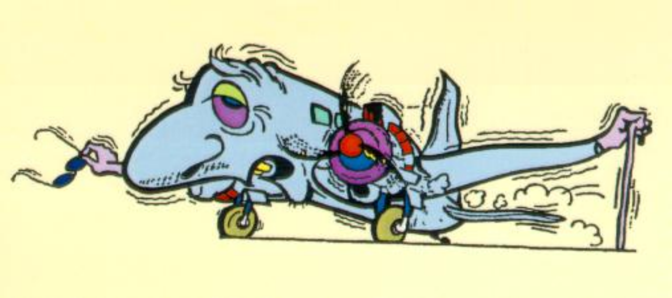
"Swiss Association of Aeronautical Science"

Polytechnic of Zürich

Mar 2026

It is a Complex Business this Aircraft Structural Integrity…



L. Molent AM

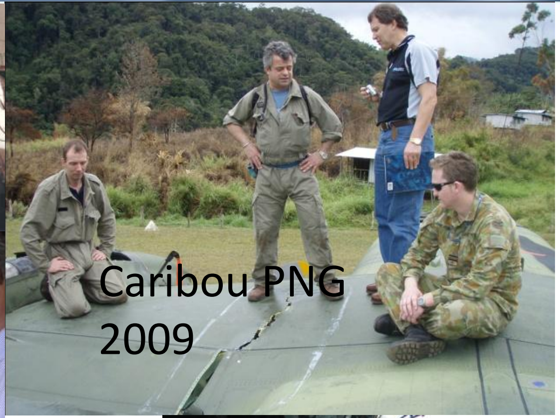
Molent Aerostructures Pty/Ltd

www.molent.com

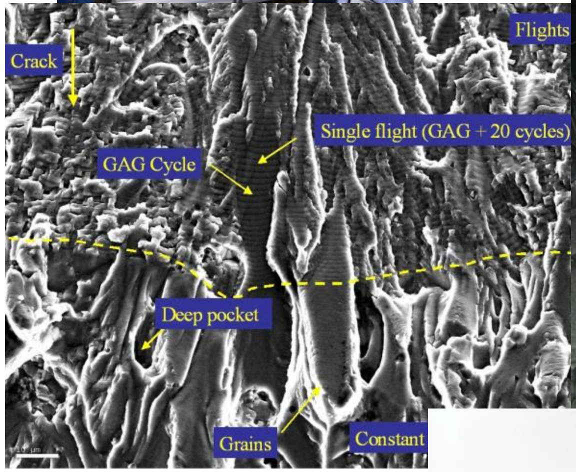
About Me
– Loris (Lorrie) Molent AM*

- Aero Structures Consultant & Trainer
- Aeronautical Engineer
- Principal Research Scientist
- Head, Aircraft Structural Integrity (Retired) Aerospace Division Defence Science & Technology Group (DSTG) - Australia
- Experienced Aircraft Accident Investigation – Airframe (Retired)
- Failure analyst not Designer

*Order of Australia

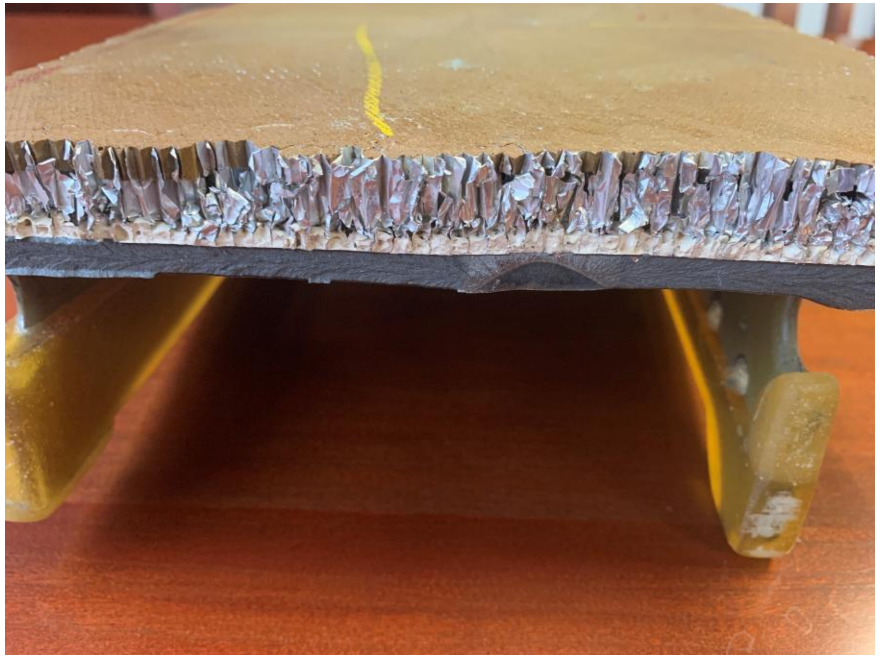


Caribou PNG 2009



F111G Pulau Aur Malaysia 1999

USAF Lincoln Award Dec 2025



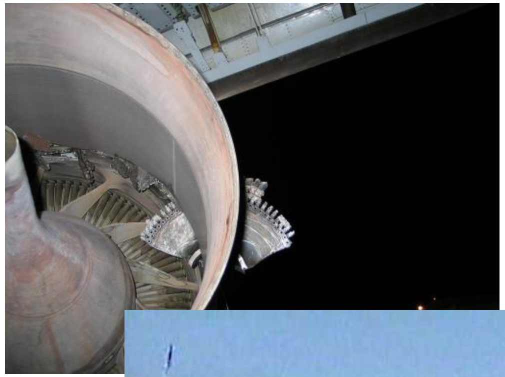
Jack's door-stop! 1969 F111 Wing Failure
"Vigilance - Never Forget"

