

Presented by

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# Dispatch with Upper Wing Frost

Latest update



**AIRBUS**

# Content

➤ Clean Wing Concept

➤ Survey Results

➤ Airbus Objective

➤ Mitigation Means

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➤ Clean Wing Concept

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➤ Mitigation Means

# Current Airbus Recommendations

- Clean wing concept remains applicable
  - ▶ Except for:
    - Upper surface of the fuselage
    - Lower wing up to 3mm (1/8 inch)

## **SURFACES . . . . . CHECKED FREE OF FROST, ICE AND SNOW**

All surfaces of the aircraft (critical surfaces : leading edges and upper surfaces of wings, vertical and horizontal stabilizers, all control surfaces, slats and flaps) must be clear of snow, frost and ice for takeoff.

Thin hoarfrost is acceptable on the upper surface of the fuselage.

*Note : Thin hoarfrost is typically a white crystalline deposit which usually develops uniformly on exposed surfaces on cold and cloudless nights ; it is so thin that a person can distinguish surface features (lines or markings) beneath it.*

On the underside of the wing tank area, a maximum layer of 3 mm (1/8 inch) of frost will not penalize takeoff performance.

# Content

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# Survey Results (Answers)

- About 120 answers on all Airbus aircraft type (except A380)

	<b>Answers</b>
<b>A320</b>	<b>77</b>
<b>A330/A340</b>	<b>32</b>
<b>A300/A310</b>	<b>10</b>
<b>Total</b>	<b>119</b>

- 8 airlines not affected



# Survey Results (Answers)

- 27 airlines scattered around the world

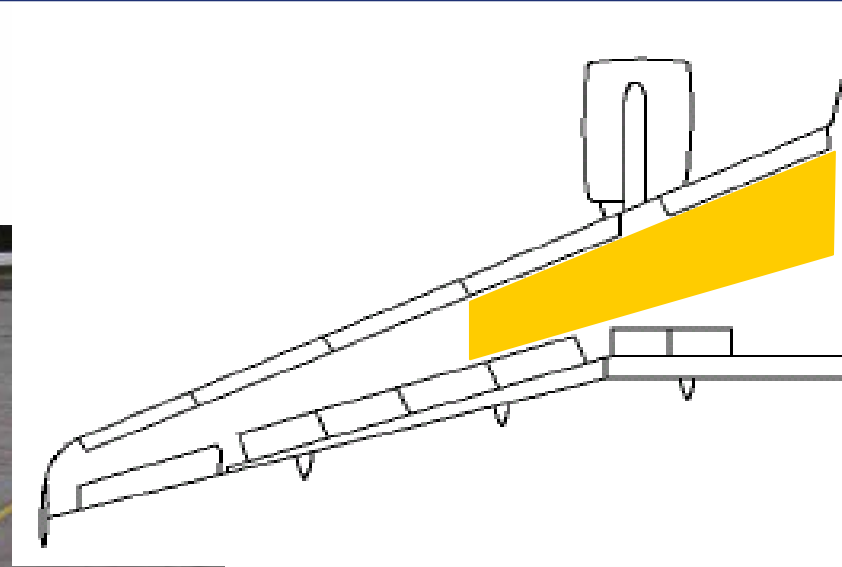


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# Survey Results (Frost Distribution)

