IATA

16th MAINTENANCE COST CONFERENCE

WEBINAR SERIES

Episode 2:
Adapting to New Circumstances

TCPC; Aircraft Disinfecting; Fuel Testing & Biocide

Wed. 16 September 2020 - 7:30-9:30am EDT

IATA

- This session is **recorded**.
- Your mic is automatically **muted**.
- **Polls:** Click on Submit once you have selected your answer
- Use the **Q&A feature** on the right side of your screen to submit your questions to our panelists

Competition Law Guidelines

IATA's Legal Anti-Trust Counsel will be screening the questions

Daniel Kanter

Assistant General Counsel, IATA

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Opening Remarks

- Role of the MCC
- MCTG Data collection

  ⇨ www.iata.org/mctg
- IATA resources about COVID
- Polls and Q&A

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Our moderator today:

Rami AWADALLA

Director of Fleet Engineering -
Postholder CAMO – Etihad

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16 September 2020

Next Episodes

- **Episode 3 – Sept 23**

(7:30am EDT or 1:30pm in GVA or 7:30pm SIN)

How COVID-19 is reshaping aircraft leasing & MROs businesses

- **Episode 4 – Sept 30**

(7:30am EDT or 1:30pm in GVA or 7:30pm SIN)

The role of used serviceable material (USM) in the industry restart

Register for Episodes 3 & 4 ⇨ www.iata.org/mcc

Watch Episode 1 ⇨ www.iata.org/mcc-2020

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Episode 2 - Agenda

- 00:00 – Opening Remarks & Introductions
- 00:05 – Airline Tech Ops Regulatory Background (IATA) + Q&A
- 00:35 – Transport of Cargo in the Passenger Compartment (Airbus) + Q&A
- 01:05 – Confident Travel Initiative Aircraft Disinfection (Boeing) + Q&A
- 01:35 – Fuel Microbiological Test Kits and Biocide Treatment + Q&A
- 02:00 – Episode 2 Wrap-up

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Introductions

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Airline Tech Ops Regulatory Background

Challenges & Opportunities During and Post the COVID Crisis

Dragos Budeanu – IATA

Manager, Paperless Ops

“Who’s Driving & Where To?”

- Aviation Industry Stakeholders (e.g. Operators, Aircraft OEMs…) in answer to the need for public air transportation (pax and cargo)

- Regulators are overseeing the process for a safe, reliable, consistent and sustainable answer to the public need

The above tenets should be clearly seen by viewers from all perspectives and they are, aren’t they?

Q: Which direction does the aircraft in the picture steer to for continuing its taxi?

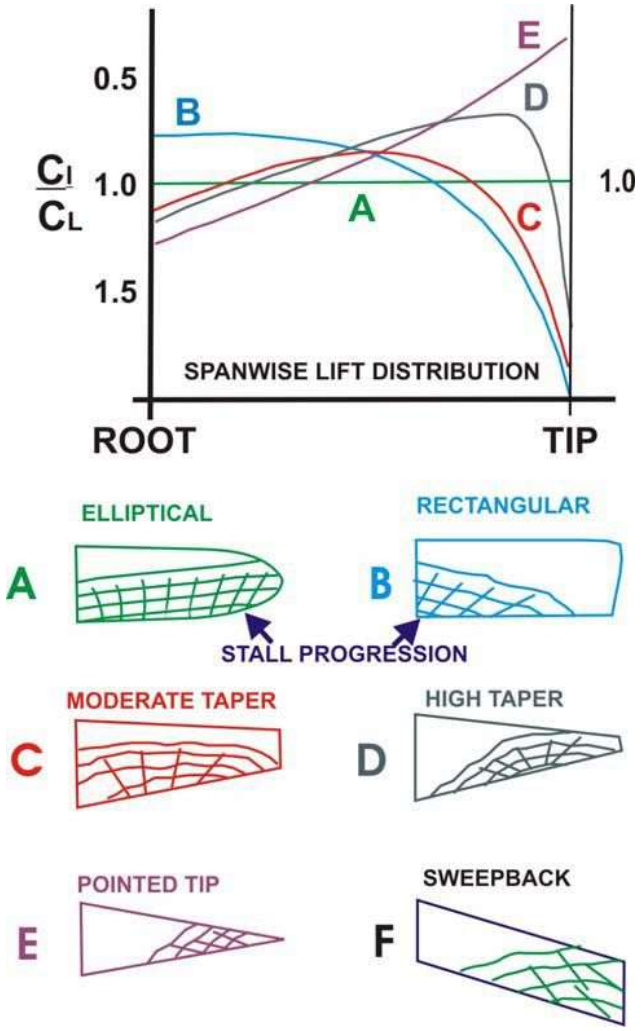
A:

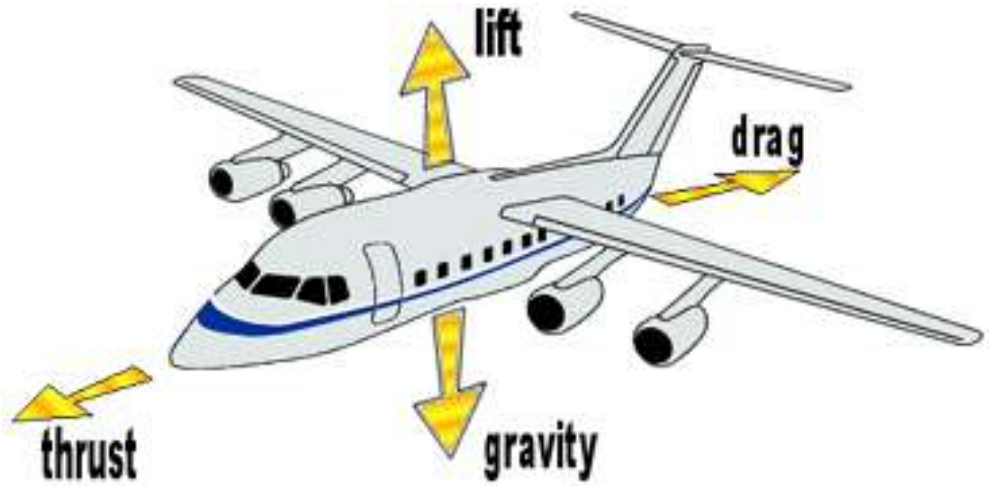
a) straight ahead

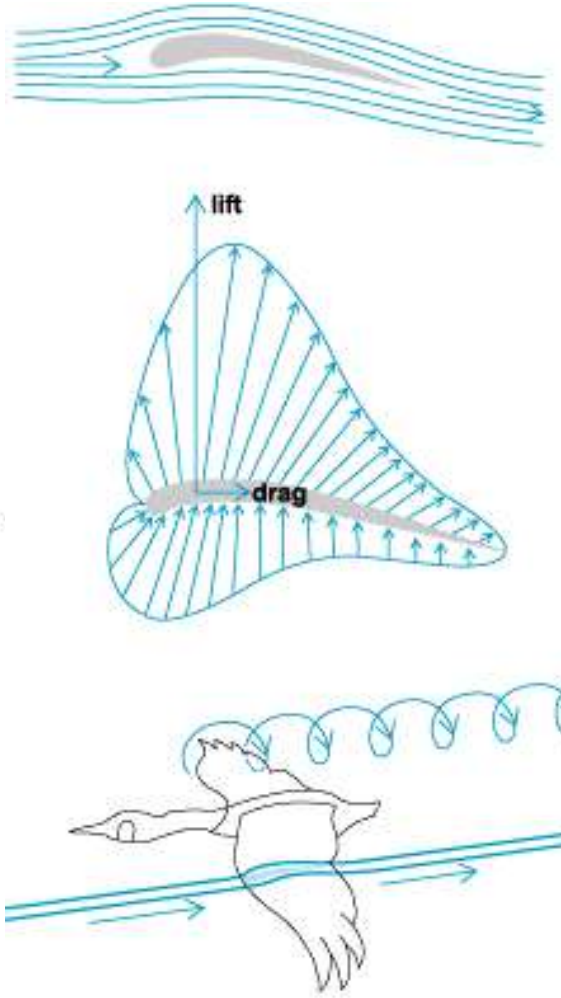
b) to the left

c) to the right

“What News Did the Crisis Bring?” Nothing!







“What News Did the Crisis Bring?” Everything!

Challenges and/or Opportunities?

- World wide fleet usage
  - aircraft status: fly-park-store
  - optimize decisions and procedures: business – technical – operational – regulatory
- Fleet re-purpose and operation re-scoping
  - cargo transportation needs vs. feasibility
- Operating with additional sanitization expectations
  - aircraft cleaning and disinfection approaches and solutions
- Issues with aircraft “fuel uplift” with no “aircraft lift”
  - handling a “flight essential” during aircraft parking times

Transporting Cargo by Air

Ideal to encourage

Options to consider

Occurrence to prevent

Definition of a Cargo Compartment

25.855 (and AMC) Cargo or baggage compartments

- General conditions to classification

25.857 (and AMC) Cargo compartment classification

- Categorization based on presence of:
  - remote or direct access observation and control by crew
  - fire or smoke detection with flight deck effect (FDE);
  - built in fire extinguishing / suppression vs. portable extinguishers
  - compartment liners
  - ventilating airflow shut-off valves (and control thereof)
- Class A, B, C (typical “belly” cargo compartment, D(old standard discontinued), E (typical main deck/cabin in all-cargo aircraft), F

The Aircraft Definition/Configuration

Cargo Compartment*	Regulatory Requirement	Passenger Cabin
Y	Fire/Smoke Detection (built-in)	N
Y	Fire Extinguishing (built-in)	N
Y	Wall Liners	N
Y	High Strength Floor Structure	N
Y	Isolate from Ventilation Air	N
Y	Contain Smoke/Gas	N
Y	Secure Tie-Down of Cargo	Possible

*Class C – lower deck cargo compartment on aircraft carrying pax

Applicable Cargo Configurations

Cargo Type	Passenger Cabin					Cargo Compartment
	Overhead Bin / Cabinet / Closet	Under Seat	On the Seats		Restrained to Seat Tracks, On Cabin Floor (seats removed)	
			In Approved Seat Bags (installed on seats)	Restrained to Seats (with nets and/or straps)		
Humanitarian Supplies / Medical and Essential Cargo	✓	✓	NAA Approval (with STC)	NAA Approval (Exemption)	NAA Approval (with STC or by TCH)	✓
General Cargo and/or mail	✓	✓	NAA Approval (with STC)	NAA Approval (Exemption)	NAA Approval (with STC or by TCH)	✓
Dangerous Goods	✗	✗	✗	✗	✗	Operator approved for Dangerous Goods ✓
Cargo Aircraft Only Dangerous Goods	✗	✗	✗	✗	✗	Operator approved for Dangerous Goods and only in Cargo Class C ✓