Dr. John (Jack) W. Lincoln, Ph.D., P.E. 1928 - 2002

Acknowledgements

Significant Ways Aircraft Fail Operationally

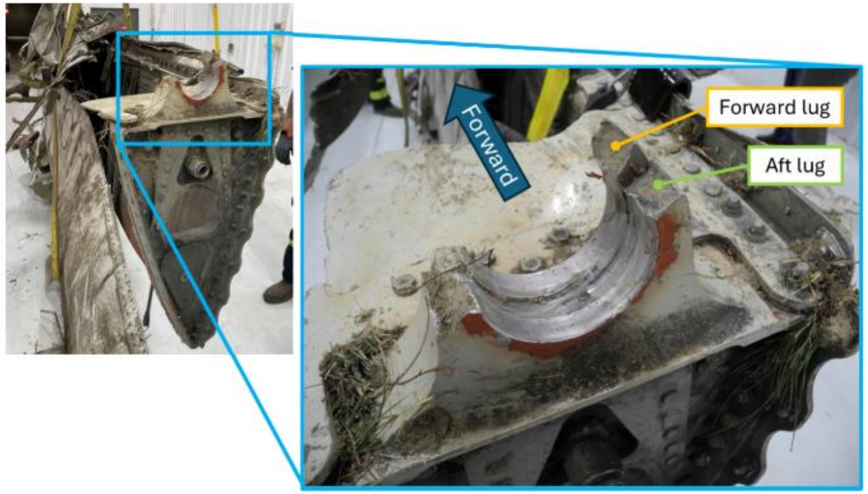
- **Aviation is inherently safe; Probability of Failure = 1 x 10^{-7} flights**



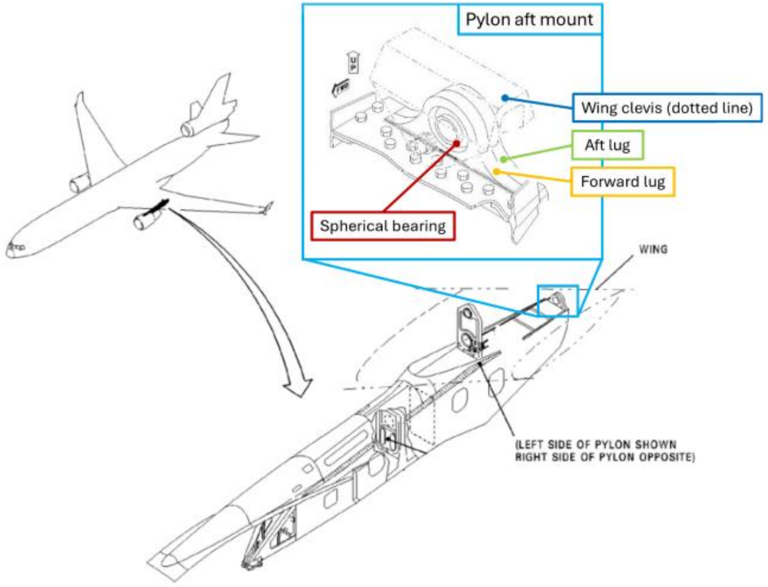
- Ultimate failure - under the application of a single (over) load.
- Excessive yielding, distortion or buckling - application of a single load above material yield but below material ultimate load.
- Overheating/Fire – Degraded material properties due to heat above allowable.
- Flutter - onset of flutter is directly proportional to the stiffness of the structure and its speed.
- Explosion/Warhead
- **Fatigue** - cracking and failure after the repeated application of subcritical loads.
- Creep - Deformation under static stress at elevated temperatures at long periods of time (> 0.4 Tm)

  – Influencing factors:
    a) corrosion and material degradation
    b) pre-existing or induced defects (cracks, damage, poor repairs)
    c) weight and balance of the aircraft

UPS MD-11F 4 Nov 2025



The separated left pylon after recovery (left image) and the left pylon aft mount's fractured forward and aft lugs (right/enlarged image). Clear signs of fatigue (NSTB)



The pylon-to-wing mount diagram, with the inset image showing details of the pylon aft mount connection to the wing clevis. (Source: Boeing, edited by NTSB)

AA DC-10 in 1979??

