

MRO operational efficiency-gains enabled by 'Go/No-Go' digital dent-mapping:

A Case Study

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About TAP-M&E

- Leading global provider of heavy-check MRO services
- Operations in Brazil and Portugal

Rio de Janeiro

Hangar Capacity: **4 WB**
Hangar Area: **14,500 m²**
Total Building Area: **180,000m²**

Porto Alegre

Hangar Capacity: **1 WB, 5 NB**
Hangar Area: **12,500 m²**
Total Building Area: **55,000m²**



Lisbon

Hangar Capacity: **3 WB, 5 NB**
Hangar Area: **26,380 m²**
Total Building Area: **71,200m²**



Care² Airframe

Whether light or heavy maintenance; pre-flight, transit, or daily checks, we've got you covered.



Care² Engines

Our 40+ years' experience on military and commercial turboprops, turbofans, and APU's will propel you forward.



Care² Components

It's the details that count. We offer overhaul repair, test, and modifications of over 15,000 components.

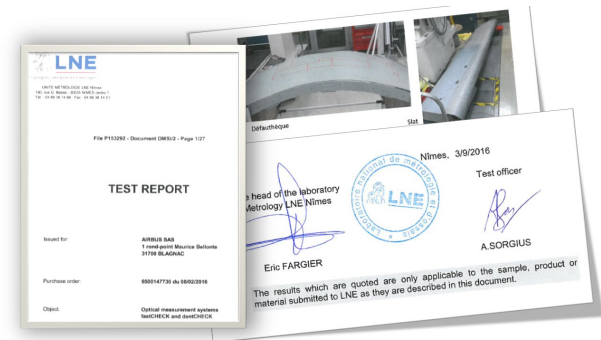


Care² Engineering

Maintenance solutions and technical services that meet the highest standards of quality, customised to your needs.

About 8tree

- Creators of **dent✓CHECK**[®], the aviation industry's tool-of-choice for 'go-no/go' dent-mapping and blend-out analysis
- Certifications –
 - LNE/Airbus
 - In process at other OEMs
- Built from the ground-up for the aviation industry
- Empowers technicians, mechanics and operators to make SRM-compliant decisions instantly



The Dent-mapping Problem

The Challenge

Achieve reliable, accurate and objective

- Dent-mapping & assessment
- Corrosion Blend-out

The Ideal Solution

Real-time. Boosts inspection efficiency

Reliable & Consistently Accurate

Comprehends SRM limits

Instant Answers...not just data

Portable. Field-friendly. Zero Learning Curve

No Surface Preparation needed



Hail Damage



Damage due to ground equipment



Lightning strike

(Image Source: Boeing)