Transporting Cargo in Pax Cabin (TCPC)

- Limited flexibility if no NAA Approval involved (i.e. “business as usual”)
- The NAA Approval must be obtained for Design (DAH) and Operation (Airline)
- Exemption – always for limited time frame and not a sustainable business solution
- Always conditional to Operator’s Risk Assessment
- Significant set of specific risk mitigation measures must be implemented by the Operator when flying TCPC

Regulatory Approach Examples for TCPC

EASA

Exemption under Article 71(1) of Regulation 2018/1139
set to expire after 8 months of use unless (EC) procedures engaged

Deviation from 25.855 proposed; if adopted
set to expire after 2000 FH or by 31 Dec 2021

Seat Bag STC limited to aircraft types exist
not time bound

FAA

Exemption No. 18561 for TCPC on seats
set to expire on Jul 10, 2021

Exemption No. 18584 for TCPC restrained to seat tracks (seats removed)
set to expire on Jul 10, 2021

TCCA

Exemption by Civil Aviation Safety Alert (CASA) 2020-04
set to expire on Jul 31, 2021

Existing Approved STC to limited aircraft MSN
not time bound

Regulatory Reference Links

EASA

- Consultation paper Deviation from CS 25.855 related to the design of cargo compartments installed on Large Aeroplanes
- Transport of Cargo in Passenger Compartment - Exemptions Under Article 71(1) of Regulation 2018/1139 (The Basic Regulation)

FAA

- Exemption No. 18561A
- Exemption No. 18584

TCCA

- Transport of Cargo in Passenger Compartment - Civil Aviation Safety Alert (CASA) No. 2020-04

Thank you!

Any questions?

Transport of Cargo in Passenger Compartment

Airbus update

Matthias Ierovante & Vincent Bouscary

16th September 2020

AIRBUS

Background

COVID-19 situation since March 2020:

- 70% of fleet grounded
- Humanitarian and general cargo transport flight demand increased
- Air cargo traffic increasing
- Operators need to maximize cargo capacity of pax aircraft
  - **Significant airlines demand for Manufacturers support**

AIRBUS

Airbus Support to the need of Transport of Cargo in Passenger Compartment:

March 2020: Early Airbus guidance for Transport of cargo in approved locations (e.g. overhead bins, underseat, …)

Based on draft EASA guidelines Airbus provided:
+ Operators Information Transmission (OIT)
+ Webinars
+ In-Service Information (ISI)

Available from Airbus World (ISI 00.00.00370)

April 2020: Airlines Support for Transport of cargo on seats or cargo on floor (after seat removal)

Strong collaboration of Airbus with EASA to clarify the exemption guidelines
Comprehensive dossier prepared by Airbus to support airlines in the exemption process

September 2020 Airbus Service Bulletin issued for Transport of for cargo on passenger cabin floor

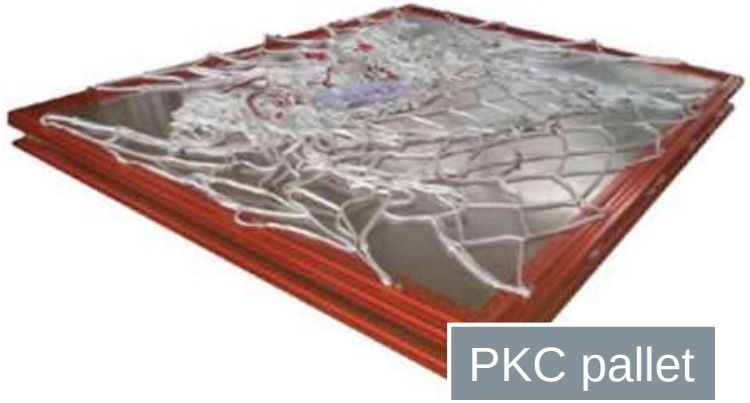
Available on demand from Techrequest

AIRBUS

Airbus SB: Cargo transportation on pallets

Main driver for solution:

- Use of standard cargo equipment available at airlines
- Maximize cargo volume
- Ease cargo installation in the cabin
- Minimize cabin tear and wear



PKC pallet

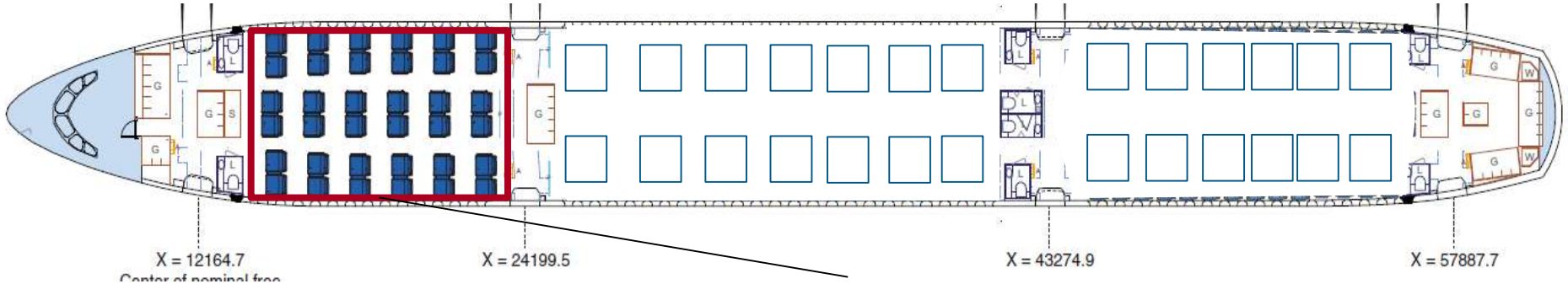
→ PKC pallets with standard net for restraint.
→ Pallets attached to floor with cargo straps
→ Capacity: 2.7m3 / 260kg per pallet

AIRBUS

Cargo in cabin options: capacities compared

		A330-300			A350-900			A320	
		Weight	Volume		Weight	Volume		Weight	Volume
Cargo on deck Airbus SB	20 pallets	4500 kg	**54 m3**	26 pallets	5800 kg	**70 m3**	Not suitable		
Cargo on seat* EASA exemption	247 seats	7800 kg	47 m3	291 seats	9200 kg	55 m3	180	5700 kg	34 m3

A350-900



When cargo is loaded on pallets, no fare-paying pax allowed

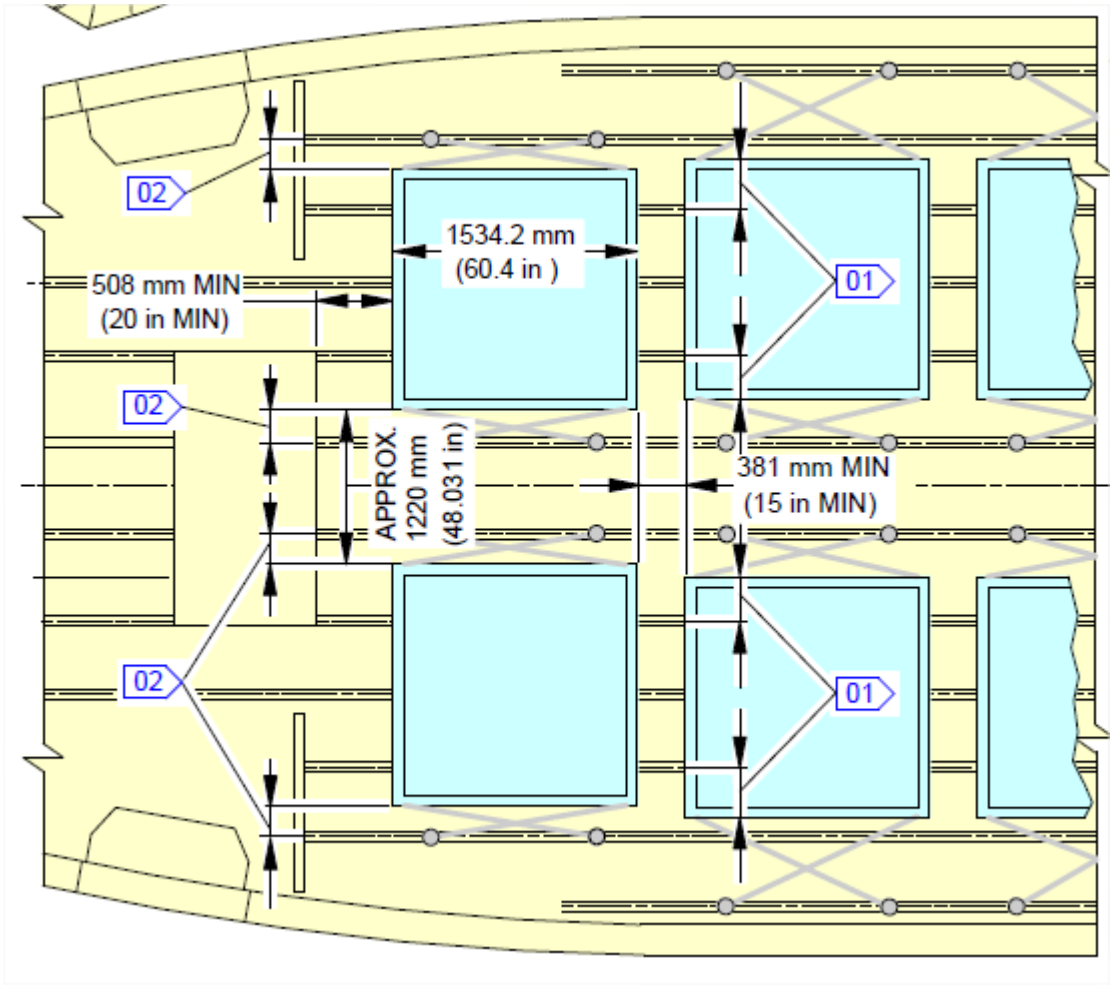
*Airbus standard 3 class layout, cargo only loaded on premium eco / eco class seats