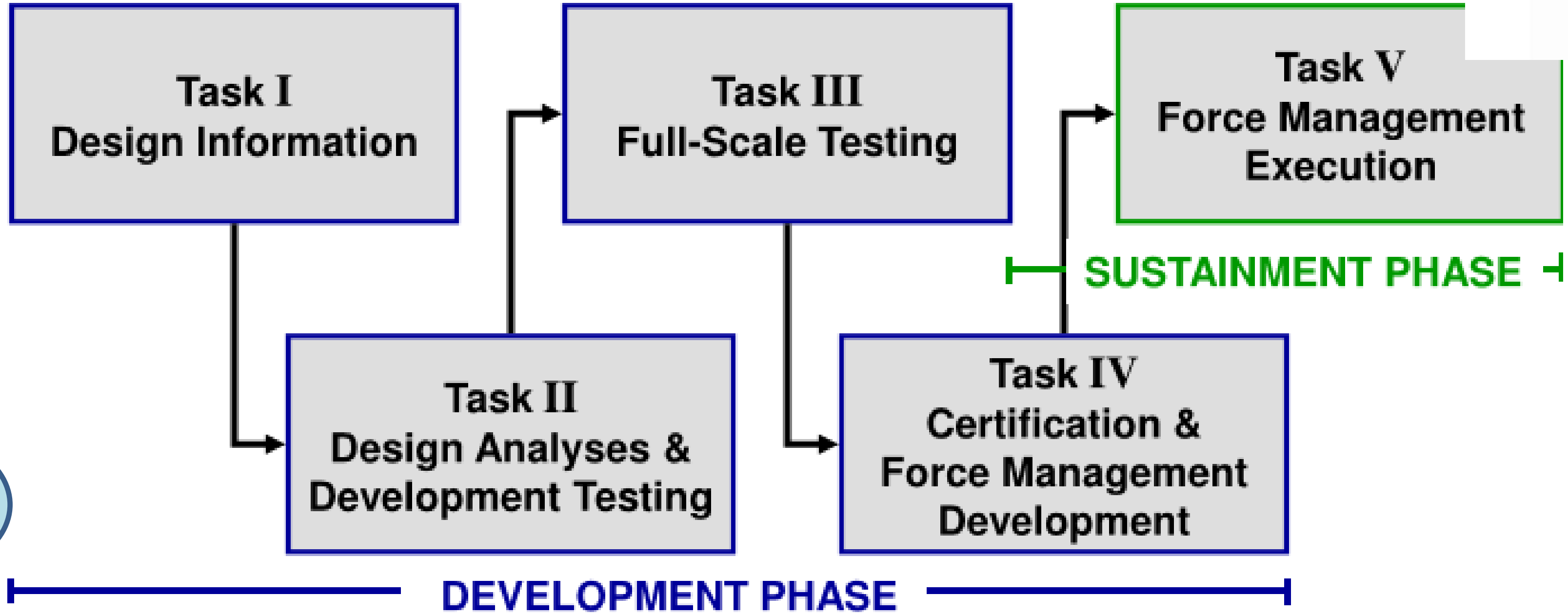
Long History of Collaboration

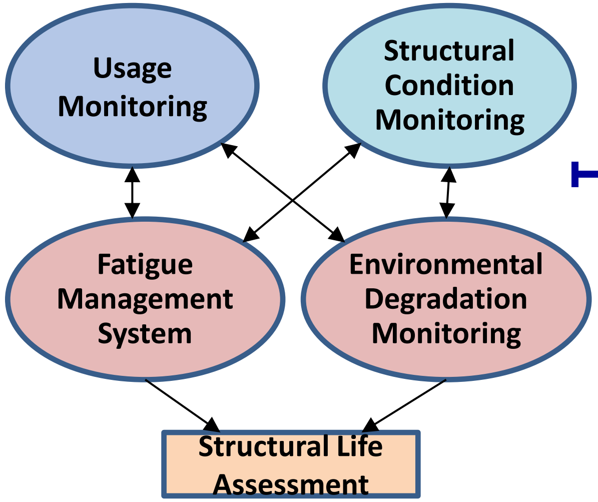
SWISS MIRAGE IIIRS (GERARD VAN DER SCHAAF / CCSA)

Mirage III Full-Scale Fatigue Test @ Emmen
circa late 70s

ASIP Tasks Overview (Vigilance)

- Many elements
- Complex
- Costly
- Multi-Organisations





ASIP Goal

Ensure the desired level of structural safety, performance, durability, and supportability with the least possible economic burden throughout the aircraft service life

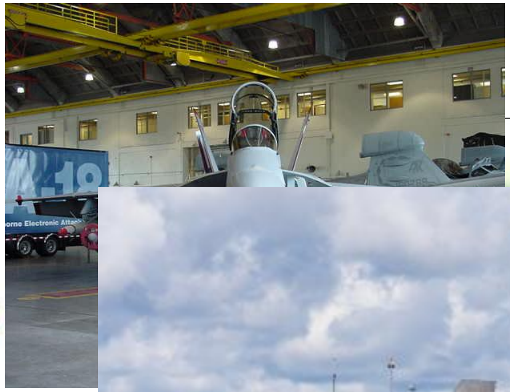
Courtesy: C.A. Babish

Royal Australian Air Force

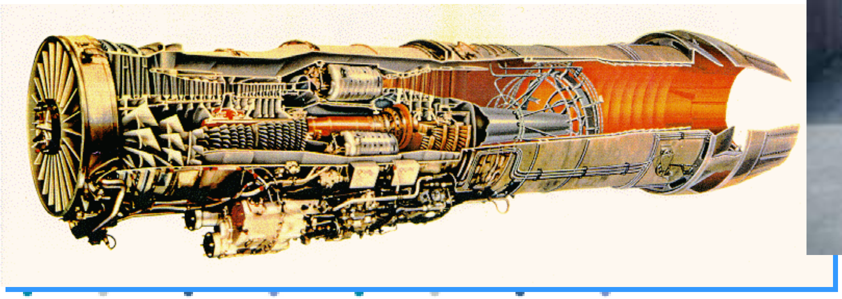
RAAF

AUSTRALIAN ROYAL AIR FORCE

PER ARDUA AD ASTRA



Owner, Maintainer, Regulator and Operator



But, what did I (we) do for the USAF?

COMPOSITE REPAIR OF AIRCRAFT STRUCTURES
The Australian Experience

By
L. Molent
Aeronautical Research Laboratory
Melbourne Australia

ARL has pioneered the use of composite repairs to metal structures. This work has established Australia as a leading exponent of this technique in the world. Whilst initially developed for military aircraft the technique is now being applied more widely to civil aircraft. In view of the growing number of problems in the ageing aircraft fleet, and economical restraints, there is great potential for this technique to gain much wider use.

This presentation will highlight some examples of composite repairs, and briefly address the philosophy behind their design.

Presented at:

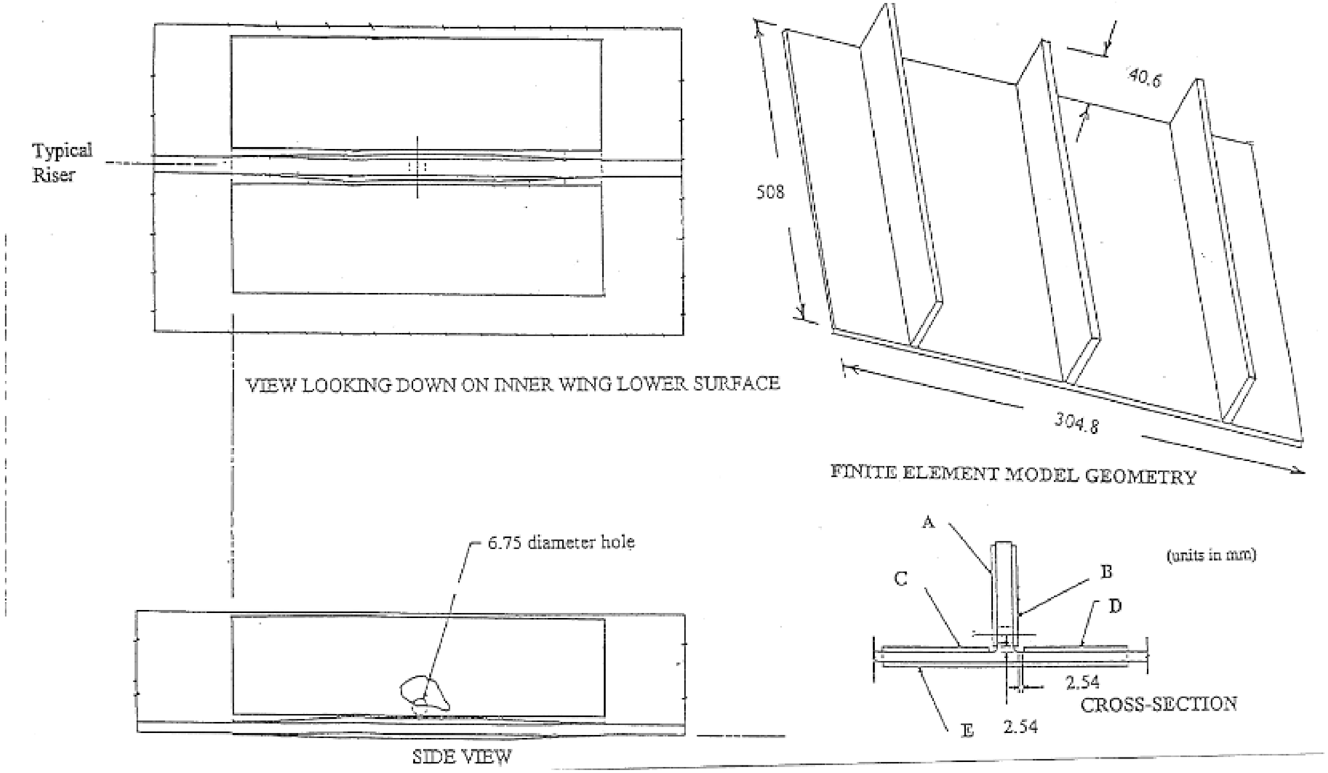
AIAA 1991 International Aerospace Engineering Conference and Show
Feb 12 - 14 1991; Los Angeles USA.

A World Of Opportunity For Aerospace

1991, and Bill Schweinberg said….

C141 Wing Weep Hole Cracking Repairs (circa 1993)

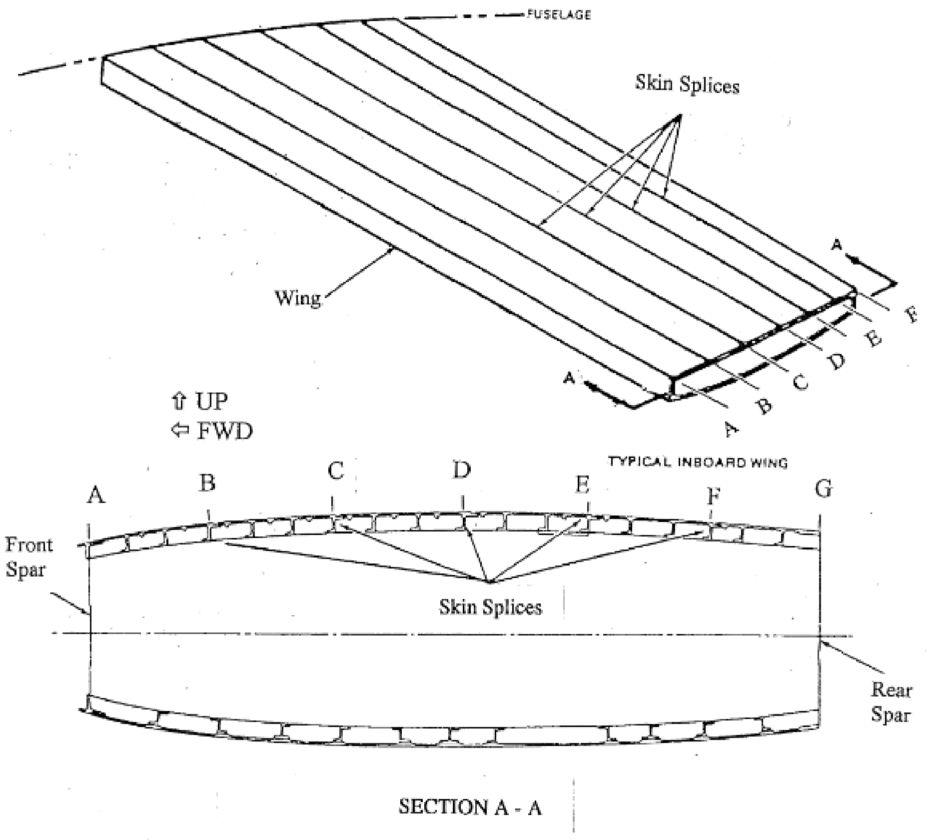
- So, you need to recover heavy lift capability Bill?

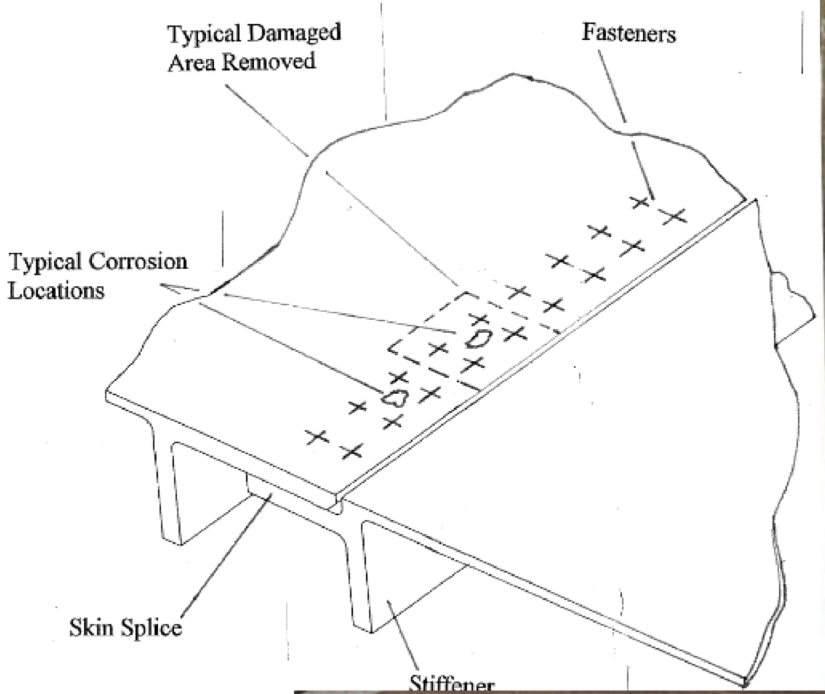


ARL-Tech Note- 62, Dec 1993

- 120 aircraft repaired
- Usually 3 patches per repair
- 2300 bonded patches
- After 10 years – No problems (see Butkus [4])