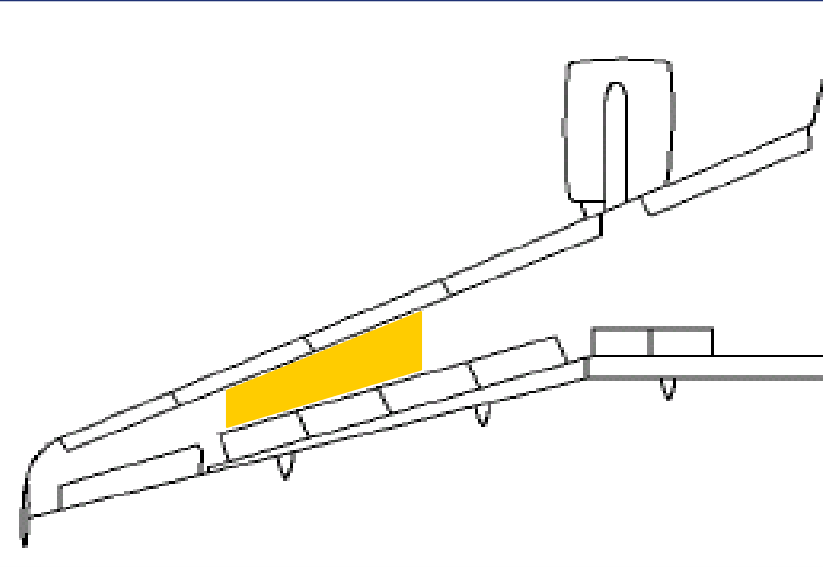
- Inner fuel tank





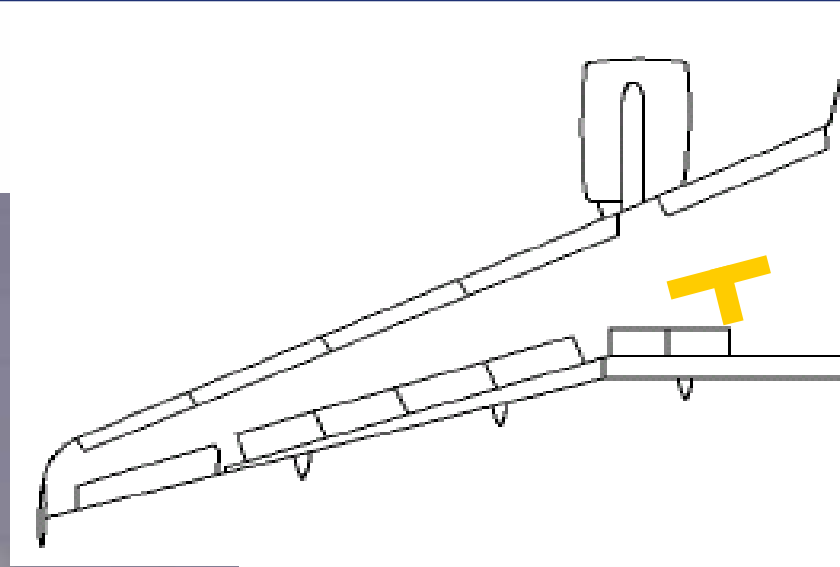
