



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

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Outline

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About Allegiant

- 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

- 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 3rd party MROs
- During the Induction, we create a Electronic Damage Log (Dent and Buckle List)



Electronic Damage Log

- 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

- 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

- 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 new data with previous 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

- 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

- 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



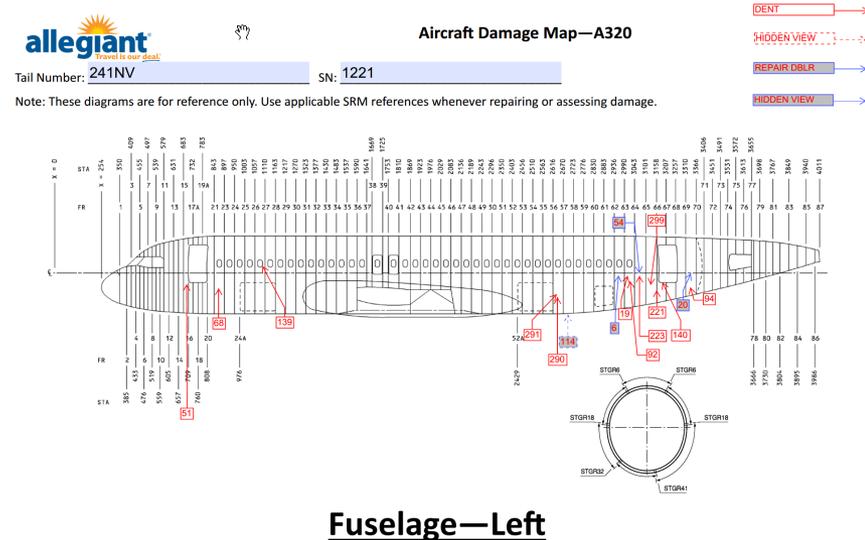
Image courtesy: Delta Airlines / A4A 2018

