



# Applying damage-mapping efficiencies to new aircraft induction with dentCHECK®

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# Outline

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1. Allegiant
  1. Allegiant's Fleet
  2. Induction of Aircraft into Allegiant's fleet
2. Electronic Damage Log
3. dentCHECK experience on 4 aircraft
4. Time Savings
5. dentCHECK Reports/ Traditional Damage File
6. Conclusions / Lessons Learned

# About Allegiant

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- Began scheduled service in 1999.
- Links travelers in small-to-medium US cities to world-class vacation destinations with all-nonstop flights and industry-low average fares.
- Maintenance bases at: AVL, BLI, CVG, FLL, GRR, IND, IWA, LAS, LAX, PIE, PGD, PIT, SAV, SFB, SRQ, TYS and VPS

# Allegiant's Fleet

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- All Airbus Fleet of 88 A319s/A320s
- 13 new A320s in 2017-19
- 75 aircraft in Allegiant's fleet have had previous operators including: Iberia, Philippine, Hamburg, Vueling, Aer Lingus, Air Blue, Rossiya, Saudia, Alitalia, Cebu Pacific, Cobalt, EasyJet and Oakhill
- Eight more aircraft inductions expected in last two quarters of 2019

# Induction of Aircraft into Allegiant's Fleet

- Purchase of a previously operated aircraft
- Merged into Allegiant's Maintenance Program through an Induction Process
- The aircraft must be stripped and painted in Allegiant livery
- Work is accomplished at 3<sup>rd</sup> party MROs
- During the Induction, we create a Electronic Damage Log (Dent and Buckle List)



# Electronic Damage Log

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- What is an Electronic Damage Log?
  - The Allegiant Electronic Damage Log is an easily accessible file of existing damages and repairs on the exterior of the AC
- Why do we need the Electronic Damage Log?
  - To prevent or mitigate operational delays. Occasionally, old damages are misconstrued as new found damage during aircraft ground operations.
  - The Electronic Damage Log contains information that gives maintenance personnel sufficient data to determine if damage was pre-existing/previously addressed or new found damage.

# Creating the Electronic Damage Log

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- The previous operator's records are reviewed and each exterior damage is given an Allegiant Damage #, then mapped on drawings of the AC exterior.
  - Repairs, such as doublers that cannot be mistaken for new damage are excluded
- Onsite maintenance personnel reconcile inspection findings against the previous operators records and apply a decal with the Allegiant damage #.
  - All damages/repairs that do not match previous operators records for location or dimension are addressed per the current SRM



# Creating the Electronic Damage Log

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- Locate damage on the AC from Allegiant Damage Map and previous operator records (d&b chart)
- Access the damage locations – positioning GSE (stairs, lifts) is always time-consuming
- Typical Measurement tools – depth-gauge + straight-edge + pen/paper
- Compare measurements and location with prior records
- If they match, the decal would be applied and a copy of the documents filed under the damage #.
- If differences were found, they would be resolved
  - mismatch is common – inspector methods vary across the industry (see [\*findings from 2019 AMC damage-mapping event\*](#) for more detailed analysis)



# Two Questions

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- How do we speed up the process of reconciling the damages with the previous operators records?
- How do we make the information filed under the Allegiant Damage # such that it can be interpreted quickly in a operational situation?
  - The Aircraft has a ground time of 45 minutes.
  - The flight crew or ground personnel discover a dent with no Dent Damage Decal.  
Is it new damage or is it previously addressed damage and the decal simply detached?

# Allegiant's Experiments with dentCHECK

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- Rigorous 6-month trial in Allegiant's base maintenance network
- Trial Period: September 2018 – March 2019
- Focus of this presentation –
  - 4 aircraft, A319/A320 – inspected in early 2019
    - 1 aircraft @ HAECO-LCQ (Paint Shop) – N241NV
    - 3 aircraft @ LHT-BQN (2 on ramp / 1 in hangar) – N322NV, N320NV, N242NV
- Allegiant's goals for this trial –
  - Can dentCHECK provide accurate baseline log of all existing dent/bump damage?
  - Can dentCHECK provide easily/quickly interpreted report to enhance existing records?