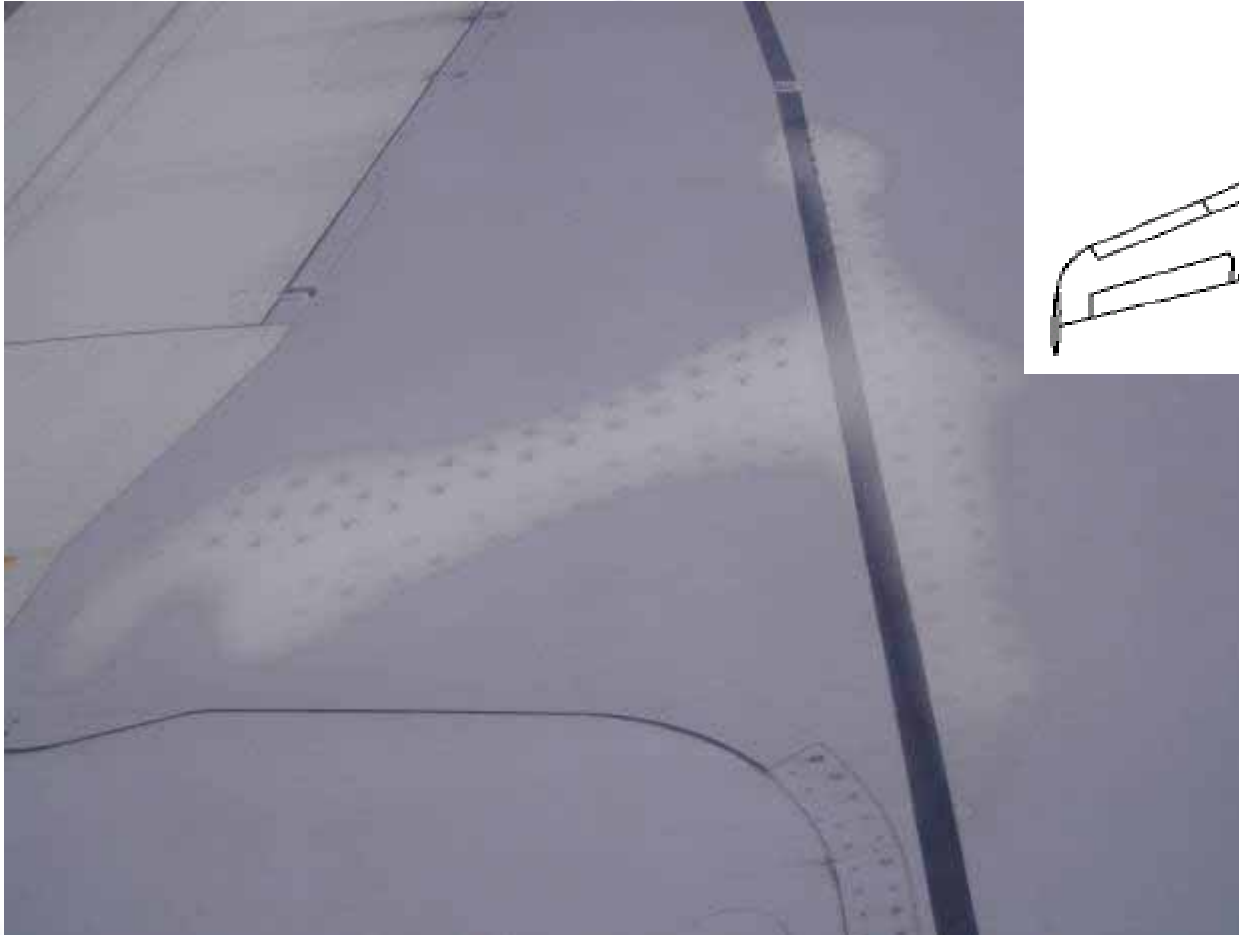
# Survey Results (Frost Distribution)