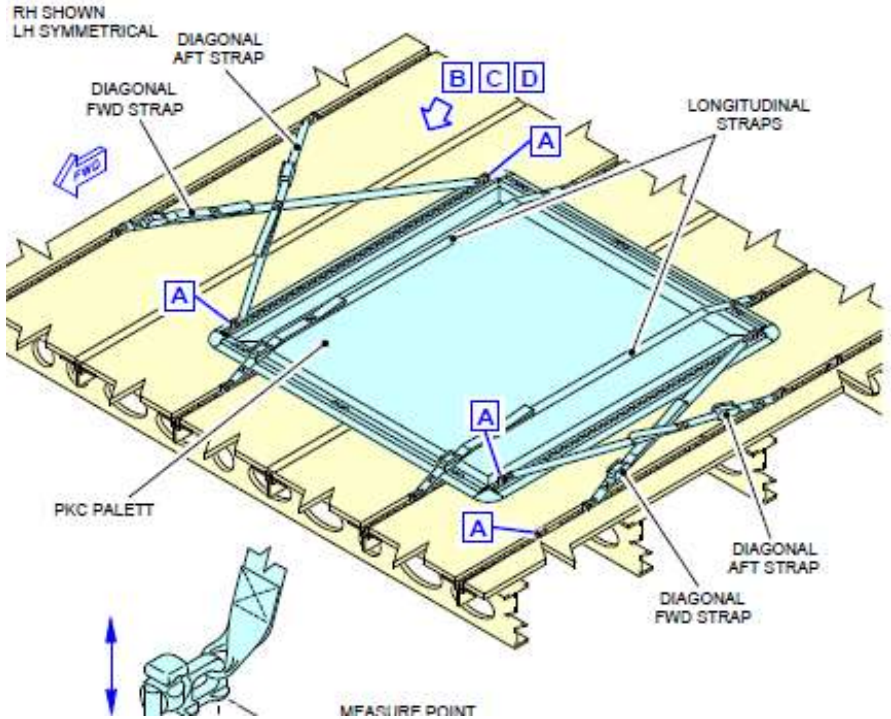
Cargo in cabin options- Airworthiness approval (exemption)

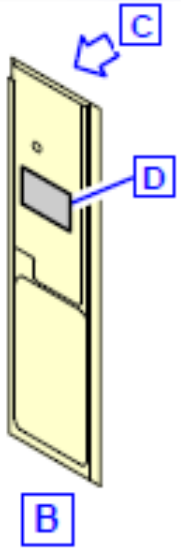
<table>
<tr><th></th><th>Cargo on seats</th><th colspan="2">Cargo on cabin floor</th></tr>
<tr><th></th><th>Local auth. exemption</th><th>Local auth. exemption</th><th>SB + Local auth. exemption</th></tr>
<tr><td>- Restraint system installation</td><td rowspan="2">Exemption request</td><td rowspan="2">Exemption request</td><td>AIRBUS SB</td></tr>
<tr><td>- Fire fighting equipment adaptation
- Oxygen system adaptation</td><td>Exemption request</td></tr>
<tr><td>Return cabin to original state</td><td>Exemption request</td><td>Exemption request</td><td>AIRBUS SB</td></tr>
</table>

The Airbus SB simplifies the airline exemption request to the local Airworthiness authority

The Airbus SB at a glance







PASSENGER CABIN INCOMPLETE

ZERO OCCUPANCY AND NO CARGO
IN THE PASSENGER CABIN
DURING TTOL AND FLIGHT

UNLESS TERMS AND CONDITIONS
TO OCCUPY SPECIFIC CABIN AREAS
HAVE BEEN APPROVED BY OPERATOR'S
COMPETENT AIRWORTHINESS AUTHORITY

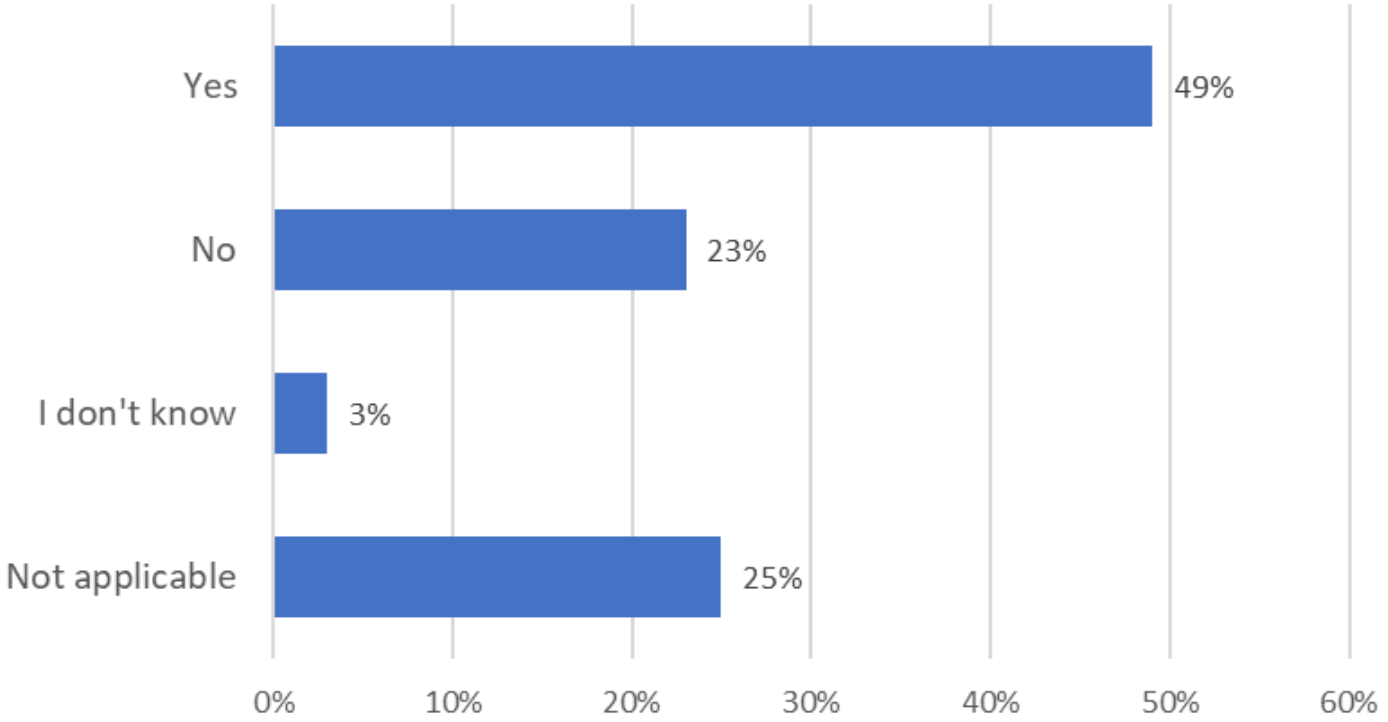
Achievements and challenges for potential next steps

- **AIRBUS achievements:**
  - Quick reaction to COVID crisis with Web Live explaining EASA guidelines and AIRBUS way to support airlines
  - Creation of a specific Task Force to investigate potential solutions and better support airlines
  - Dossier prepared with all relevant information to support airlines in the exemption process
  - SB released to further facilitate the exemption process
- **Further investigations**
  - Avoidance of the exemption process needs to comply with the same requirements as a cargo compartment certification
  - Review of a potential full, non time limited, certifiable solution

AIRBUS

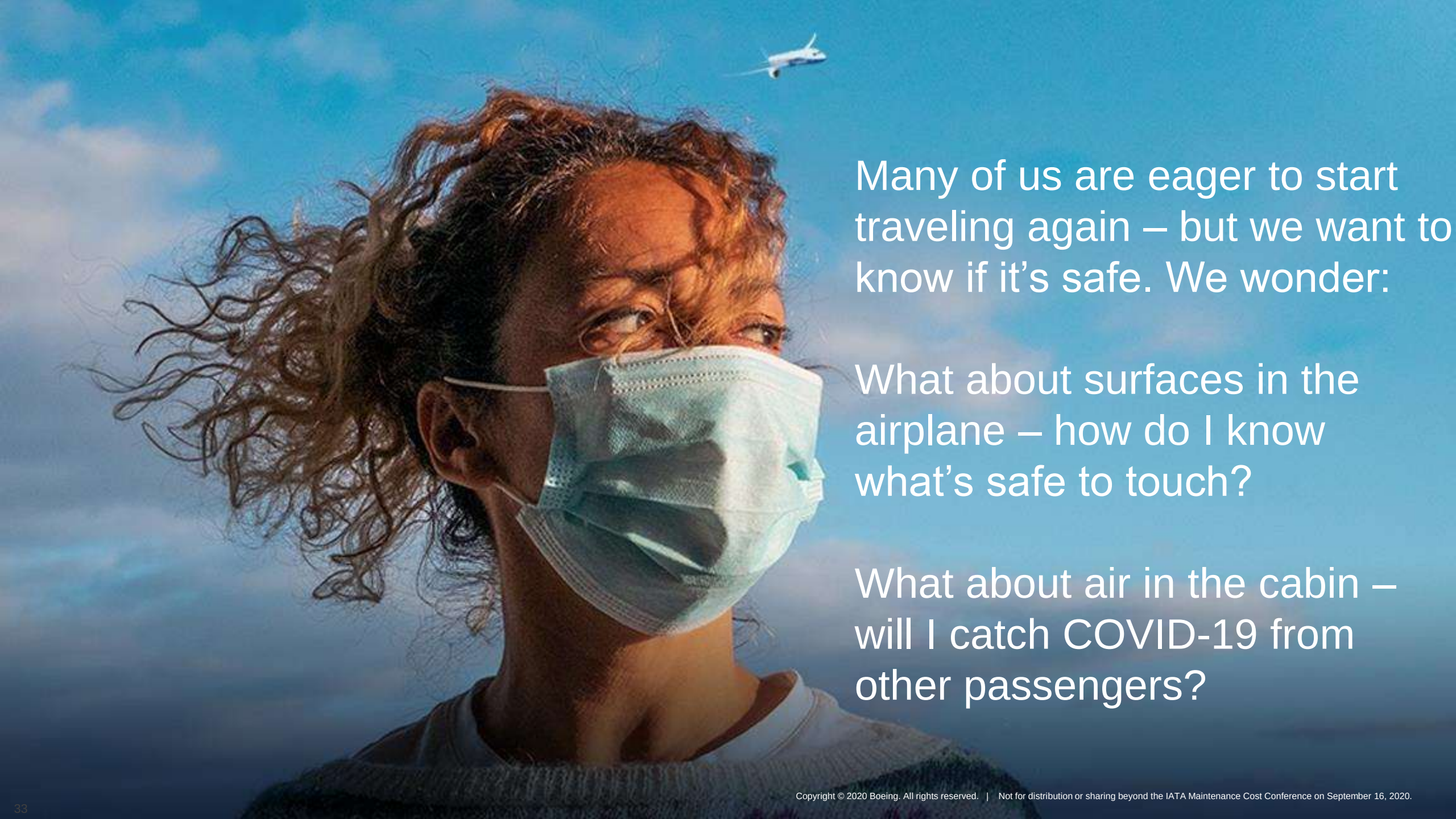
Poll #1

Is your airline transporting cargo in the passenger compartment?