- The only OEM-certified handheld 'go/no-go' tool for 3D damage inspection that can claim the following –
  - Built-from-the-ground-up per requirements of airlines/MROs
  - Delivers actionable SRM-compliant answers (not just data!) in seconds
  - Inspects **dents, bumps and blend-outs**
  - OEM-approved for metal, composite, flat & curved surfaces
  - Fully self-contained system – **no external computer, no wires**
  - **Designed for any skill-level.** Just power-on, point-&-click
    - no pre-programming/configuration
    - no post-processing software
    - no surface preparation or stickers
- Used daily by dozens of airlines/MROs worldwide



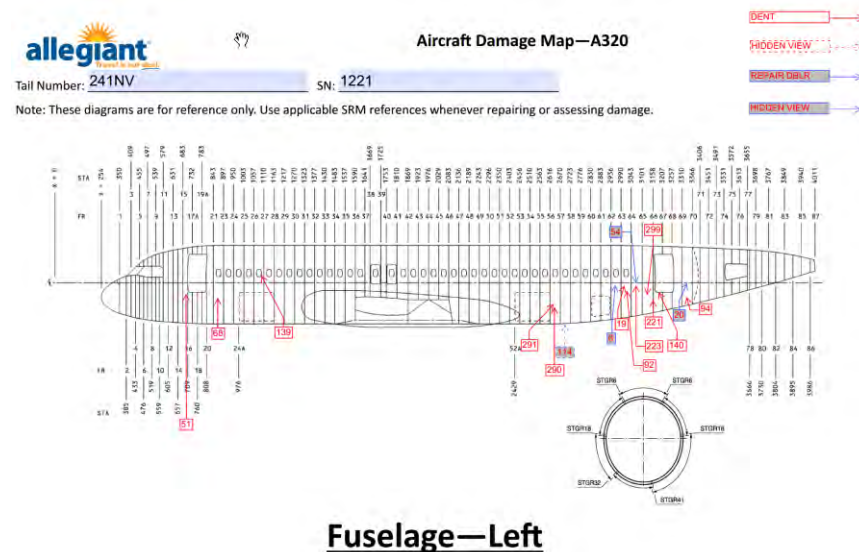
Image courtesy: Delta Airlines / A4A 2018

# dentCHECK in use at Allegiant's MRO (LHT-BQN)



# Aircraft #1 (N241NV – SN 1221) with dentCHECK

- 48 dents/bumps
  - Primarily concentrated around Entry, Service and Cargo Doors on exterior fuselage
- Inspection & reporting – one-person task
- AC in Paint Hangar, No Zonals
  - Locate damage using existing d&b records
  - reposition GSE for better access to damage locations
- First time independently operating dentCHECK inspection tool & Damage Reporting Tool (DRT) – *near zero-learning curve*



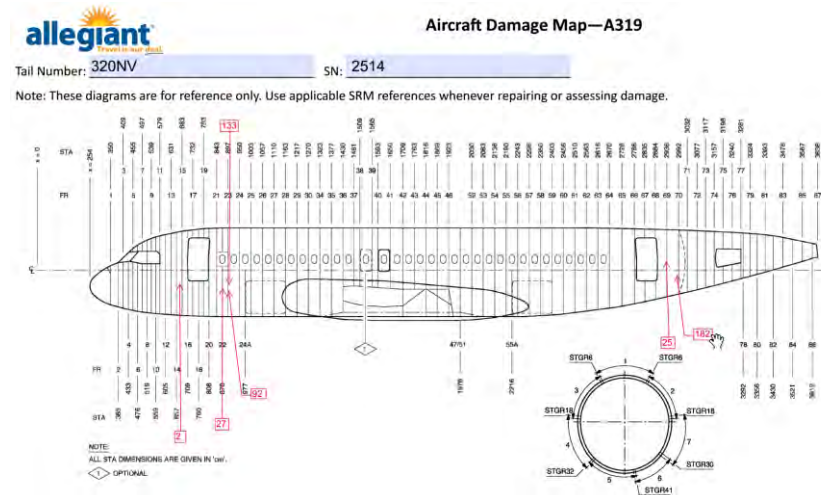
Man Hours	
Traditional tools	dentCHECK
~60 hours	8 hours

Time savings / efficiency gains = 87%



# Aircraft #2 (N320NV – SN 2514) with dentCHECK

- 9 dents/bumps
  - Primarily concentrated around Entry, Service and Cargo Doors
- Inspection & reporting – one-person task
- AC on Ramp, New Paint and Zonal Inspections completed by the MRO
  - Locate damage using existing d&b records
  - reposition GSE for better access to damage locations