- Outer fuel tank



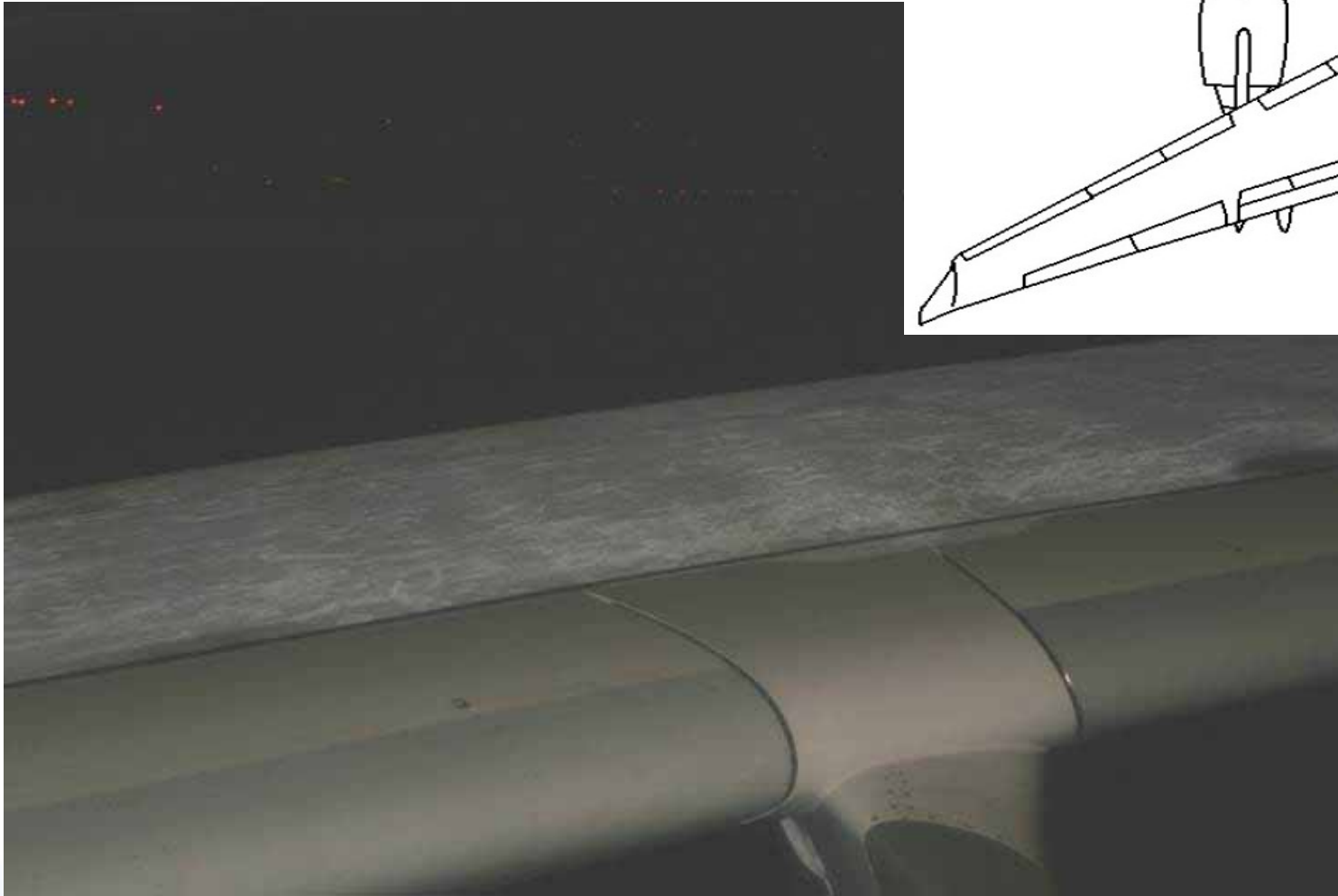
# Survey Results (Frost Distribution)

- Above landing gear structure



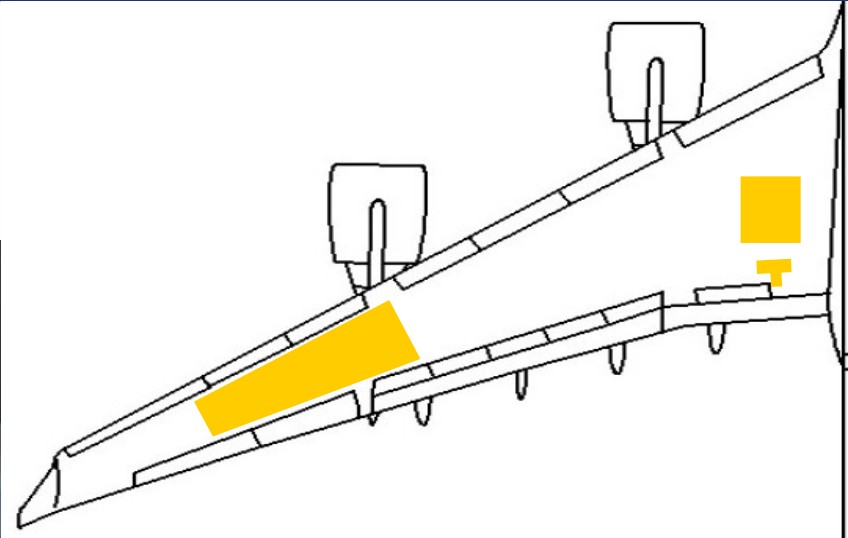
# Survey Results (Frost Distribution)