Confident Travel Initiative
Aircraft Disinfection

Dan Freeman, Engineering Director
Confident Travel Initiative
September 16, 2020



Many of us are eager to start traveling again – but we want to know if it's safe. We wonder:

What about surfaces in the airplane – how do I know what's safe to touch?

What about air in the cabin – will I catch COVID-19 from other passengers?

Boeing is helping airlines protect passengers from a virus

TODAY'S SOLUTIONS

CHEMICAL DISINFECTANTS
20 tested, 8 Boeing approved disinfectants

ELECTROSTATIC SPRAYERS
Efficient application for hard to reach areas

CABIN AIRFLOW
Complete air exchange every 2-3 minutes

HIGH EFFICIENCY PARTICULATE AIR (HEPA)
99.9+% effective at removing particulates

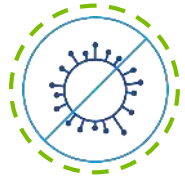
UV TECHNOLOGY
For use in flight deck today, cabin is under study

ANTIMICROBIAL COATINGS
Developing our own, validating others' for a long lasting solution

TOMORROW'S POTENTIAL SOLUTIONS

THERMAL DISINFECTION
Eliminating viruses with heat

IONIZATION TECHNOLOGY
Electrically charging the air to make it even cleaner



BOEING ANTI-VIRAL COATING
Breakthrough anti-microbial with high kill rate, long life

UV BUILT INTO THE AIRPLANE
Continuous disinfection through the travel journey

= UNDER STUDY

How Boeing Knows This is Effective

ANALYSIS OF THE AIRPLANE:

Computational Fluid Dynamics (CFD) of cabin airflow

Particle dispersion analysis

Fomite transmission Monte Carlo analysis

TESTING IN THE LAB:

Material compatibility with disinfectants

Flammability

UV resistance

Fluid intrusion & electronic function

TESTING ON AN AIRPLANE:

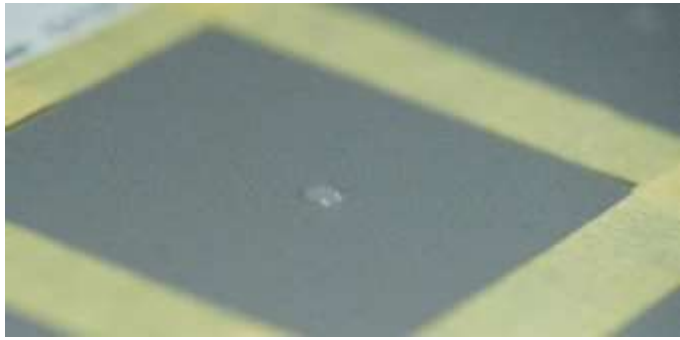
Cough testing using 1 micron particles and sensors for seated passengers

Live virus testing with different disinfecting technologies

UV Prototype validation

Tested Cleaning Technologies on a Live Virus

- Boeing, together with the University of Arizona's Department of Environmental Science, conducted an innovative, first-of-its-kind test to help airlines eliminate the spread of COVID-19 in airplanes
- The goal: test effectiveness of cleaning products, methods and technologies against a live virus in a cabin
- The virus, MS2, is safe and harmless to humans and is harder to kill than COVID-19
- The virus was placed on strategic points throughout the cabin, like tray tables, arm rests, seatbelts and latches. Each area was then disinfected using one of the following products/technologies/methods:
  - Chemical disinfectants
  - Electrostatic sprayer
  - Antimicrobial coatings
  - Ultraviolet wand
- The University of Arizona analyzed results, to determine how successful disinfecting methods were at killing the MS2 virus



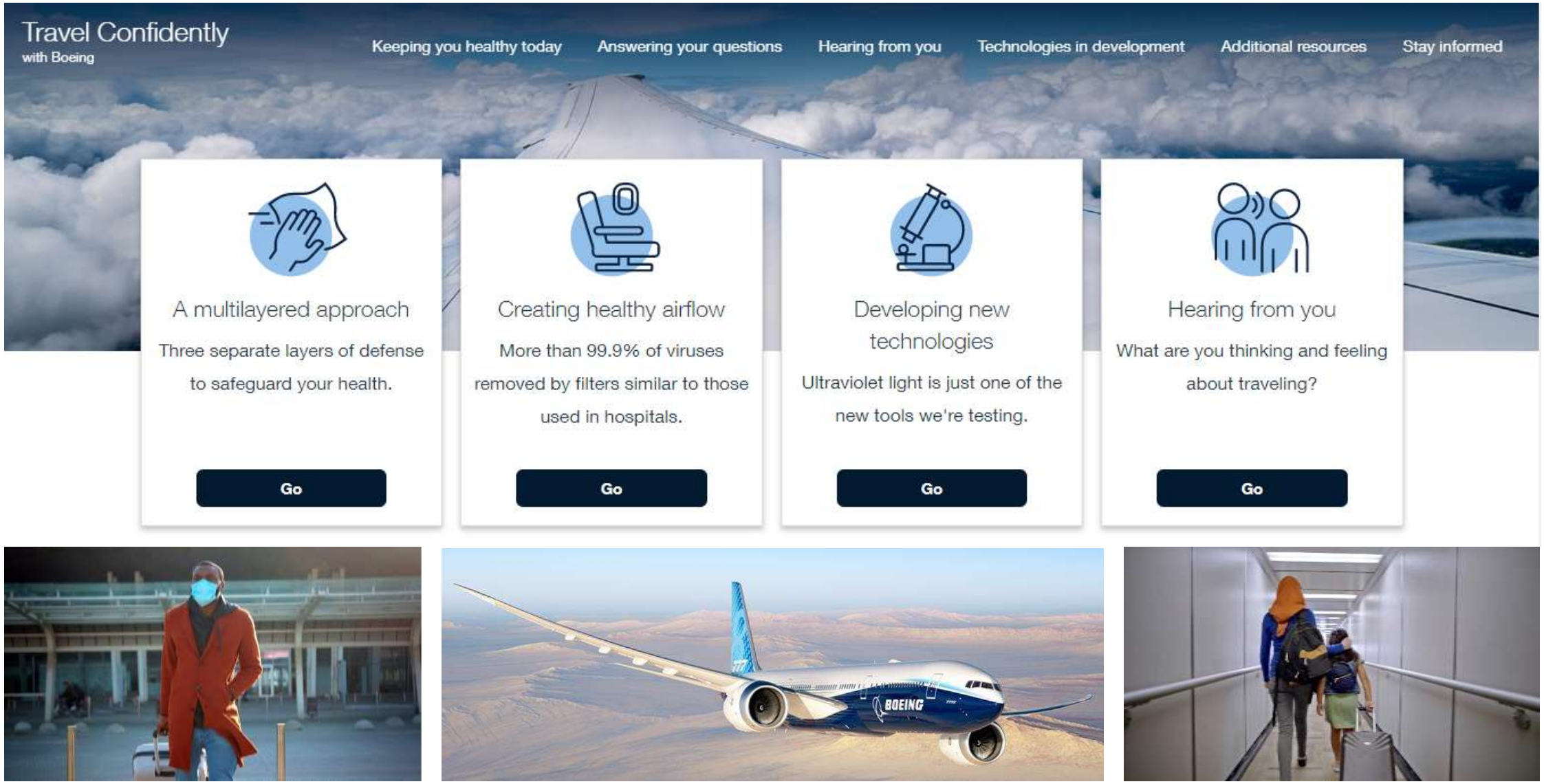
Results

- University of Arizona found all products tested were successful in eliminating MS2:
  - Chemical disinfectants
  - Electrostatic sprayer
  - Antimicrobial coatings
  - Ultraviolet wand

- Boeing recommends these cleaning products and procedures to airline customers as part of a multilayered approach to protect the airplane and keep it free of viruses
- The University is working on data to compare the successful kill rate of MS2 to a successful kill rate of COVID-19

Confident Travel Initiative Key Findings

- Boeing is investing in testing and research to determine the best available solutions and future technologies for protecting passengers from a virus
- Airlines and airports have adopted the multi-layer approach to combat the pandemic
- Cleanliness programs in the airport and airplane are effective. Sentiment analysis reveals that visible cleanliness programs are critical to passenger confidence
- Working with medical experts and transparently sharing to validate this work



BoeingConfidentTravel.com

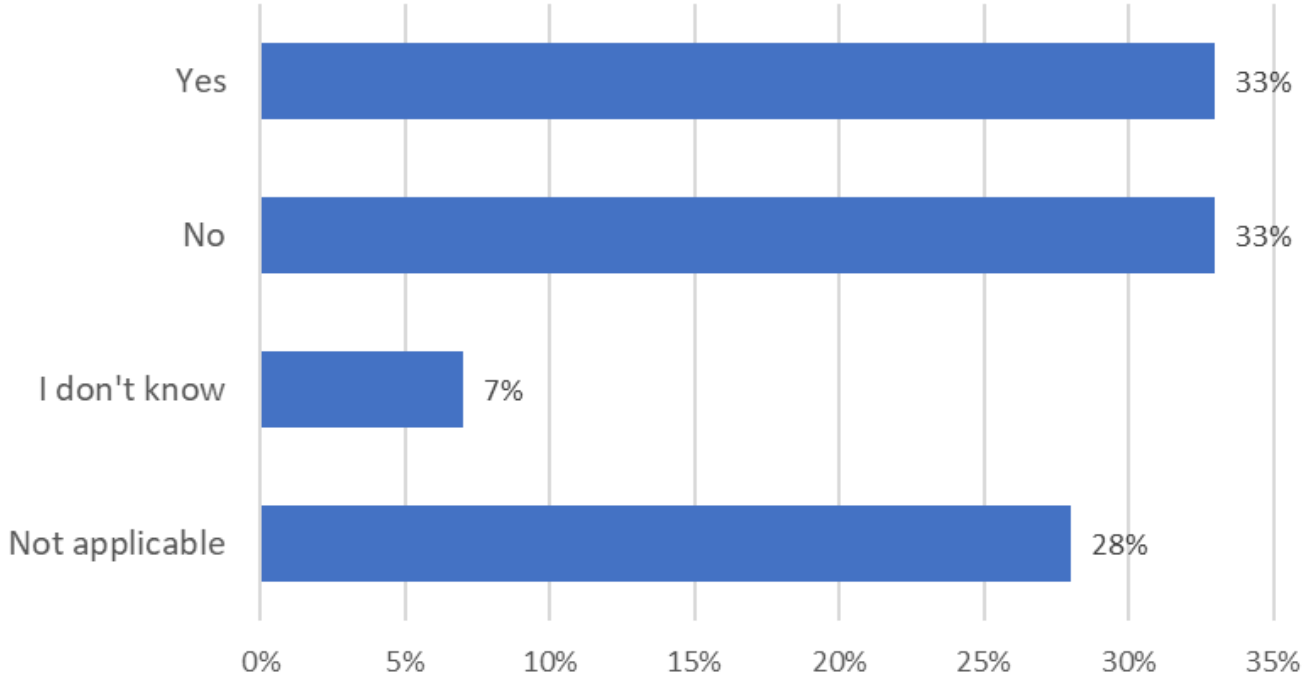
www.icao.int/covid/cart/Pages/default.aspx

www.icao.int/covid/cart/Documents/CART_Report_Take-Off_Document.pdf

www.iata.org/contentassets/5d42ffd2b6ee43a8963ee7876584de5a/aircraft-cleaning-guidance-covid.pdf

Poll #2

Is your airline using any of these new technologies (UV light, electrostatic spraying, fogging, surface coating, etc.) to disinfect the cabin?