Operator Experience Today

What operators demand

Ease of use

Accuracy

Consistency

Reliability

What operators must tolerate

Difficult learning curve

Complex tools & menus

Long interpretation & reporting time

Subjectivity & Human-error

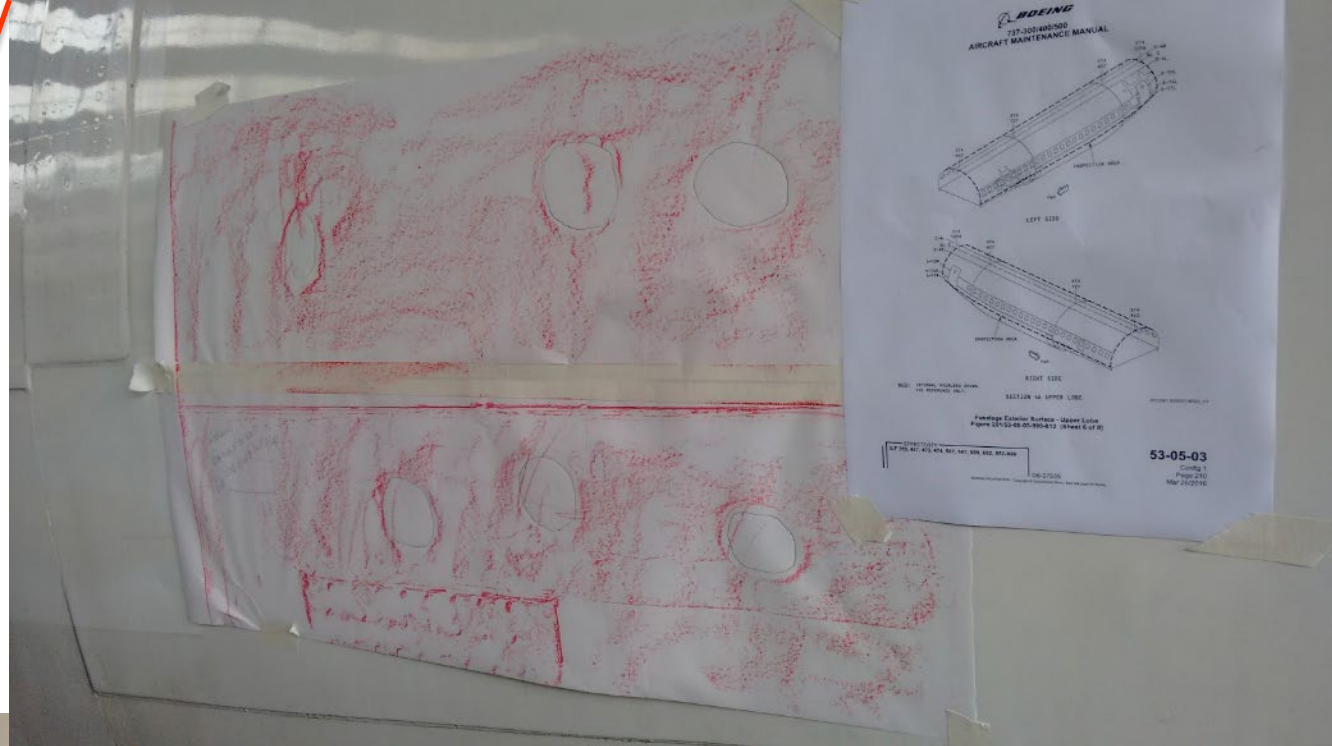


TAP-M&E : The Problem Statement

“Traditional dent-checking methods are very time consuming and frustrating”

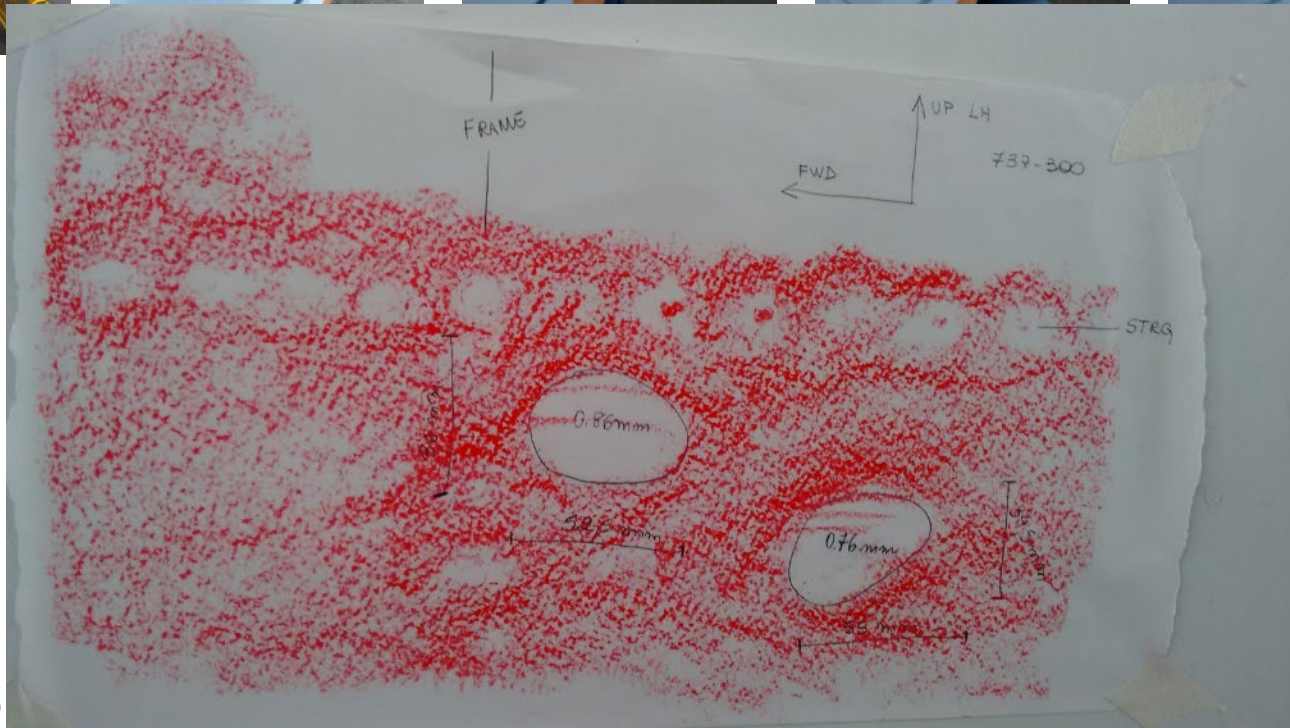
Valter Fernandes
EVP, Operations
TAP-Maintenance & Engineering