- Inner fuel tank



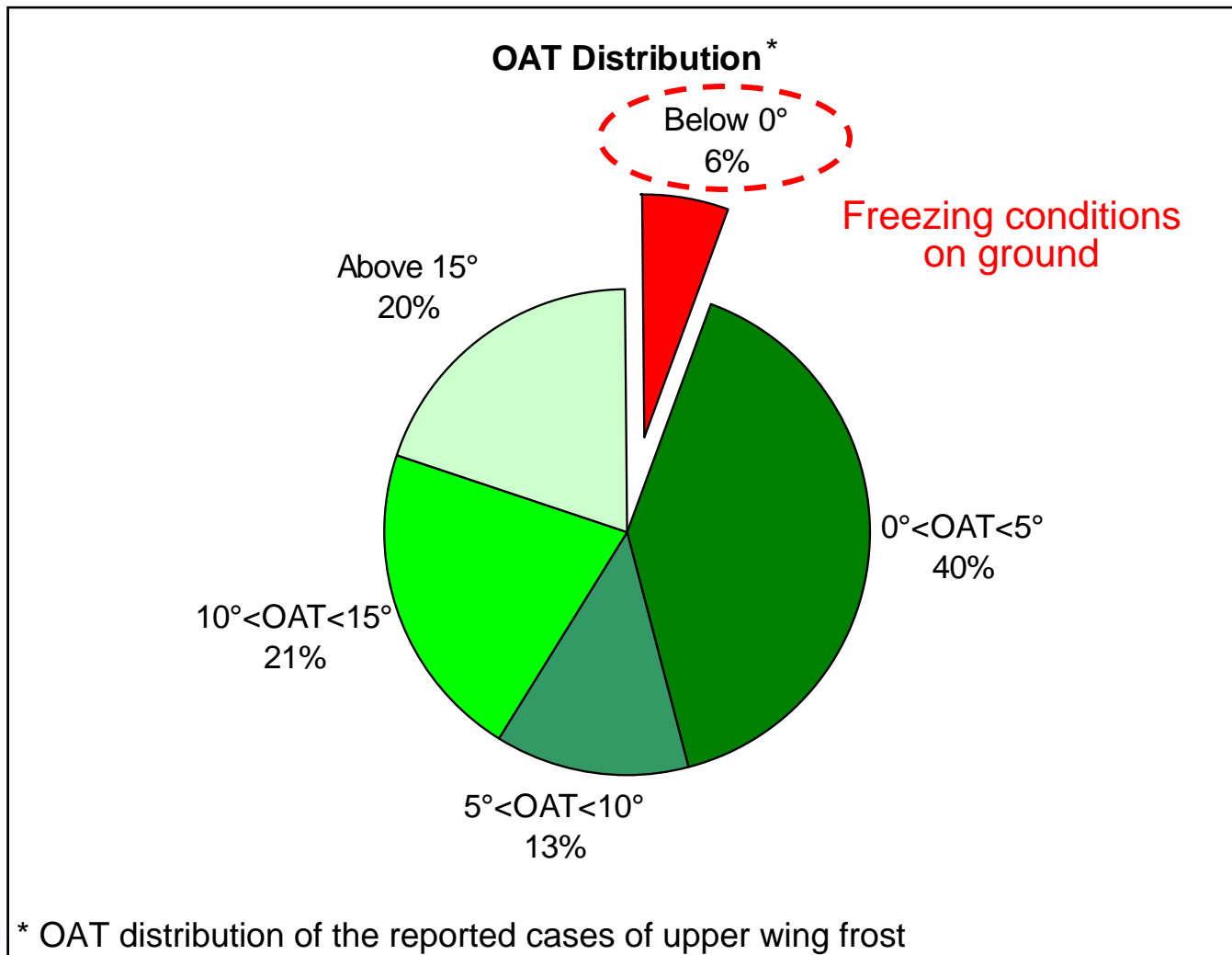
# Survey Results (Frost Distribution)