Fuel – Microbiological Test Kits and Biocide Treatment

Mark Vaughan

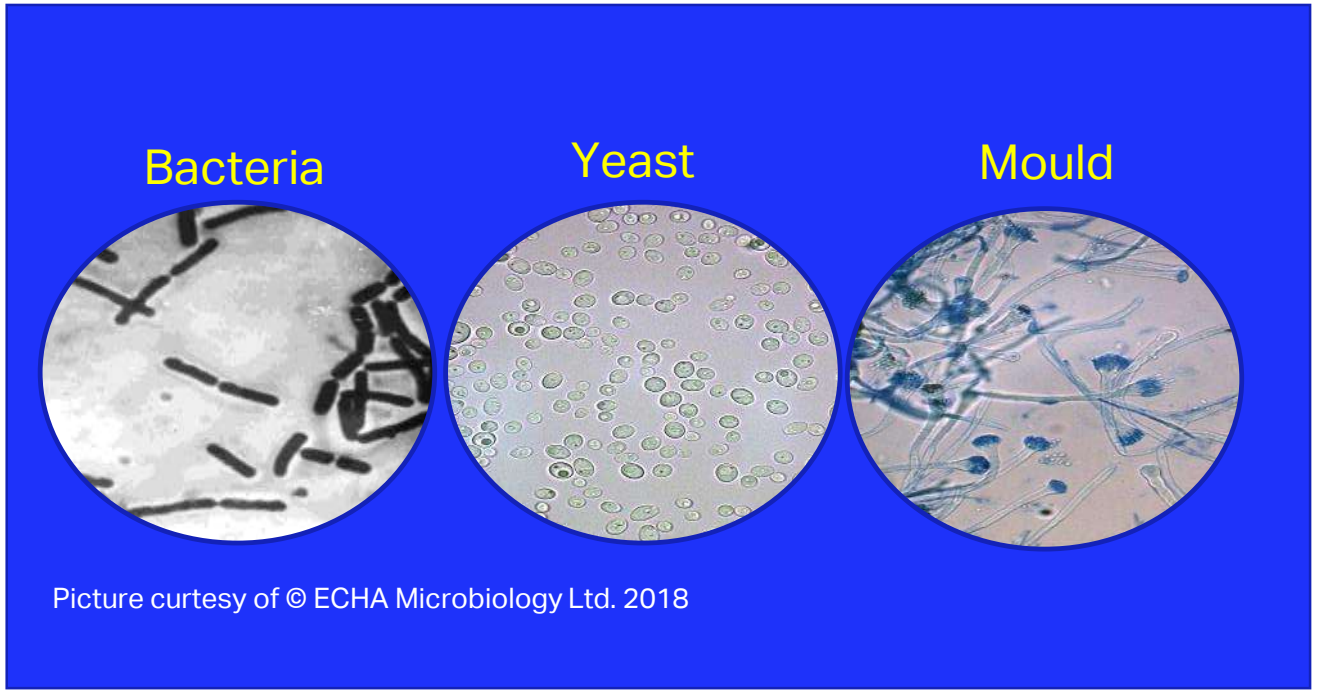
What are we going to discuss?

- What is microbiological contamination?
- How do we prevent microbiological contamination?
- Detection (Test Kits)
- Treatment (Biocides)
- Ballpark/High level costs of testing and treatment
- Feedback that OEM would like from airlines

Before we start, it is important to note that this presentation…

- is not an endorsement of any of the test kits or biocide
- is not a training on how to manage microbial growth in your aircraft
- does not override what is stated in the AMM of the OEM

What are microbes?



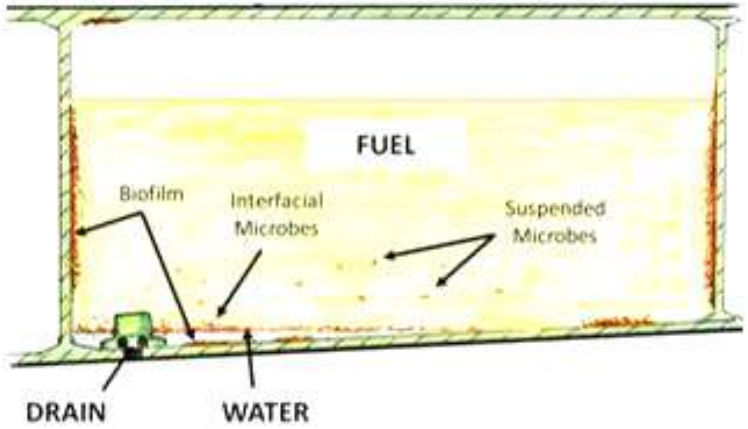
Picture curtesy of © ECHA Microbiology Ltd. 2018

Problems	Primary Microorganism
Pipe, valve and blockage	Fungi; biopolymer bacteria
Fuel probe damage	Fungi; biopolymer bacteria
Sludge formation	Fungi; bacteria (all)
Surfactant production - coalescer/water separator malfunction and fuel/water emulsions	Fungi; aerobic bacteria
Corrosion (MIC)	Fungi; anaerobic bacteria and sulfur reducing bacteria
Downtime	ALL
Suspended solids in fuel	Fungi; bacteria (all)
Hydrocarbon breakdown	Fungi aerobic bacteria
Filter clogging	Fungi; bacteria (all)
Injector fouling	Fungi; aerobic bacteria
Increased sulfur content	Sulfur reducing bacteria
Damage to protective linings	Fungi
Loss of Life	ALL

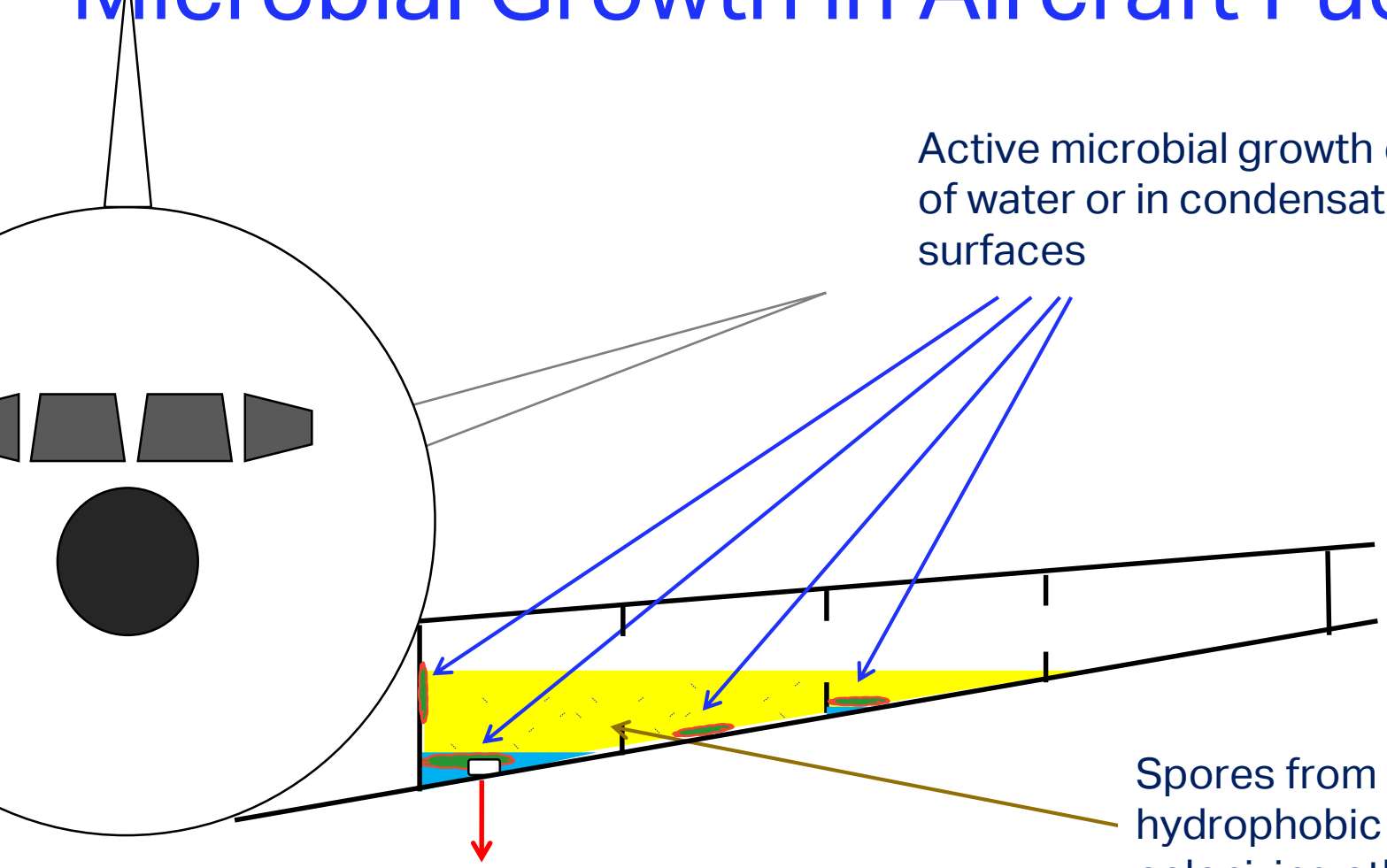
Table 1 Problems associated with microbial growth

Picture curtesy of © Hammond Fuel Additives

Consequences of microbial growth



Microbial Growth in Aircraft Fuel Tanks



Active microbial growth occurs in pockets of water or in condensate films on fuel tank surfaces

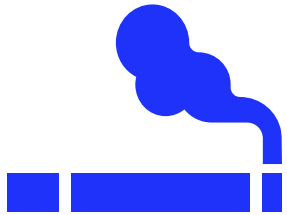
Free water forms from condensation:

- dissolved water in fuel as it cools on ascent
- humid air as it enters cold tank through vents on descent

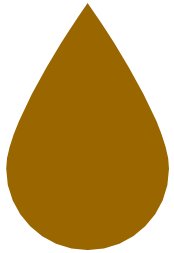
Spores from the active growth are hydrophobic and are dispersed in fuel colonizing other areas of water accumulation

Routine sumping to remove water is the key measure in minimizing microbial growth.