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*

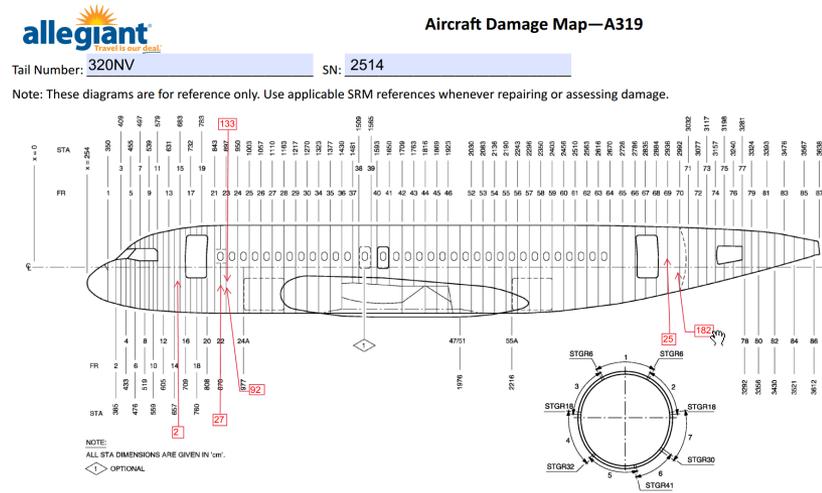


Man Hours	
Traditional tools	dentCHECK
~60 hours	8 hours

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



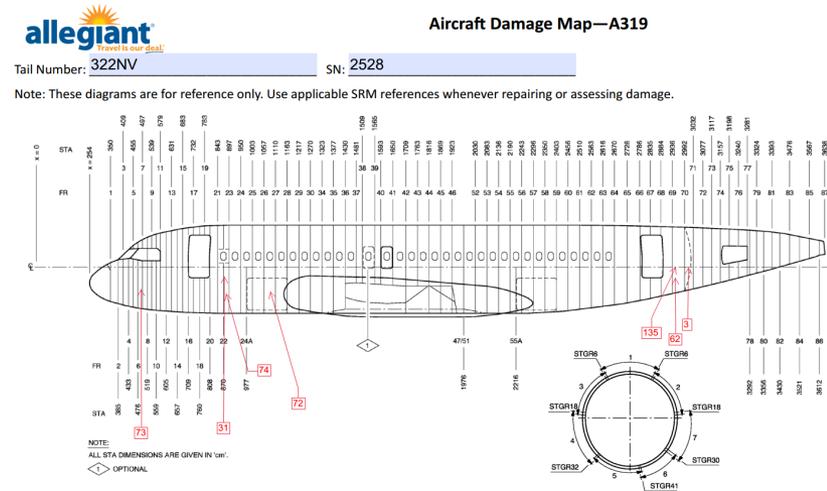
Fuselage—Left

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%

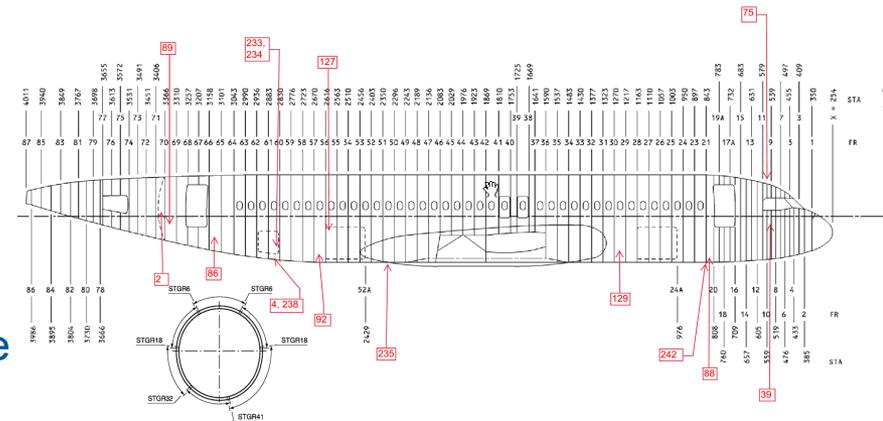
Man Hours	
Traditional tools	dentCHECK
12 hours	1.5 hours

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



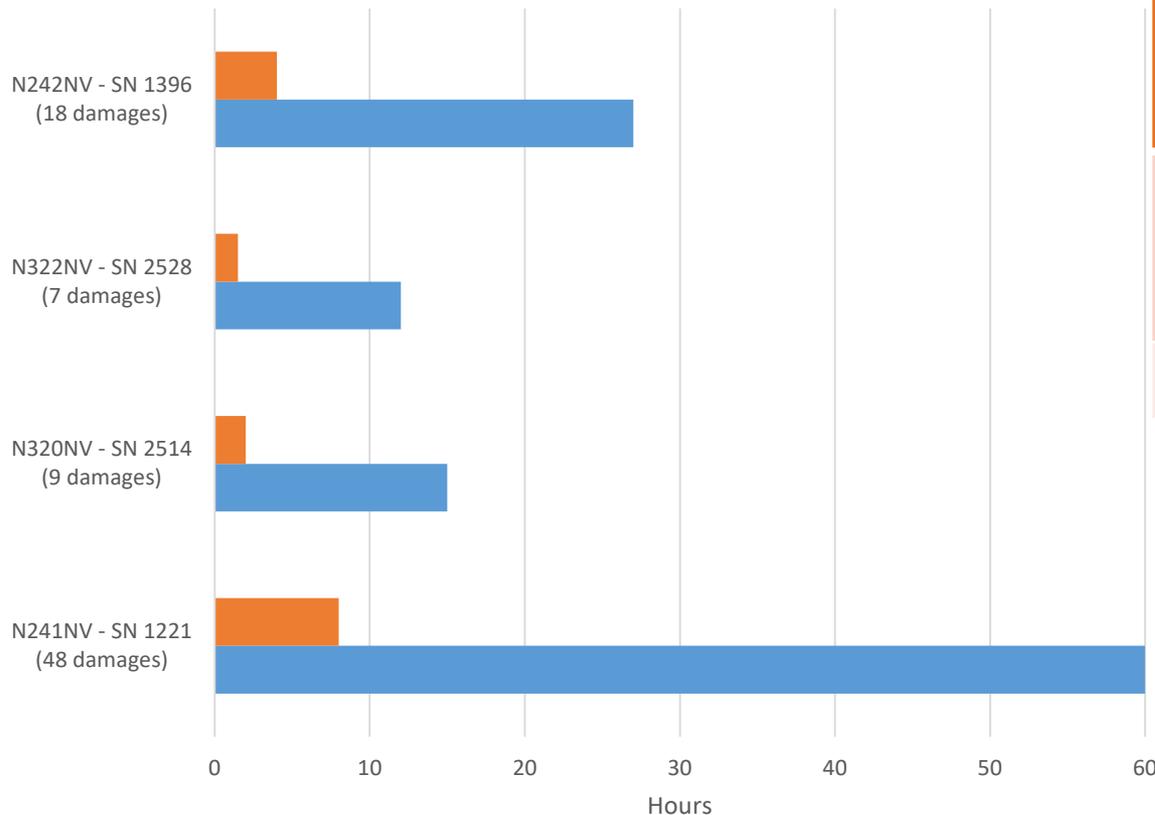
Fuselage—Right

Time savings / efficiency gains = 85 %

Man Hours	
Traditional tools	dentCHECK
27 hours	4 hours

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

- 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

- 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

- 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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