

## Recommendations

- Continuous Descent from Top Of Descent
- Standard 3° FPA
- Predetermined vertical flight path
- Stabilised approach: energy & gates
- Less workload to cope with **EMERGENCY**

# Recommendations

GM1 CAT.OP.MPA.115 Approach flight technique — aeroplanes

CONTINUOUS DESCENT FINAL APPROACH (CDFA)



(a) Introduction

- (1) Controlled flight into terrain (CFIT) is a major hazard in aviation. Most CFIT accidents occur in the final approach segment of non-precision approaches; the use of stabilised-approach criteria on a continuous descent with a constant, predetermined vertical path is seen as a major improvement in safety during the conduct of such approaches. Operators should ensure that the following techniques are adopted as widely as possible, for all approaches.

## Recommendations

- Continuous Descent from Top Of Descent
- Standard 3° FPA
- Predetermined vertical flight path
- Stabilised approach: energy & gates
- Less workload to cope with **EMERGENCY**

# Operational Documentation

## FCOM OEB 32

FFFC ATA 42/2	OPERATORS ENGINEERING BULLETIN	# 1
F.C.O.M.	O.E.B. N° 32	Issued by OCT 17

**SUBJECT:** ENG FIRE warning during steep slope descent in landing configuration with Power Levers at Flight Idle

**1. Reason for issue**

This OEB is issued to inform and provide operators with operational recommendations following a series of reports of engine ENG FIRE warning that occurred in the following conditions:

- During steep slope descent at low speed (around 130 kt) to final approach speed,
- In landing configuration (Gear Down, Flaps 30 or 35) and at high altitude,
- Power Levers (idle) management at Flight Idle.

In such conditions, the engine operation is reduced and the engine temperature may reach the engine fire detection threshold triggering the ENG FIRE warning. In some of these situations, events associated with the above conditions, the ENG FIRE warning stopped when the Power Levers were advanced above Flight Idle position.

**2. Risk assessment**

Investigations are in progress to define the appropriate corrective actions.

**3. Operational recommendations**

ATR recommends to plan and to perform a standard 3° to 5° descent flight path from top of descent, in clean configuration, IAS 240 kt.

If for any reason, during the final descent in landing configuration, the power levers have to be set in flight idle this shall be for temporary flight path corrections only.

In addition, ATR considers that engine ENG FIRE warning is associated with temperature increase in the months with the incidence of the "Incident". Any ENG FIRE warning, even temporary, must be reported to operator's maintenance in order to conduct the appropriate routine inspections and subsequent maintenance actions if required.

**4. Procedures in case of ENG FIRE warning, in landing configuration, with PL at FI**

Following procedure has to be applied **only** in the following conditions:

- During steep slope descent at low speed (around 130 kt) to final approach speed, and
- In landing configuration (Gear Down, Flaps 30 or 35) and at high altitude, and
- Power Levers (idle) management at Flight Idle.

■ ENG 1/2 FIRE warning during steep slope descent in landing configuration with PL at FI

- ▶ PL 1/2 → ADJUST ABOVE 10% TO
  - If ENG 1/2 FIRE warning stops before V1
    - ▶ PL 1/2 → ADJUST ABOVE 10% TO LAND ASAP
  - If ENG 1/2 FIRE warning persists after V1
    - ▶ ENG 1/2 FIRE OR SEVERE MECHANICAL DAMAGE IN FLIGHT procedure – APPLY
- ▶ Report to maintenance facilities must be reported in accordance with the appropriate maintenance procedures.

ENG FIRE  
Warn  
when  
out of

## AOM

### 42/72/2017/07 issue 1

TOD

Level off at 6000ft  
240kt

ATR	
Date: 08 February 2017	Ref: AOM 42/2018/14 issue 2
Aircraft models: ATR42 and ATR72	ATA 32
<b>SUBJECT:</b> SLG brakes and tires damage during taxi or following Aborted Take-Off	
<b>REASON</b>	
Some cases of tires skidding, brake smoke emission or brake fire have been reported on in-service ATR types.	
The investigations revealed that the factors contributing to increase the energy absorbed by the brakes and subsequent tire or brake damage are:	
<ul style="list-style-type: none"> <li>• An inappropriate setting of engine power levers above Ground Idle during taxi or aborted take-off, or</li> <li>• Inappropriate use of brakes.</li> </ul>	
To prevent such damage, the aim of this AOM is to reinforce the existing good practices and to inform about the Aborted Take-Off procedures.	
<b>DESCRIPTION</b>	
Some reports of the SLG skidding to reduce the aircraft speed, an important part of the aircraft kinetic energy is converted into heat within the SLG brakes and wheels, or into the amount of energy to be dissipated by the tires, the aircraft may be subject to operational and safety consequences such as tire deflation, reduced braking efficiency or tire fire.	
The analysis of such events have shown that the major part of the energy absorbed by the SLG is before take-off or the taxi that ground speeds were set to flight idle instead of Ground Idle during aborted take-off or/and subsequent taxi. As a consequence a continuous use of brakes was necessary to maintain engine rotation at appropriate taxi speed.	
AOM 42/2018/14 issue 2	13

### 3- Operational recommendations

ATR recommends to plan and to perform a standard 3° to 5° descent flight path from top of descent, in clean configuration, IAS 240 kt.

If for any reason, during the final descent in landing configuration, the power levers have to be set in flight idle this shall be for temporary flight path corrections only.