- Outer fuel tank, fuel collector cell and landing gear structure



# Survey Results (OAT)

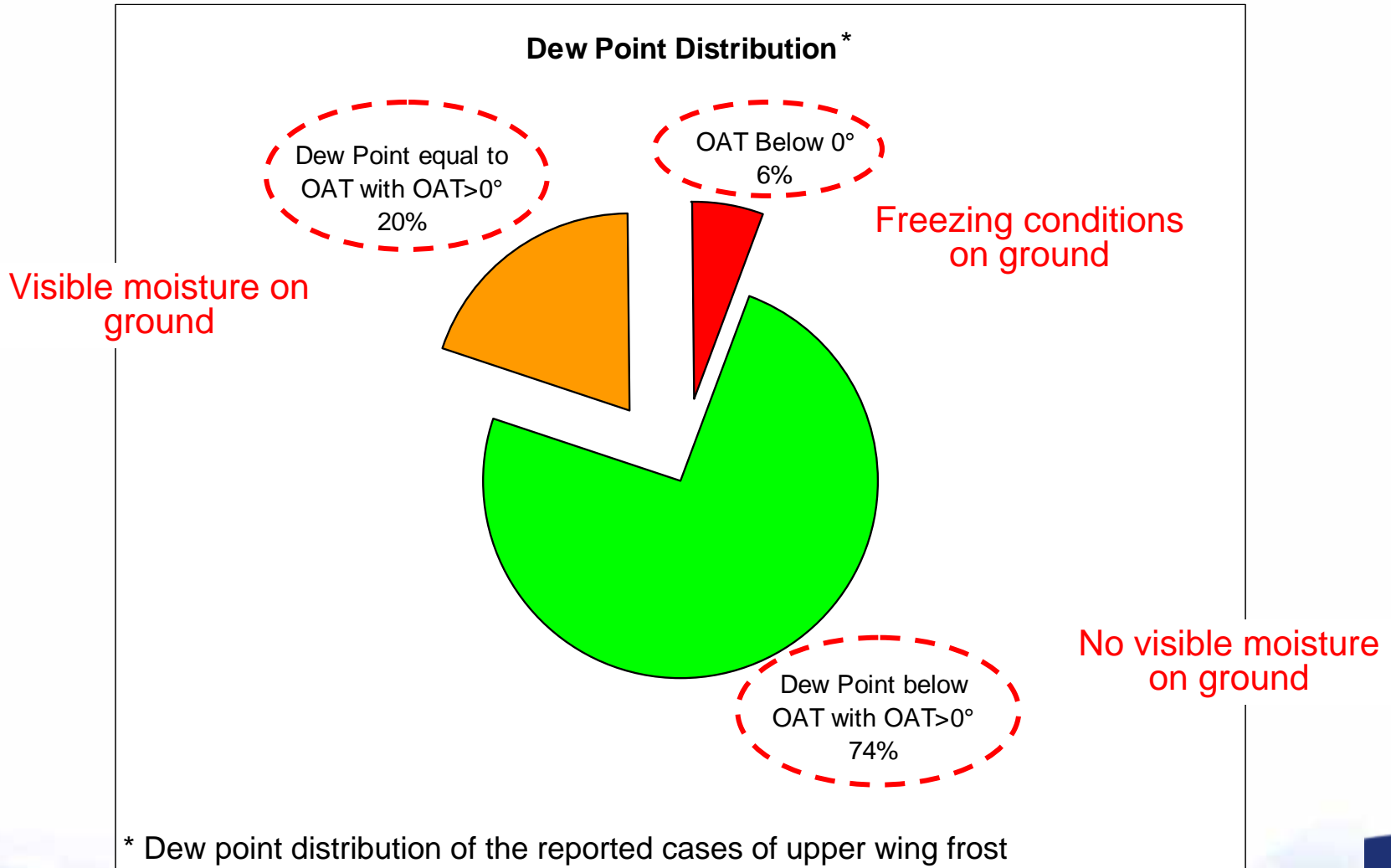
- OAT Reported





# Survey Results (Dew Point)

- Dew Point Reported



# Content

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➤ Survey Results

➤ Airbus Objective

➤ Mitigation Means

# Airbus Objective

- Obtain certification for dispatch with upper wing frost
  - ▶ Area outlined on the wing by painted lines
  - ▶ Frost distribution symmetrical
  - ▶ Maximum thickness of about 1.5 mm (1/16 inch)
  - ▶ No frost on control surfaces
  - ▶ OAT above freezing, and
  - ▶ No visible moisture or precipitation
  
- This would cover up to 74% of the reported cases during our survey

# Operational Advantages

- Lower operational costs



Comments from airlines:

"Spot deicing [for upper wing frost] is between \$300 and \$800"

"On some destinations, we have to pay more than \$1200 for this procedure almost regardless of contaminant amount"

# Operational Advantages

- Lower operational costs
- Higher fuel tankering value



Money saved with fuel tankering



Deicing costs



Savings



# Operational Advantages

- Lower operational costs
- Higher fuel tankering value
- Lower turn around time



Having to deice even on a warm sunny day?

# Operational Advantages

- Lower operational costs
- Higher fuel tankering value
- Lower turn around time
- Higher dispatch reliability



# Operational Advantages

- Lower operational costs
- Higher fuel tankering value
- Lower turn around time
- Higher dispatch reliability
- Lower delay



Waiting for your turn at the deicing pad?



# Operational Advantages

- Lower operational costs