B52 Wing Corrosion Repairs (circa 1994) [5]





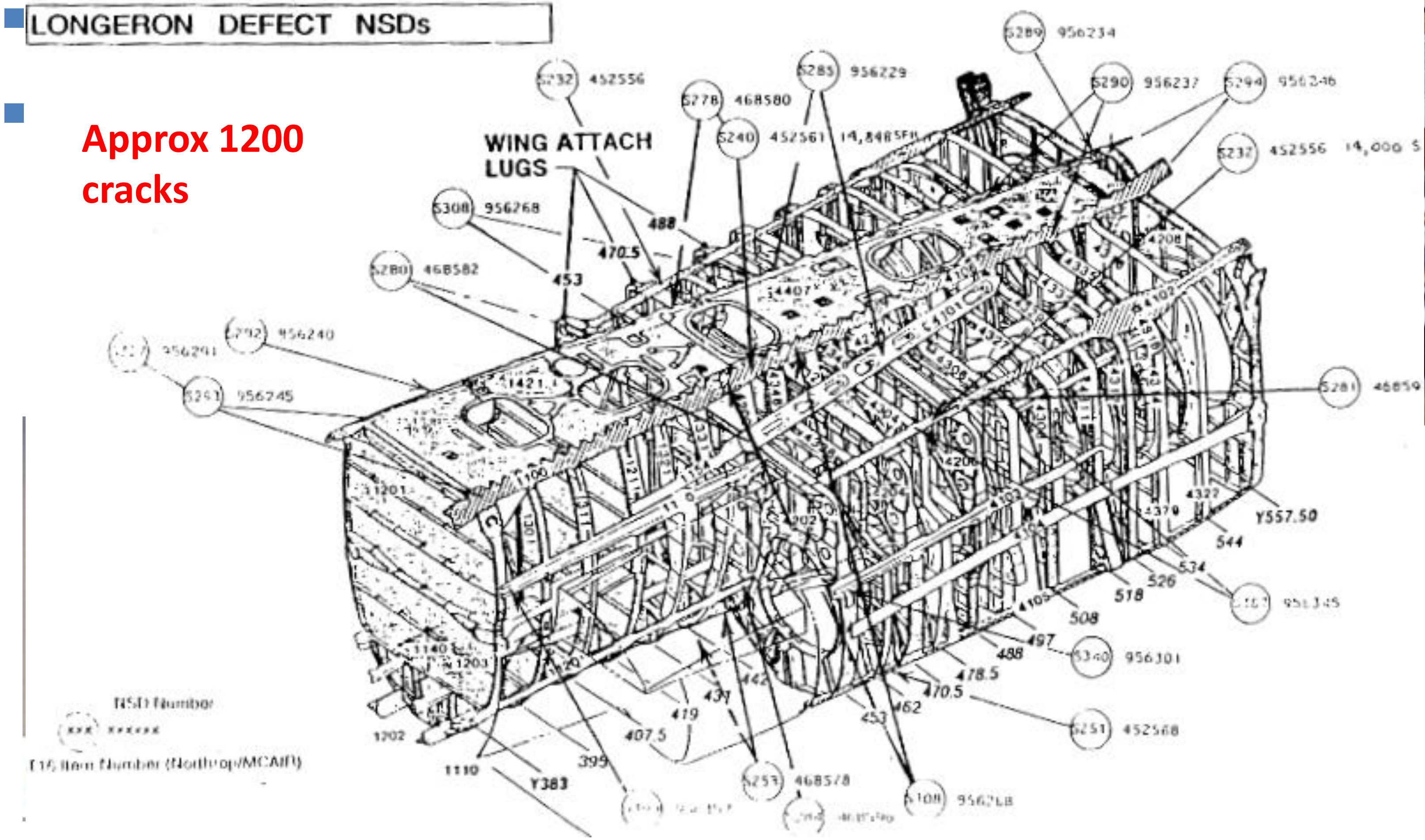
Not to Scale

Repair design and validation testing (Specimens with B52 wing Spec)

ST16 Teardown Center Fuselage Critical NSDs

Ref.: ICM No. 334-1110-11489 and NAVAIR NOD LETTERS Ser PMA265-2/2958-91 Ser PMA265-2/3033-91

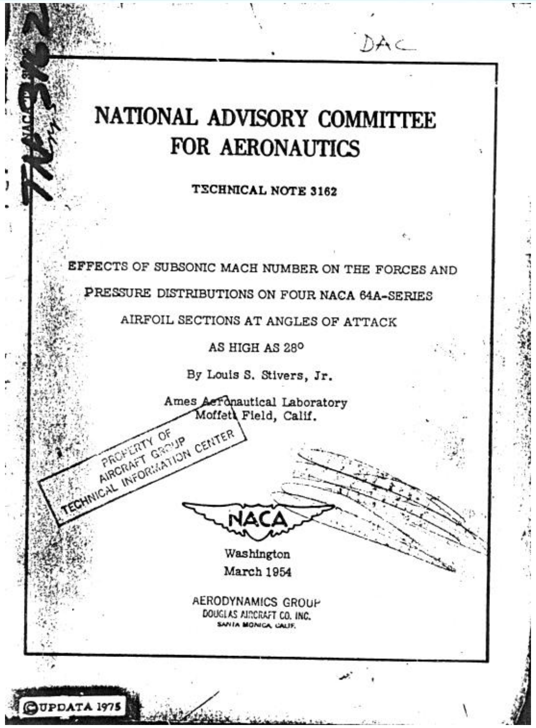
Cracks Discovered at 16,000 SFH Unless Otherwise Noted



Approx 1200 cracks

Salubrious “Office” JP1 Crystal City

SuperSonic P3C Orion (circa 1991) [6]