# Operational Documentation

**FCOM**  
**OEB 32**

**AOM**  
42/72/2017/07 issue 1

Level off at 6000ft  
240kt

TOD

## 4- Procedure in case of ENG FIRE warning, in landing configuration, with PL at FI

Following procedure has to be applied only in the following conditions:

- During steep slope descent at low speed (around 130 kt to final approach speed), and
- In landing configuration (Gear Down, Flaps 30 or 35) set at high altitude, and
- Power Levers durably maintained at Flight Idle.

### ■ If ENG 1(2) FIRE warning during steep slope descent in landing configuration with PL at FI

▶ PL 1+2 ..... ADJUST ABOVE 10% TQ  
*TQ increase improves the nacelle ventilation*

#### ■ If ENG 1(2) FIRE warning stops before 10 s

▶ PL 1+2: MAINTAIN ABOVE 10% TQ  
**LAND ASAP**

#### ■ If ENG 1(2) FIRE warning persists after 10 s

▶ ENG 1(2) FIRE OR SEVERE MECHANICAL DAMAGE IN FLIGHT procedure.....APPLY

▶ Report to maintenance

*Nacelles must be inspected in accordance with the appropriate maintenance procedures.*

Validity: All aircraft

ENG FI

- Warn
- when
- out of

# Use of Continuous Descent Flight Path on Standard Descent 3°



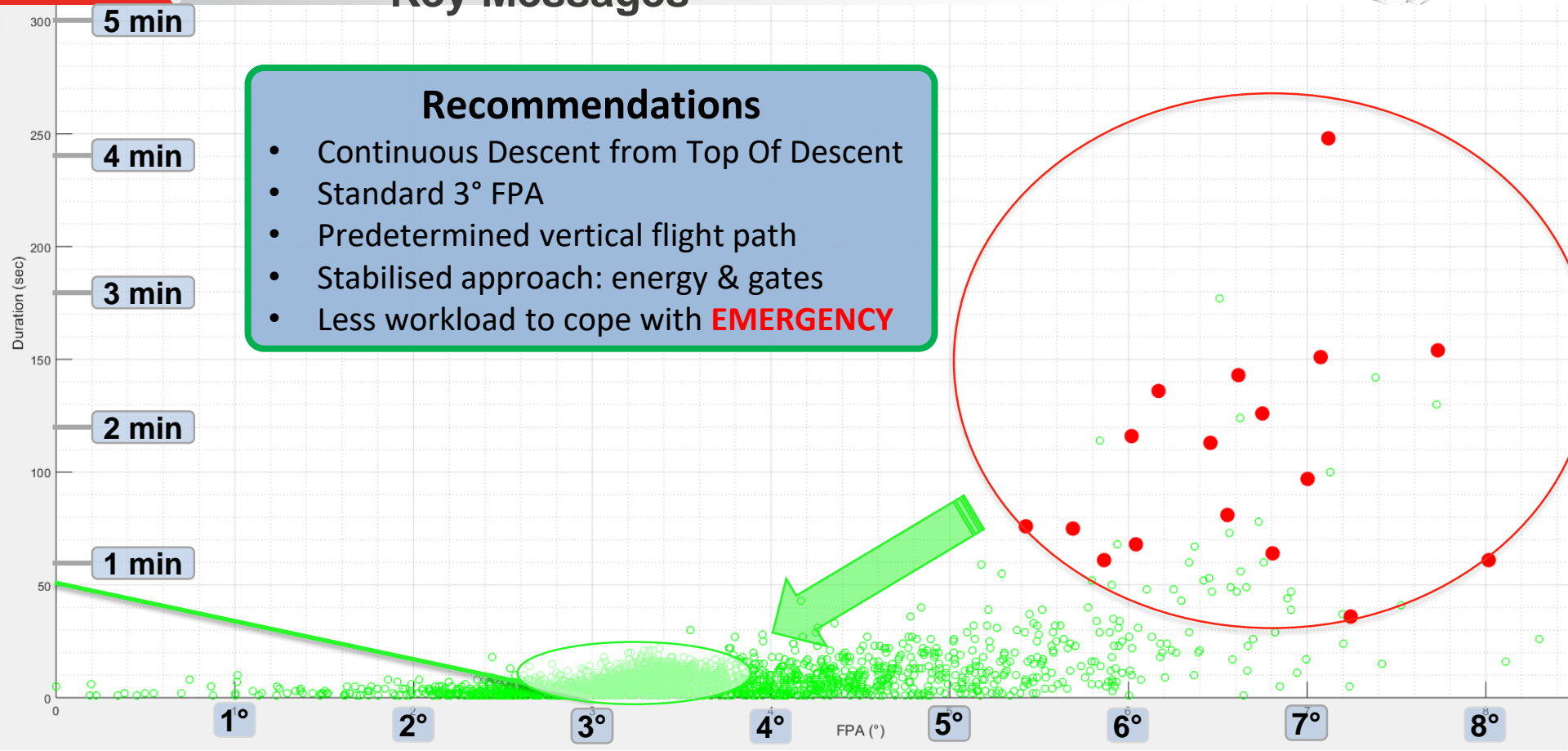
**FPA 7° (11%)**

FU 250kg  
Time 18'

**Standard FPA 3° (5.2%)**

Continuous Descent  
Decelerated approach 240kt  
Stabilized Landing Conf 1000ft  
FU 240kg  
Time 19'

# Key Messages





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