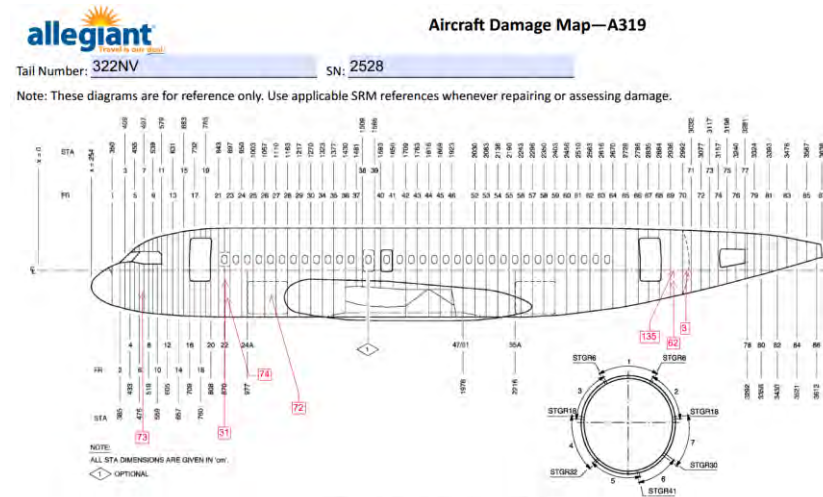
**Fuselage—Left**

**Time savings / efficiency gains = 87%**

Man Hours	
Traditional tools	dentCHECK
15 hours	2 hours

# Aircraft #3 (N322NV – SN 2528) with dentCHECK

- 7 dents/bumps
  - Primarily concentrated around Right Entry and Right Service Doors
- Inspection & reporting – one-person task
- AC on Ramp, New Paint and Zonal Inspections completed by the MRO
  - Locate damage using existing d&b records
  - reposition GSE for better access to damage locations



**Fuselage—Left**

**Time savings / efficiency gains = 88%**

Man Hours	
Traditional tools	dentCHECK
12 hours	1.5 hours

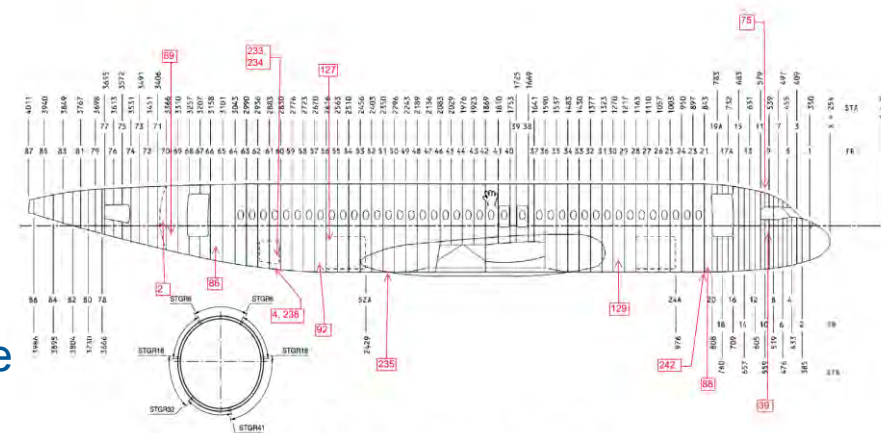


# Aircraft #4 (N242NV – SN 1396) with dentCHECK

- 18 dents/bumps
  - Primarily concentrated around Entry, Service, Cargo Doors and FWD Fuselage
- Inspection & reporting – one-person task
- AC on Ramp, New Paint and Zonal Inspections completed by the MRO
  - Locate damage using existing d&b records
  - reposition GSE for better access to damage locations