Indicators of microbial contamination

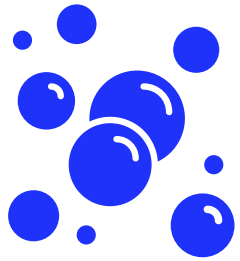


Foul smells

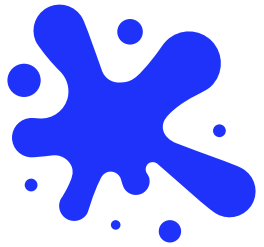


Brown color water

Particles in water

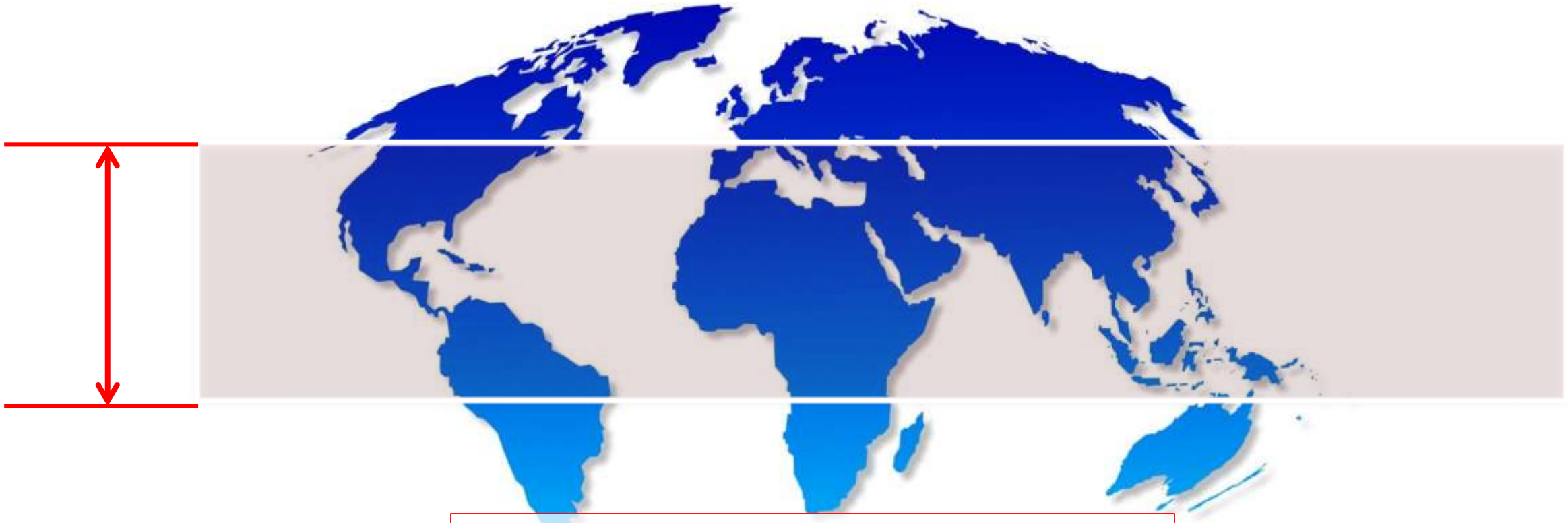


Lacy foam between water and fuel layers



Slime or sludge

Climate and Microbial Growth



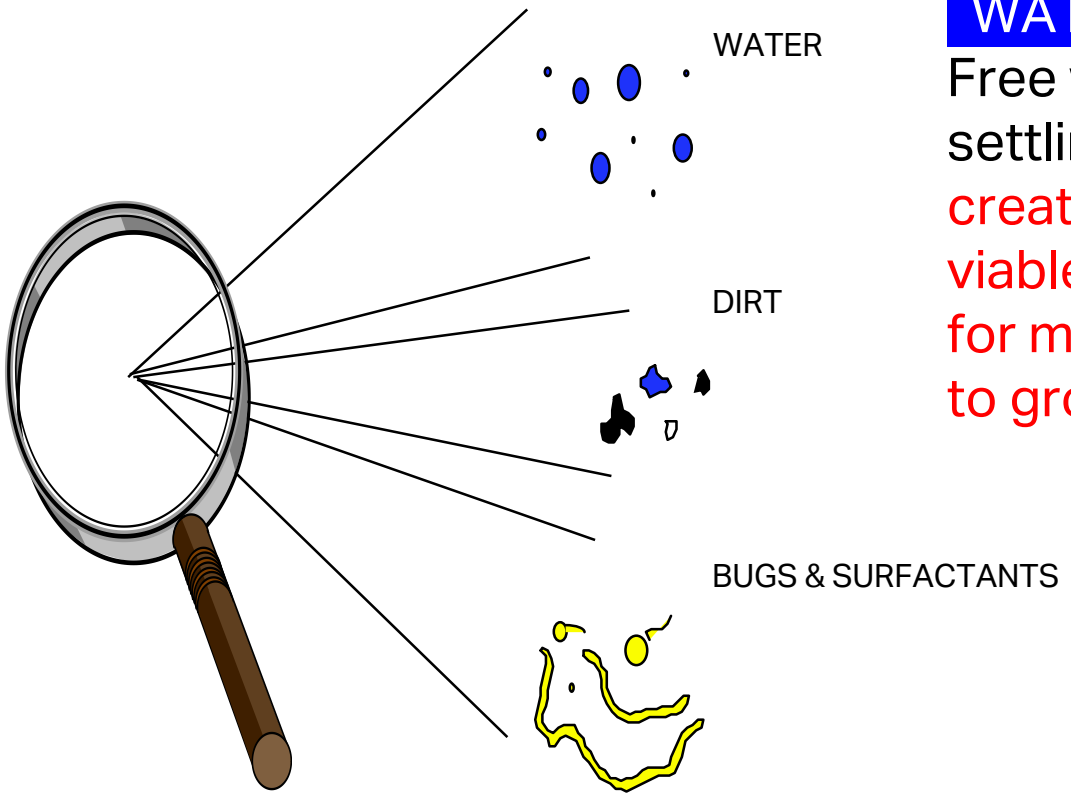
Areas at higher risk of microbial growth

- **Tropical zone**
- **High humidity**
- **High ambient temperatures**

Picture curtesy of © ECHA Microbiology Ltd. 2018

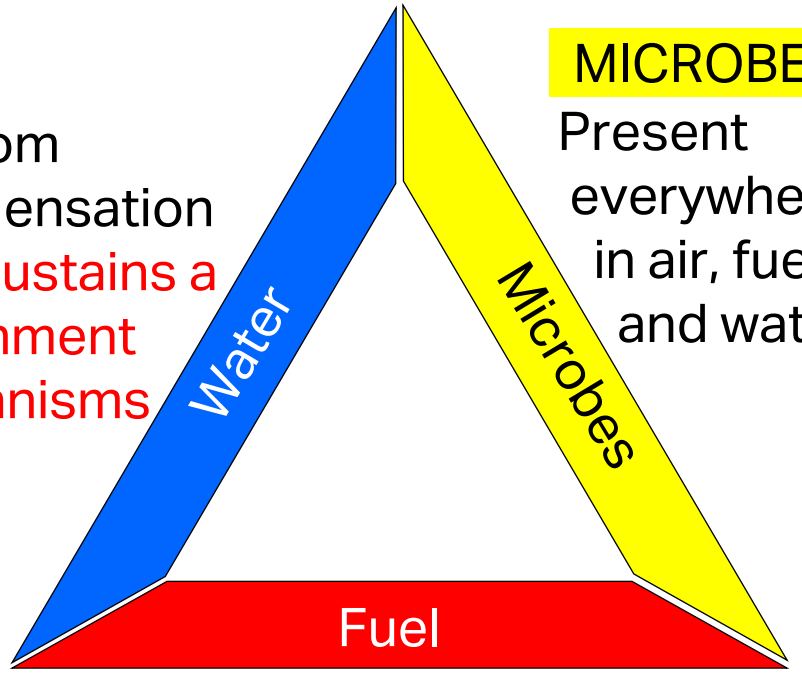
The microbial growth triangle[2]

As aviation fuel moves through the system:



WATER

Free water from settling, condensation creates and sustains a viable environment for microorganisms to grow