- Higher fuel tankering value
- Lower turn around time
- Higher dispatch reliability
- Lower delay
- Lower environmental impact



# Estimated Cost due to Deicing

- Cost of fuel
  - ▶ A320: 300 kg
  - ▶ A330: 800 kg
  - ▶ A340-500: 1200 kg / A340-300: 700 kg
  - ▶ A380: 1800 kg
  - ▶ A310/A300-600: 700 kg
- Cost of deicing procedure
  - ▶ Depends on aircraft size and airports
  - ▶ Varies from \$300 to \$5000
- Cost of delay
  - ▶ Airbus, Average 30min delay cost:
    - A320 Family: \$1000
    - A330/A340: \$2500
    - A380: \$3500
    - A310/A300-600: \$1500



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# Mitigation Means – Avoid Frost

- How to avoid frost contamination?
  - ▶ Manual fuel transfer on ground
    - Only available on A330/A340
    - Fuel transfer from outer to inner fuel tanks
    - Good feedback from operators
    - Time consuming procedure
    - Not recommended in flight
  - ▶ Limit the amount of fuel tankering
    - Avoid contact of the fuel with upper wing skin

A321	Wing Tank	3 100 l (819 US Gal)
A318 / A319 / A320	Inner Feed Tank	3 110 l (822 US Gal)
A330 / A340-200 -300	Inner Feed Tank	10 910 l (2 882 US Gal)
A340-500 -600	Feed Tank 1(4)	5 010 l (1 323 US Gal)
	Feed Tank 2(3)	13 850 l (3 659 US Gal)

# Conclusion

- OAT above freezing and no visible moisture:  $\frac{3}{4}$  of reported cases
- Airbus fully understands
  - ▶ Operational benefits and potential savings
  - ▶ Studying potential solutions and associated planning
- In the meantime, clean wing concept remains applicable
  - ▶ ... but mitigations means exist



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