NATIONAL ADVISORY COMMITTEE
FOR AERONAUTICS

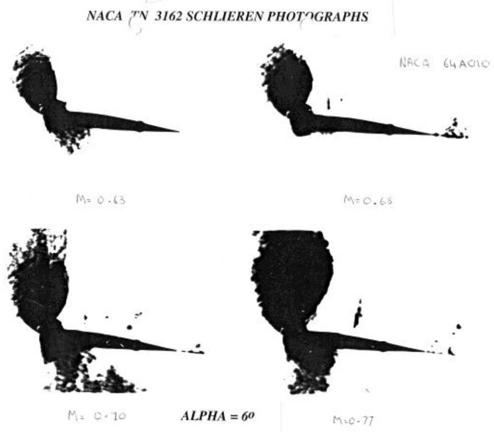
TECHNICAL NOTE 3162

EFFECTS OF SUBSONIC MACH NUMBER ON THE FORCES AND
PRESSURE DISTRIBUTIONS ON FOUR NACA 64A-SERIES
AIRFOIL SECTIONS AT ANGLES OF ATTACK
AS HIGH AS 28°

By Louis S. Stivers, Jr.

Ames Aeronautical Laboratory
Moffett Field, Calif.

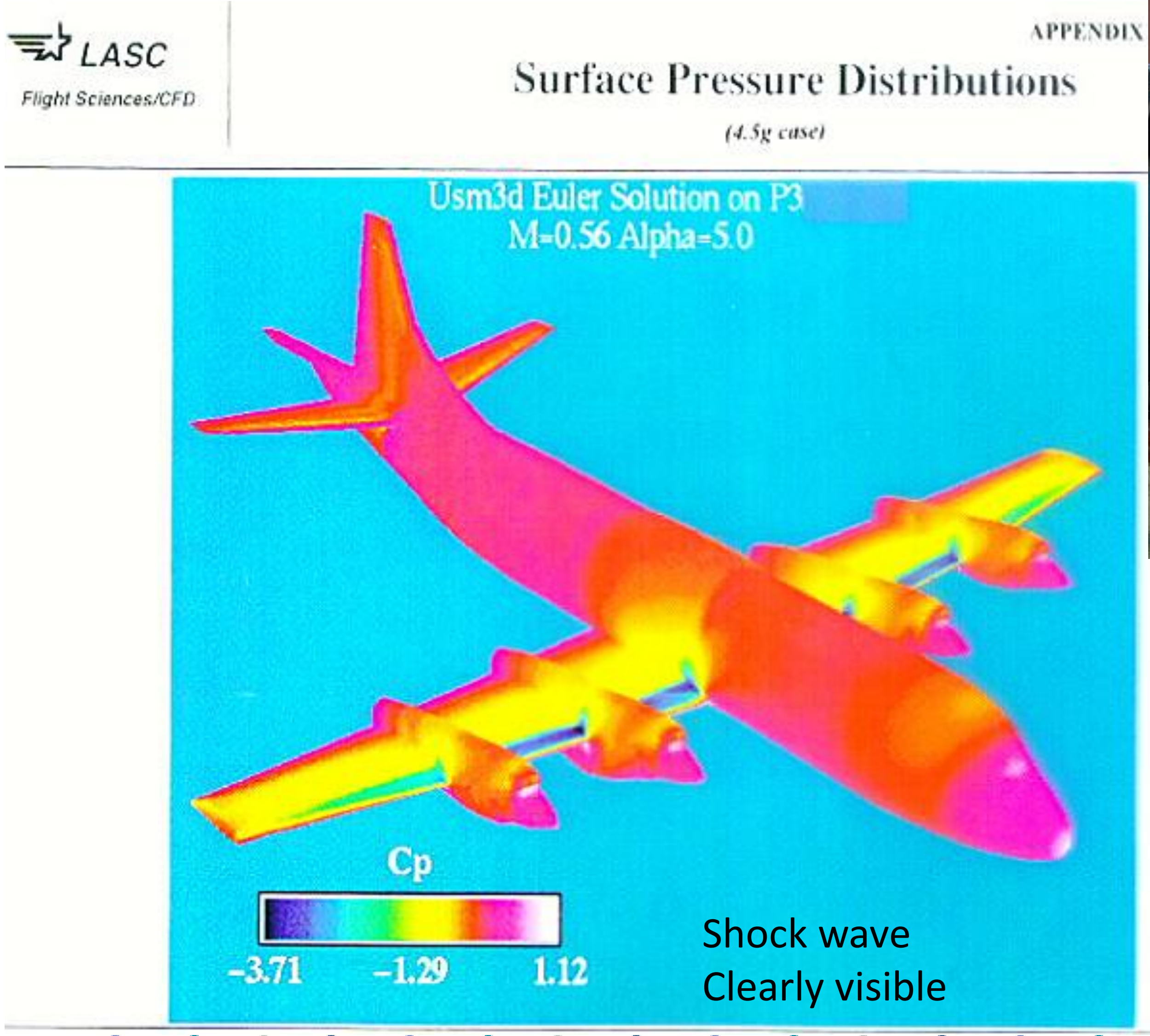
Washington
March 1954



At the 1992 P3C International Users Conference… Lockheed laughed at this suggestion and called me !#$%!&*

Transonic Compressibility

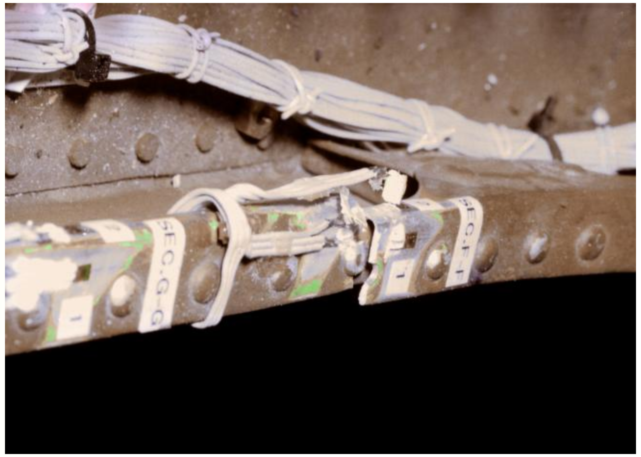
Super Orion Con't



Shock wave
Clearly visible

Lockheed White Paper on 1.5 factor [7]