Traditional Mapping Methods



September 2016

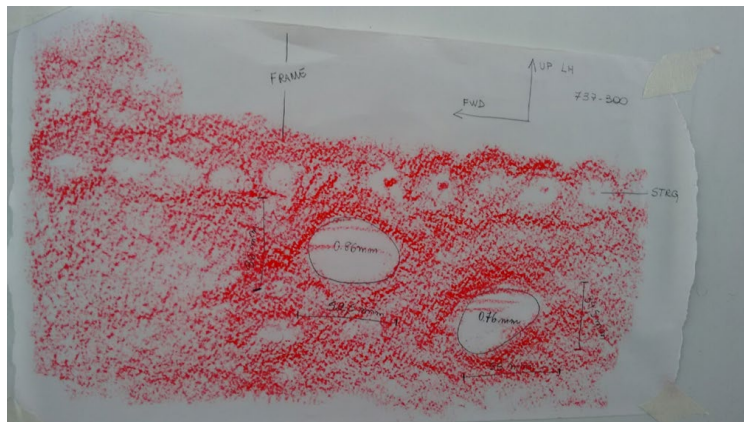
Traditional Mapping Workflow



Dent Reports: Traditional Methods

Typical industry format

- Minimal identification data
- Basic numeric measurement values
- Relies on manual entry of location information
- Text-only, unless operator attaches a photograph / manual drawing of affected area



TAP MAINTENANCE & ENGINEERING Structure Defect Report

Fleet: A330		Registry: C-XXXX	MSN: 123	Airline: BRASIL	Check: C	Flight Cycles: 1	Flight Hours: 20000	ATA: 57
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Job Number: 123
SDR Number: 123 57 28
Date: Nov 05/2016

Generating Item: ☐ Scheduled task (routine): 1586777 ☐ Job Number:
☐ Other (EO, CAR, TLB, SNAG,...)

Inspection Method: ☒ General Visual ☒ Detailed Visual ☐ Ultrasonic ☒ HFEC ☐ MFEC
☐ Rototest ☐ X-Ray ☐ Magnetic(MPI) ☐ LFEC ☐ Thermography
☐ Borescope ☐ Conductivity ☐ Tap Test ☐ Spot Fluid (FPI) ☐ Other:

Damaged Part: ☐ Fuselage ☐ Vert Stabilizer ☐ Slat ☐ Rudder ☐ Spoiler ☐ Wing ☐ Aileron ☐ Flap ☐ Nacelle ☐ Elevator ☐ Door ☐ Horiz Stabilizer ☐ Other: PN: SN:

Type of Damage: ☐ Crack ☒ Dent ☐ Corrosion ☐ Perforation ☐ Lightning Strike ☐ Missing
☐ Scratch ☐ Wear ☐ Delamination ☐ Debonding ☐ Other

Type of Corrosion: ☐ Exfoliation ☐ Intergranular ☐ Pitting ☐ Foliform ☒ N/A

Corrosion Level: ☐ 1 (Light) ☐ 2 (Medium) ☐ 3 (High) ☒ N/A

Description/Location of the Damage: DENT WAS FOUND NEAR RIB 4 STRG 10. Size of the Damage: Unit: mm
Length: 55 Width: 23
Depth: 0,85
Remaining Thick:

Sketch/photo attached: ☐ Yes/Second page may be used-Requires NRC N* ☒ No

Allowable Damage: ☐ SRM ☐ Other
Repair Reference: ☐ SRM ☐ Other

Repair Category (*): ☐ A Permanent - Unlimited ☐ B Permanent - Inspection ☐ C Temporary ☐ TBD
Specific Maint Req:

Method: Threshold FC: Interval FC: Threshold FH: Since New Interval FH: Since Repair Embodiment

(*) IF Repair Category "B" or "C", FILL Specific Maint Req

PRODUCTION (SIGNATURES)
Originator/Reported by: Date/Signature/stamp
Accomplished by (mechanic): Date/Signature/stamp
Verified by (inspector): Date/Signature/stamp

Implementing dentCHECK® @ TAP-M&E

- Tool introduction inside TAP (Oct 2015)
 - User training – minimal; intuitive 1-button operation
- Integrating the system inside TAP's workflow
 - First-phase = Dent-Mapping
 - *Next-phase = Corrosion Blend-out, Scratch & Gouge Blend-out*
- Acceptance by technicians – easy-to-use tool

dent✓CHECK® – Go/No-Go Digital Mapping

- Never look away – eyes always on task!



Dent Reports: dentCHECK®

- Image-based reporting format with traceable measurement values
- Measurement values extracted directly from SRM-compliant dentCHECK results

Information Rich Reporting

A / Y (or W / D)

Deepest point x-section

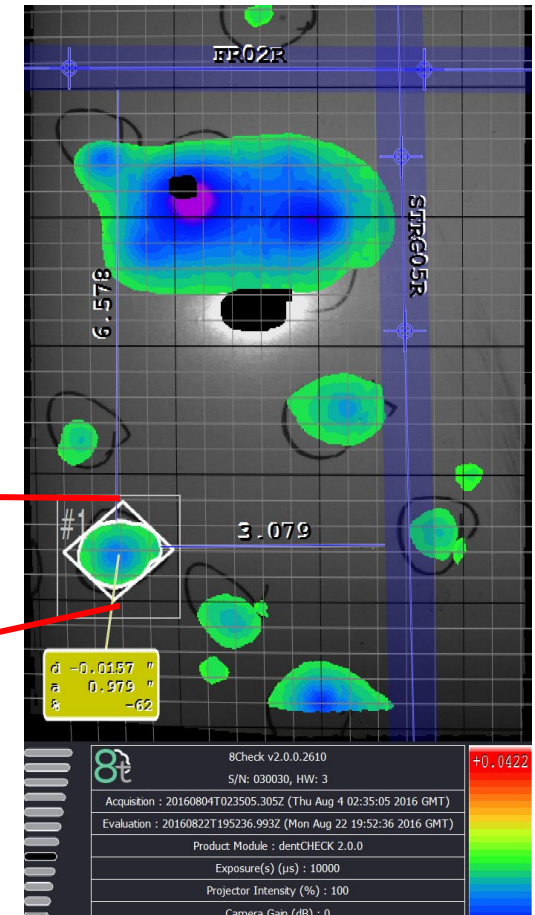
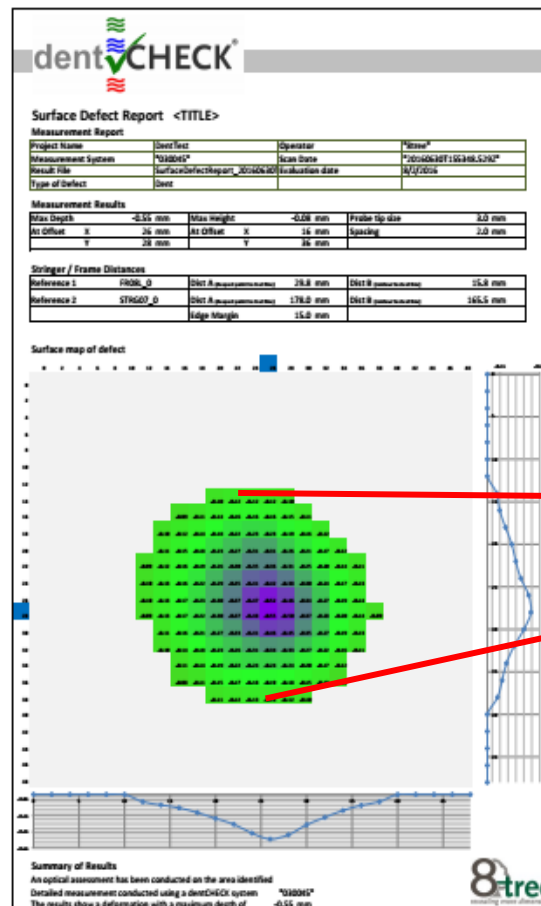
Distance to frame & stringer