Aircraft Damage Map—A320



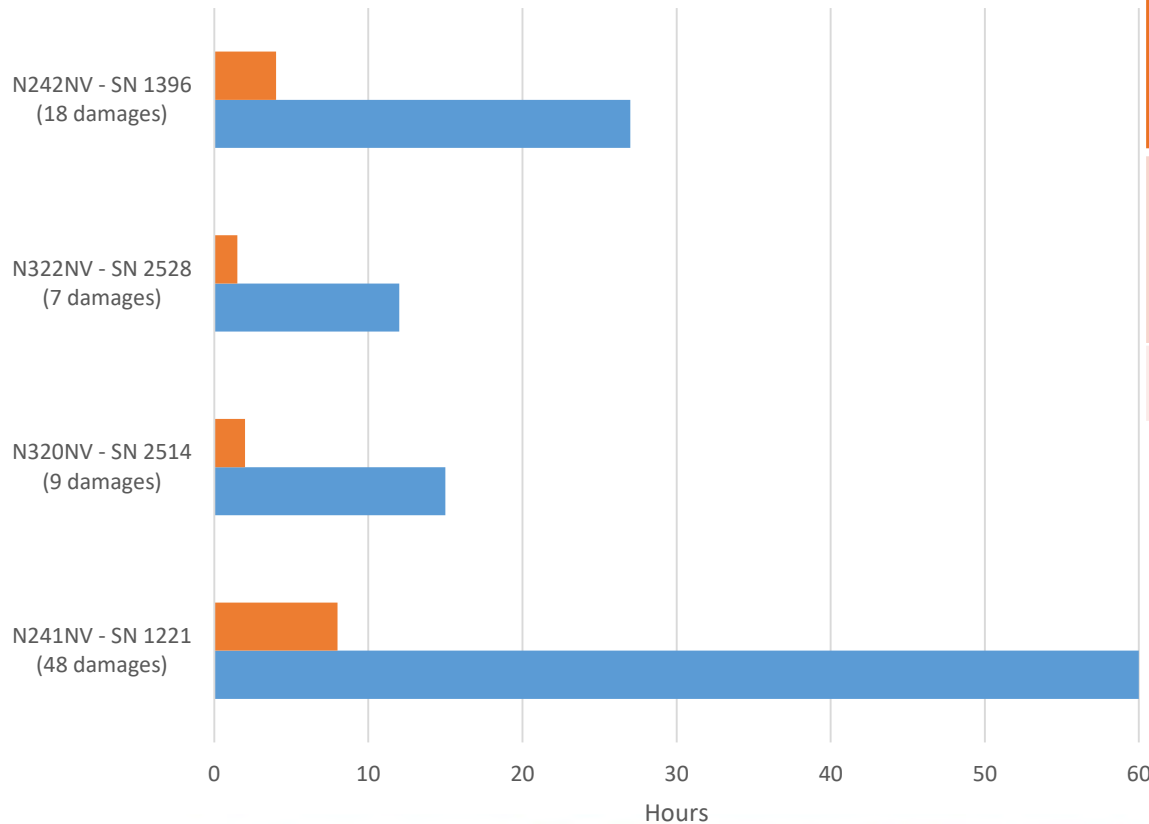
Fuselage—Right

Man Hours	
Traditional tools	dentCHECK
27 hours	4 hours

Time savings / efficiency gains = 85 %

# Time Savings with dentCHECK

Time taken to INSPECT & REPORT damage



## Measurement & Reporting Time / Damage

*Average of all aircraft inspected (minutes)*

Traditional Measurement Technique	92
dentCHECK	12

dentCHECK  
Traditional Tools

**87% Time savings with dentCHECK**

# dentCHECK in use at Allegiant's MRO (LHT-BQN)



# Induction process – with dentCHECK

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- dentCHECK reports reconciled with AC pre-existing damage records
- Any differences between dentCHECK & pre-existing damage reports were re-measured with mechanical methods
- dentCHECK mapping was consistently found to be more precise
- dentCHECK's continuously expanding capabilities, including 8cloud and blend-out integration make it a very compelling tool in our toolkit
- Allegiant is eagerly committed to exploring implementation of dentCHECK across it's maintenance operations.

# dentCHECK Reports/ Traditional Damage File

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- dentCHECK Reports
  - Easy to Interpret, Concise and Consistent, Three PDF pages
  - Data is Digitally Transferred to the Report, No Chance for Errors
  - Gives Visual Representation of the dent with 2D and 3D Photos
  - Web Cam Photo Aids in Locating the dent on the Fuselage
- Traditional Damage File
  - Huge PDF File, Some More than 100 Pages, Requires **Time** to Interpret
  - Generally Lacks Photos or Sketches
  - Difficult for Average Ramp Personnel to Understand

# Conclusions / Lessons learned

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- Did dentCHECK meet Allegiant's goals? – YES, consistently more precise
- This is supported by [findings from the 2019 AMC damage-mapping event](#) (co-sponsored by Alaska Airlines & 8tree), which tallied measurements across ~100 different human operators. Compared to traditional manual methods, dentCHECK was found to be –
  - 37x more consistent
  - 18x greater measurement certainty
  - 8x faster inspection
  - 10x faster reporting





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