Recertification test at DST

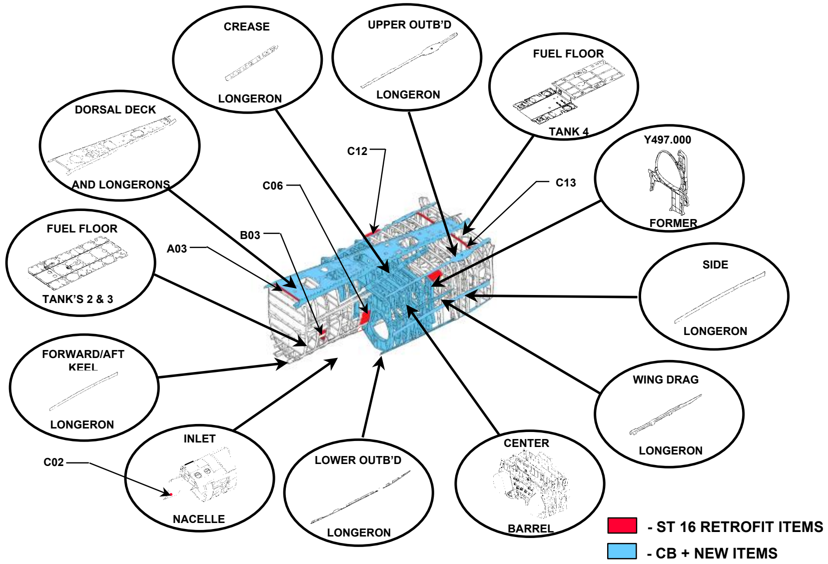


Interesting times in 91…

- Hornet cleared to carry 15Klb modified cannon-barrel bomb…
- Boys & girls came home
- Service Life Bulletin (SLB) No. 3 released under my signature…

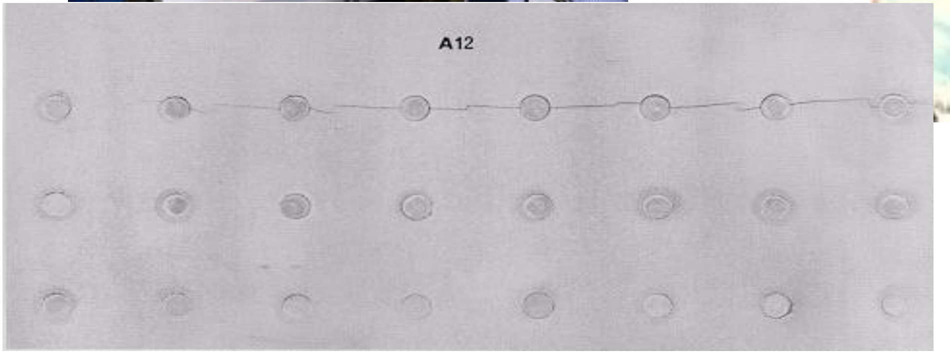
Don P: “Lorrie, Admiral wants to see you”
Lorrie: “That can’t be good”
Don P: “Yes”

Center Barrel + Work Content

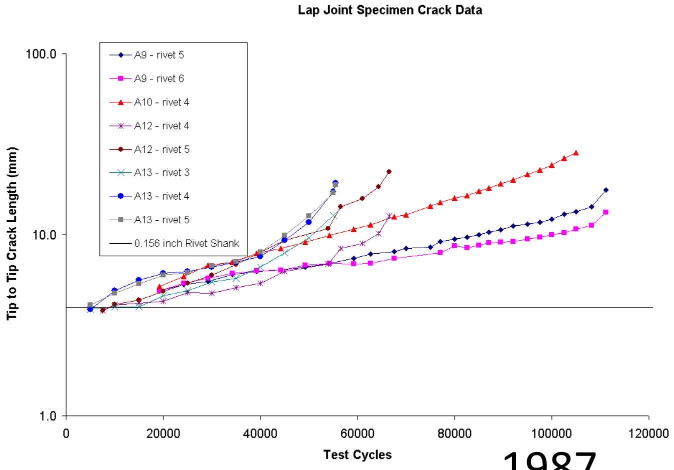


Admiral Dyer: “The RAAF want to sue us because of the limited life of the aircraft (sic SLB)”
Me: “Sad to hear that Sir”
Admiral: “You will get sadder, as we will sue you!”
Me: “yes, Thank you, Sir. ”