MICROBES

Present everywhere in air, fuel and water

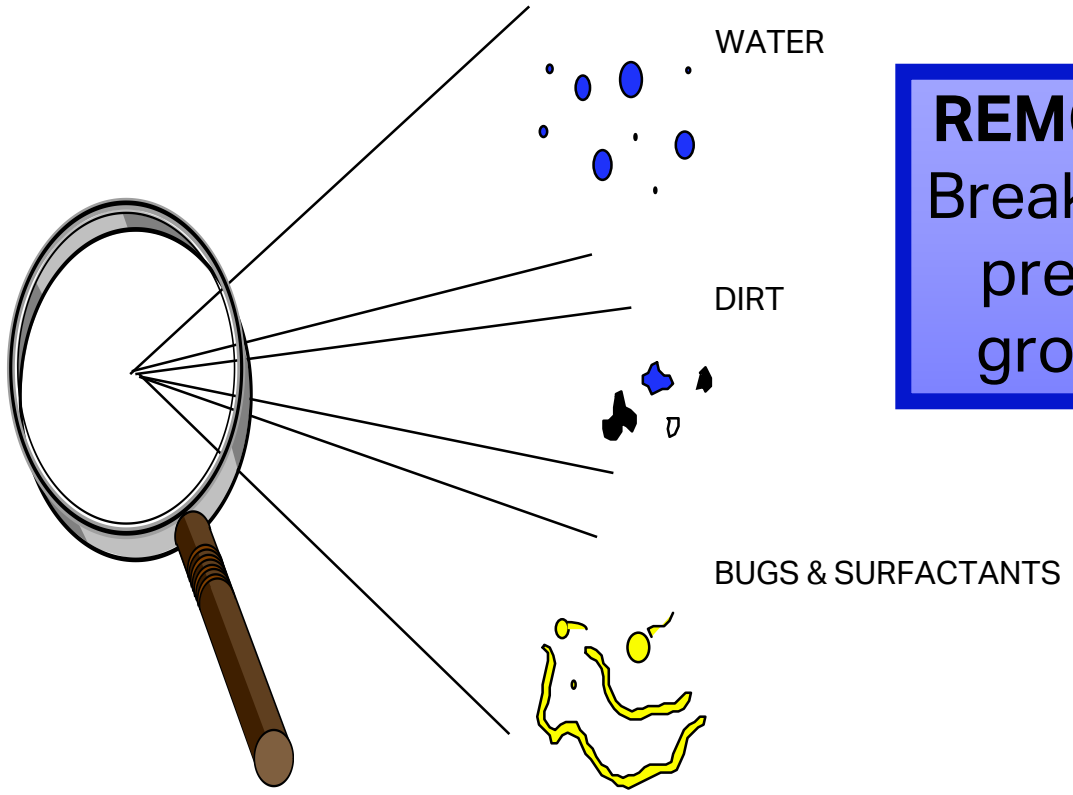
FUEL

Microbes consume the fuel as nutrients

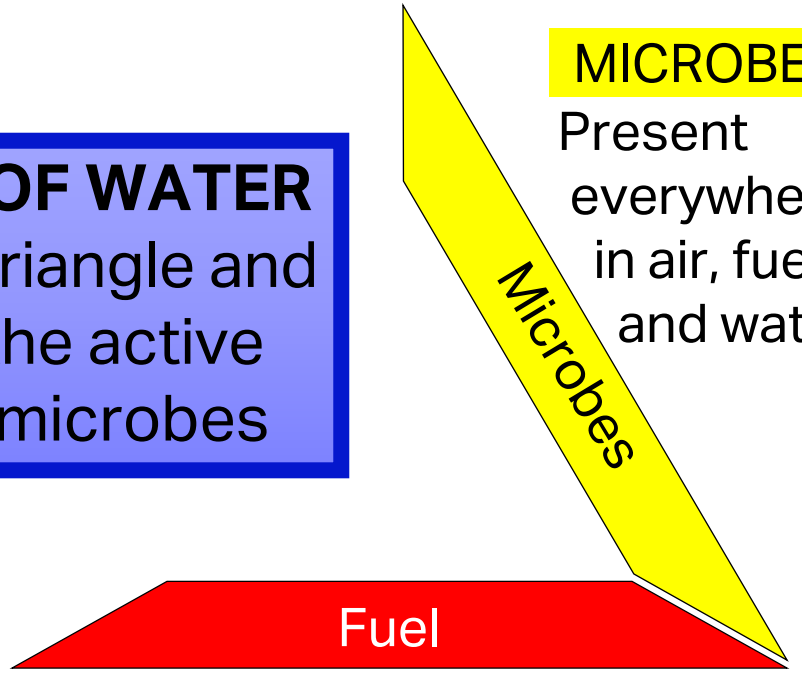
[2] JIG TID No 1 - Technical Information Document - Fundamentals of microbial growth

The microbial growth triangle[2]

As aviation fuel moves through the system:



REMOVAL OF WATER
Breaks the triangle and prevents the active growth of microbes



MICROBES
Present everywhere in air, fuel and water

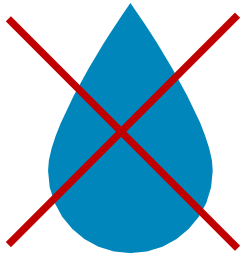
FUEL
Microbes consume the fuel as nutrients

[2] JIG TID No 1 - Technical Information Document - Fundamentals of microbial growth

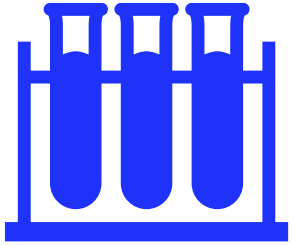
Fundamentals of microbial growth

Follow robust water drain procedures

Visually check for water



Eliminate water from the MBG Triangle



Testing provides earliest detection

Prevention is better than cure

IATA GM listed Test kits and categories

Water Phase

Easicult® TTC / Easicult® M

San-AI-Oil ®

Fuel Phase: Field Tests

FUELSTAT®[1]

MicrobMonitor®2

HY-LiTE® Jet A1 Fuel Test

IATA GM listed Biocides

Biobor JF by Hammond

Kathon FP 1.5 by Dupont (withdrawn from the market)

AMM recommended fueling practice for parked aircraft

Aircraft parked for longer than 1 month

- Fill each tank 10% of total volume while injecting biocide as per OEM AMM
- Test each tank for microbial contamination at start of parking and after 30 days
- If no biocide is applied testing needs to be done every 15 days

AMM recommended fueling practice for parked aircraft (cont.)

Aircraft parked for longer than 1 month

- Drain any free water from tank low points/drains, every 15 days
- If no biocide was applied, drain any free water from tank low points/drains, every 7 days

Assumptions made for the cost analysis

Narrow body aircraft *used for this exercise*

- Aircraft fuel tanks filled with 2 000Lt (500usg) fuel
- Biobor JF dosed at 270ppm (by mass)
- Number of tanks/tests (5)
- Estimated total cost of a test kit / aircraft between USD 70-90
- Biocide approximate cost ~ USD 20 (treat 500 usg fuel)

Cost analysis

	Cost Analysis for long term parking WITHOUT biocide application							
		Cost of test kit	Shipment Cost	Cost of Biocide	Shipment cost	Cost of Biocide Application	Manpower for sump drains	
1st month	Start 1st month	x	x				x	
	every 7 days						x	
	every 15 days	x	x				x	
	every 7 days						x	
	end of 1 month	x	x				x	
	Grand Total after 1 month	$0		$0			$0	**$0**
2nd month	every 7 days						x	
	every 15 days	x	x				x	
	every 7 days						x	
	end of 1 month	x	x				x	
	Grand Total after 2 months	$0		$0			$0	**$0**

	Cost Analysis for long term parking WITH biocide application							
		Cost of test kit	Shipment Cost	Cost of Biocide	Shipment cost	Cost of Biocide Application	Manpower for sump drains	
1st month	Start 1st month	x	x	x	x	x	x	
	every 7 days							
	every 15 days						x	
	every 7 days							
	end of 1 month	x	x				x	
	Grand Total	$0		$0			$0	**$0**
2nd month	every 7 days							
	every 15 days						x	
	every 7 days							
	end of 1 month	x	x				x	
	Grand Total after 2 months	$0		$0			$0	**$0**

Test Kit Contact Info

HY-LiTE® Jet A1 Fuel Test

Name: Ed English
Email: eenglish@fqsinc.com
Phone: +1 (770) 967-9790
Website: fqsinc.com

MicrobMonitor®2

Name: Mike Haywood
Email: info@echamicrobiology.com
Phone: +44 (0) 29-2036-5930
Website: echamicrobiology.com

San-AI-Oil

Name: San-Ai-Oil – HND Aviation
Email: HND_aviation@san-ai-oil.co.jp
Phone: +81 3-5757-0322
Website: www.san-ai-oil.co.jp/

Easicult® TTC / Easicult® M

Name: Katja Skogman
Email: katja.skogman@aidian.eu
Phone: +358-50-381-7297
Website: aidian.eu

FUELSTAT®[1]

Name: David Mitchell
Email: david.mitchell@conidia.com
Phone: +44 (0)1491-829102
Website: conidia.com

[1]In industry guidance material, the kit is referred to as "FUELSTAT resinae PLUS"

Biocide Contact Info

Hammond Fuel Additives

Biobor JF
Toll Free: (800) 548-9166
Phone: (281) 999-2900
Fax: (281) 847-1857
Website www.biobor.com/

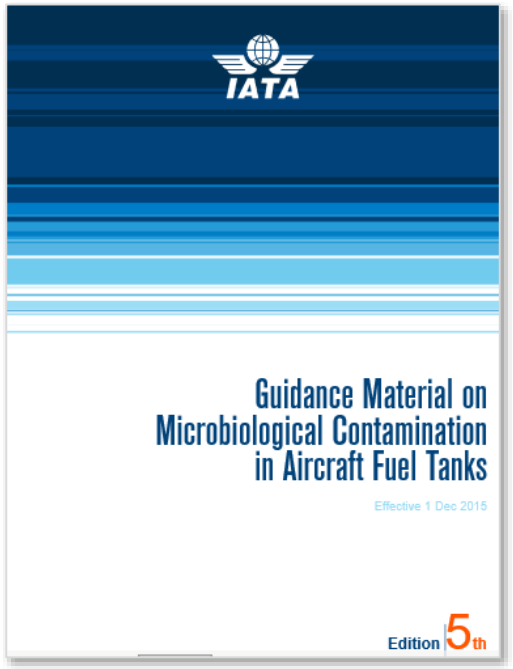
Useful Info

Jet Fuel Microbial Testing Webinar:

www.youtube.com/watch?v=k1Onk8uX

Microbiological Contamination in Aircraft Fuel Tanks

New version 2021 – 6th Edition



store.iata.org/IEC_ProductDetails?id=9680-05

Feedback that OEM would like from airlines

Standardisation of AMM procedures

- Timeframe between positive testing and action?
- When positive test, are the tank clean, or is there any biofilm? etc…
- Is there correlation on the rate of findings based on routes (climate), age, storage time, etc.