Detailed log (operator ID, time-stamp, job #)

Color-coded annotation

Audit-ready digital reporting

Customizable reports



Benefits Realized : dentCHECK® @ TAP

Workflow Benefits

- Extremely rich and detailed results – visual and SRM-compliant numeric answers
- Portable and handheld design – ideal for the busy maintenance environment – no wires, no PC, no power supply
- dentCHECK Desktop Reporting Tool (DRT) – “brings the airplane into the office”
- All measurement results are digitally captured for ease of record-keeping and sharing with OEMs and Operators
- Zero-learning curve – almost no training required
- Compliant with and recognized by OEM standards – Certified by Airbus

Benefits Realized : dentCHECK® @ TAP


Time Savings & Efficiency Gains

Step	Task	Time taken (Traditional Methods)	Time taken (dentCHECK®)
1	Setup per dent	5 min	1 min
2	Operator maps a dent on aircraft*	10 min	30 seconds
3	Multiple operators repeat measurements on same dent to verify and reach consensus	10 min	30 seconds
4	Create a dent-mapping report for each dent*	10 min	1 min
	Total	35 min	3 min

dentCHECK reduces Mapping AND Reporting time by >90%

* In an SRM-compliant fashion

Benchmarking Efficiency & ROI

Man-Hours	Dent Mapping & Reporting	
	Traditional Methods	With  dentCHECK
1	2 Dents	30 Dents
8 (1-workday or 1-shift)	16 Dents	240 Dents

dentCHECK saves 14 days of time and labor with every day of use

Return on Investment (ROI) period ~2 months

“dentCHECK isn’t simply an enhancement to our dent-mapping processes...

...it’s a huge leap in efficiency!”

Valter Fernandes

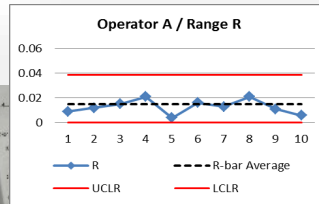
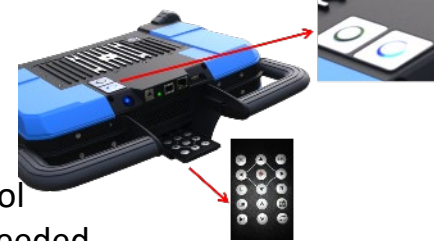
EVP, Operations

TAP-Maintenance & Engineering

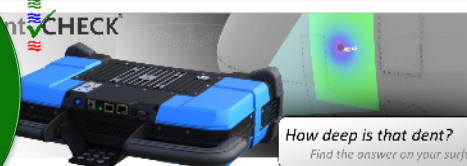
dent✓CHECK®: Benefits to Airlines/MROs



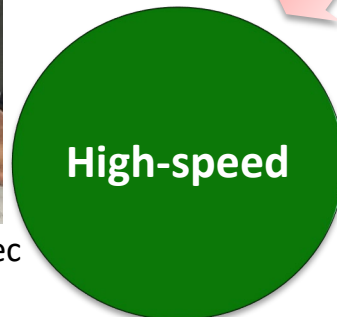
Zero Learning Curve
1-button operation
Tablet/smartphone control
No surface preparation needed



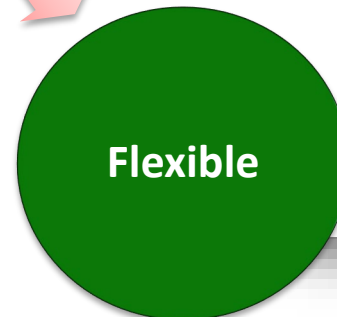
Traceable to
National Standards



Lightweight
No cables or monitor
No external CPU



Actionable Results <2 sec
Efficiency boost >10x
Real-time feedback



QR code Configuration

www.tap-mro.com

www.8-tree.com

Operator Experience with dentCHECK[®]

What operators want = What operators get

Ease of Use

Accuracy

Consistency & Objectivity

Quick out-of-box experience

Simple to operate & understand

Instant Analysis = fast decisions!

*“Don't bend to technology.
Bend technology to your needs”*

- Jason Pontin
MIT Technology Review

Thank you

Questions?

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