Questionnaire to assist OEM with next AMM revision

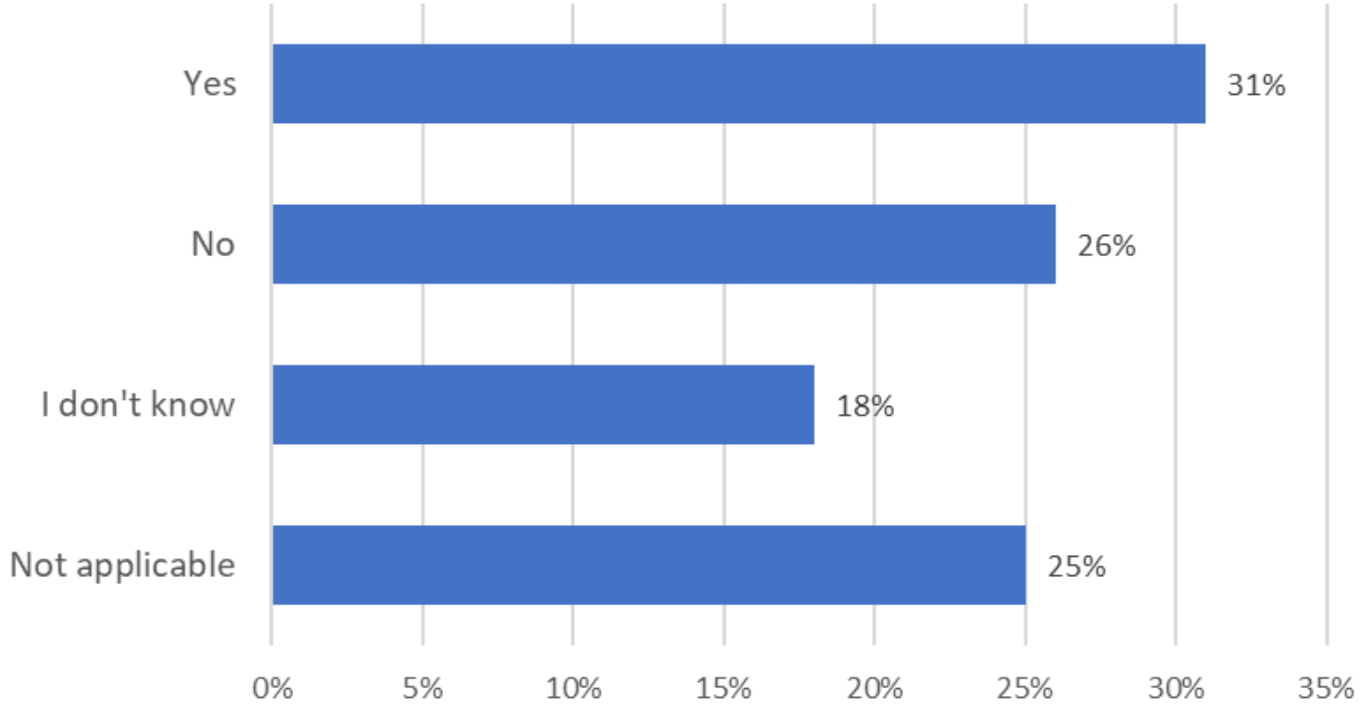
A reminder

- Follow your airlines procedures (AMMs, etc.)
- Consult your equipment manufacturer
- Consult your biocide manufacturer
- Consult your test kit manufacturer
- Do your own risk assessment
- Do your own cost analysis

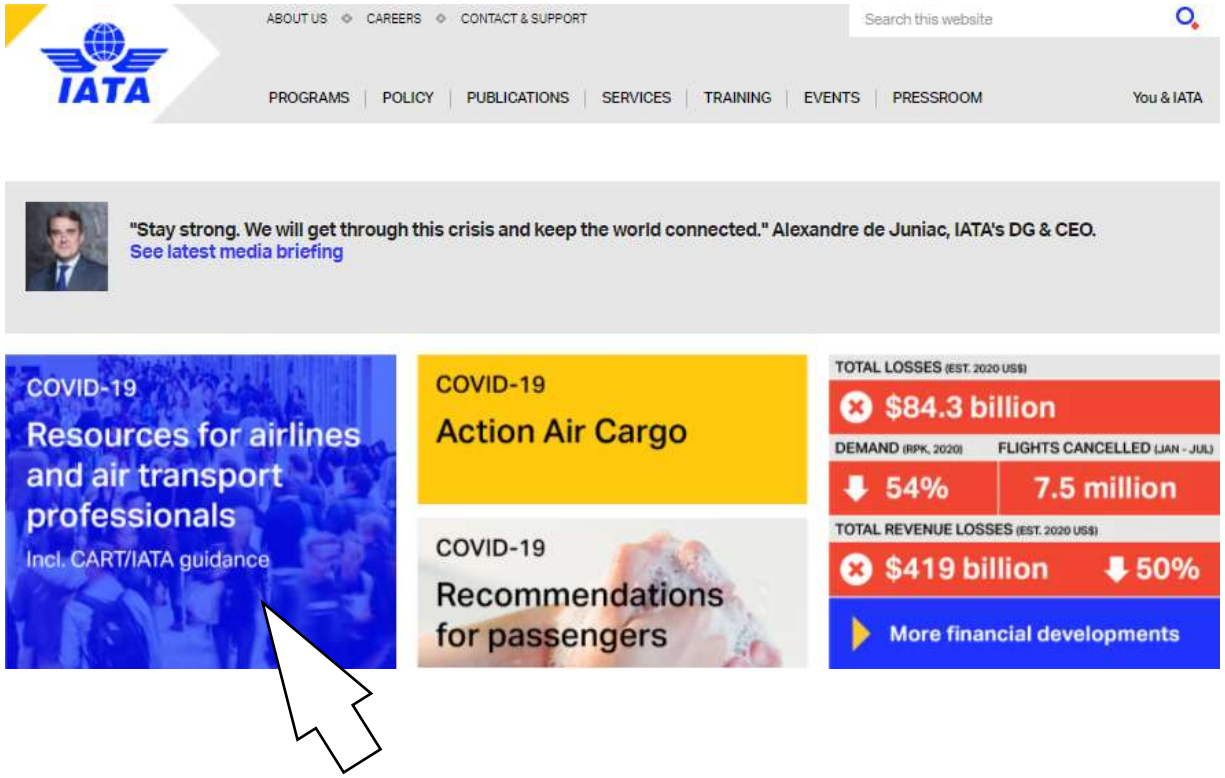
THANK YOU

Poll #3

Is your airline using any fuel biocide treatment during this pandemic?



IATA COVID-19 Resources



www.iata.org

www.iata.org/en/programs/covid-19-resources-guidelines

www.iata.org/en/pressroom/covid-19-news

airlines.iata.org/topic/covid-19

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WEBINAR SERIES

Thank you for attending!

Any further questions?
Please email Geraldine Cros (crosg@iata.org)

Episode 2:
Adapting to New Circumstances

TCPC; Aircraft Disinfecting;
Fuel Testing & Biocide

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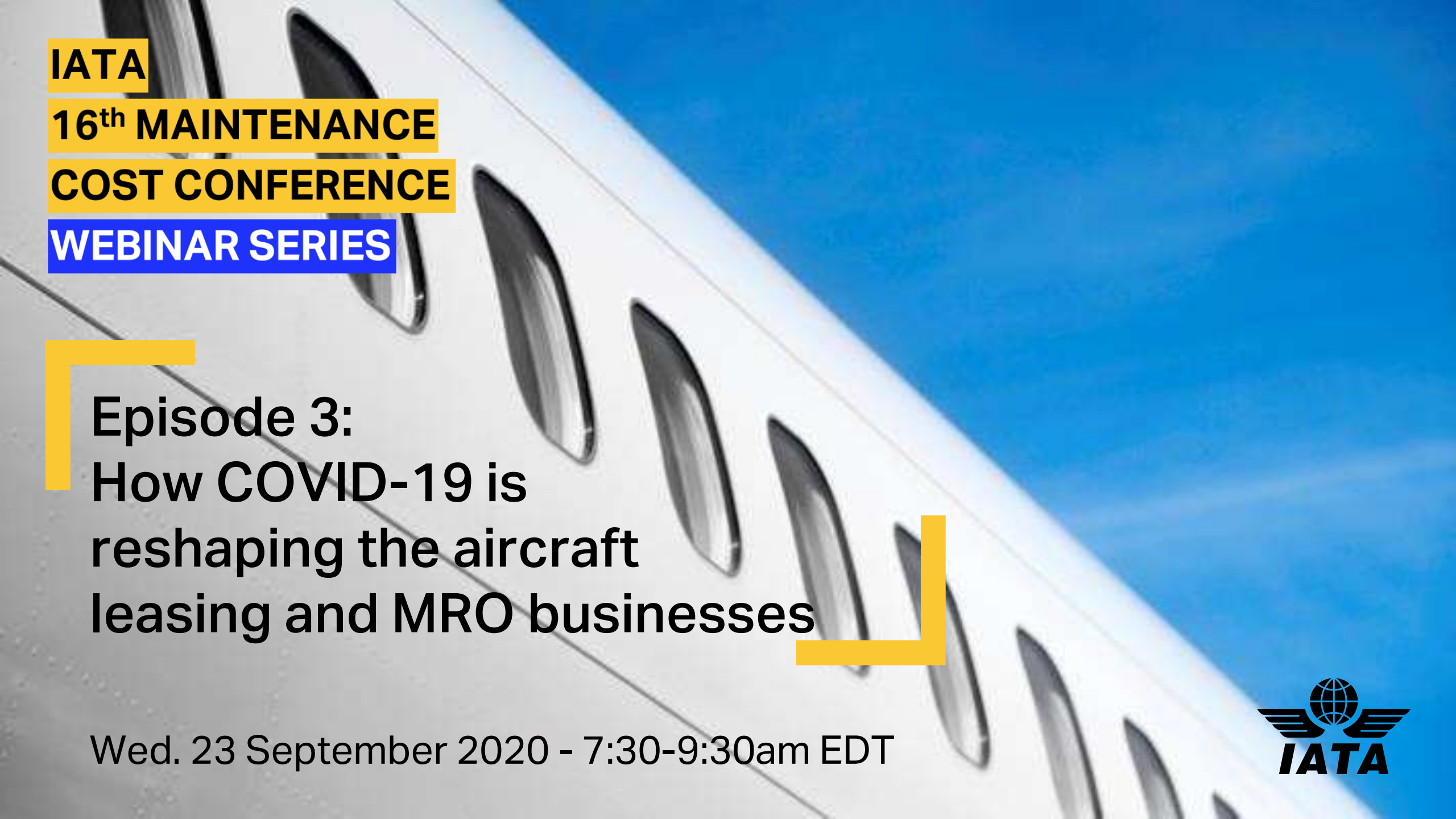

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16th MAINTENANCE COST CONFERENCE

WEBINAR SERIES

Episode 3: How COVID-19 is reshaping the aircraft leasing and MRO businesses

Wed. 23 September 2020 - 7:30-9:30am EDT

IATA