Aloha Airlines Boeing 737 29 April 1988



Chief Investigator
Tom Swift in Oz



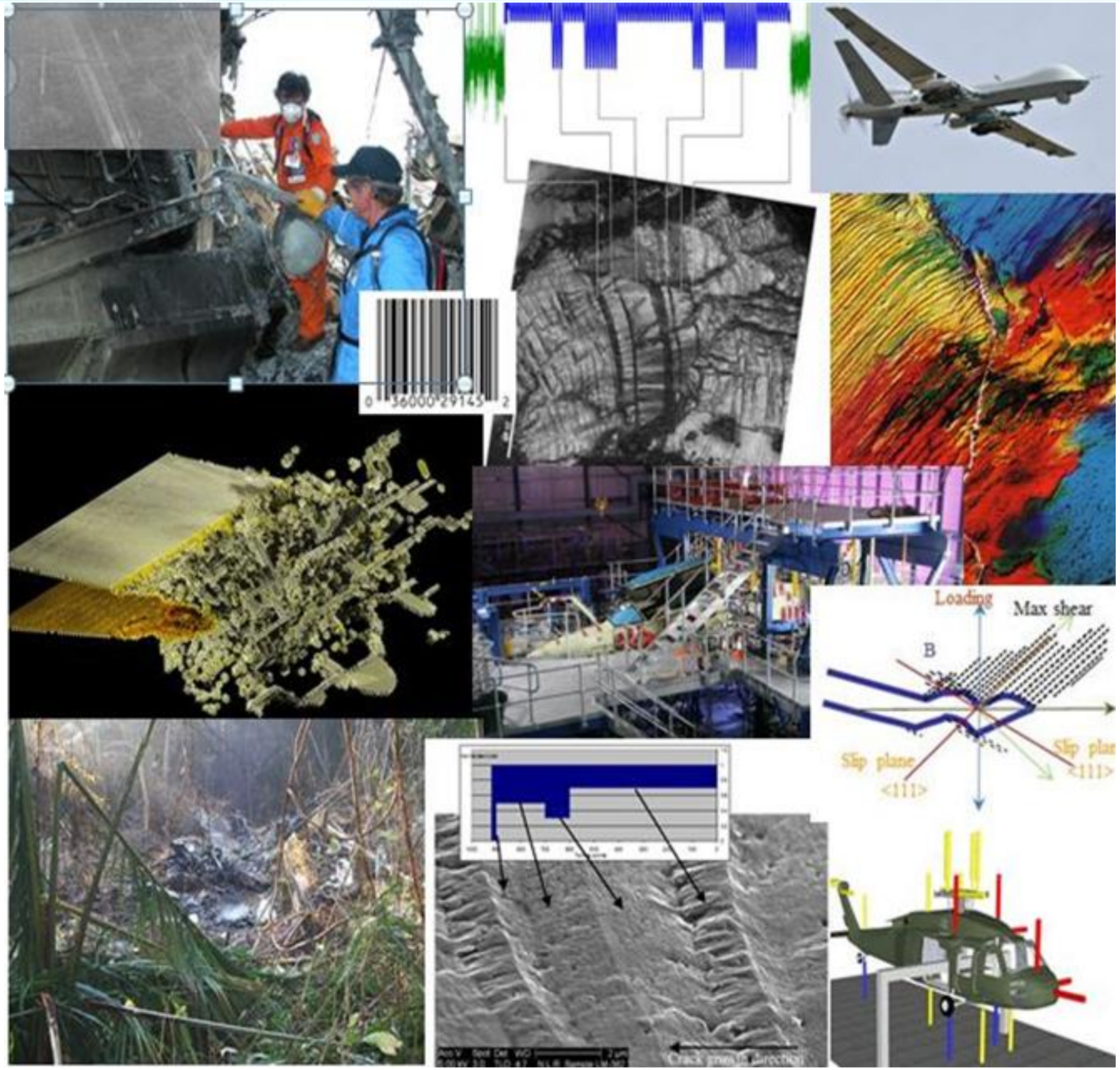
1987

Data provided to FAA & Boeing

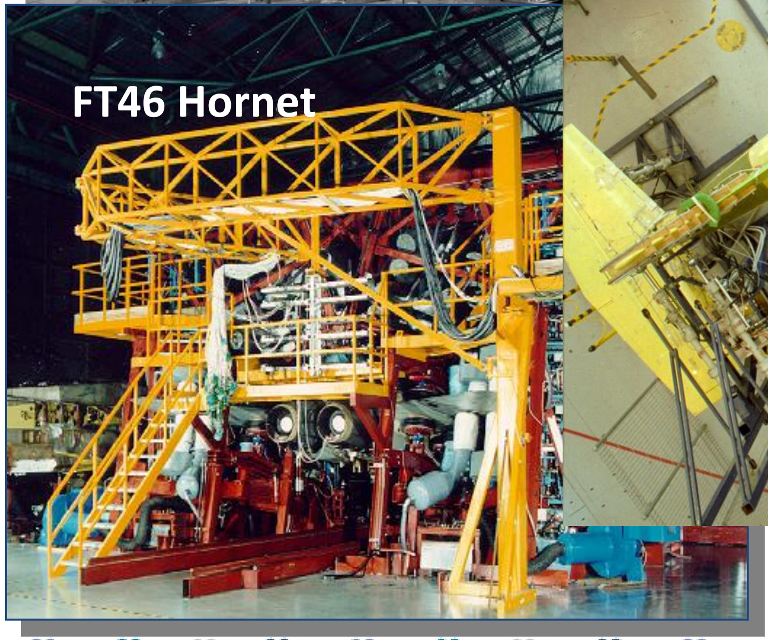
Ulf (Chief Structures Boeing) & Inger Goransen

See [8-10]

Back in Oz….

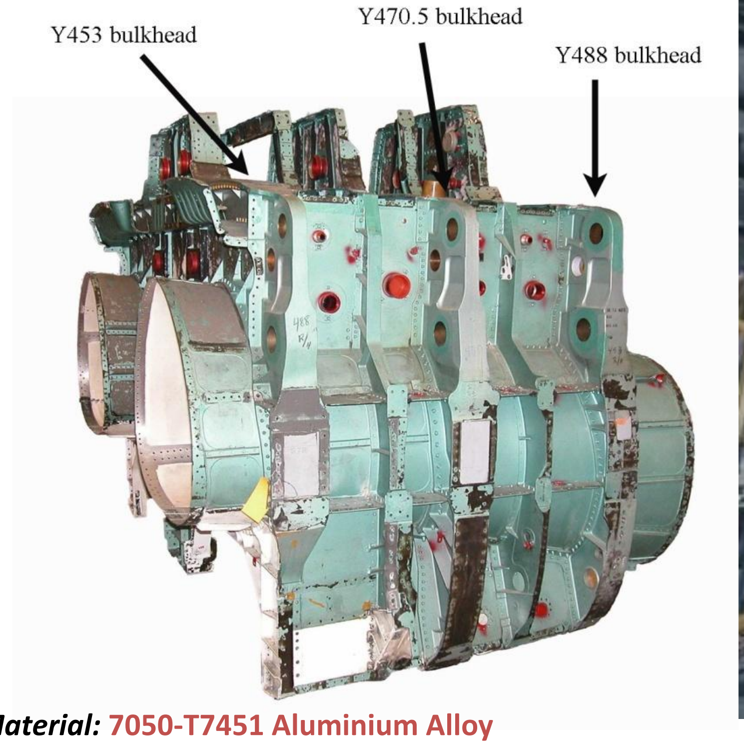


FSFTs [12-15]



And ….

Hornet “Centre Barrel” Test (High Speed Film)



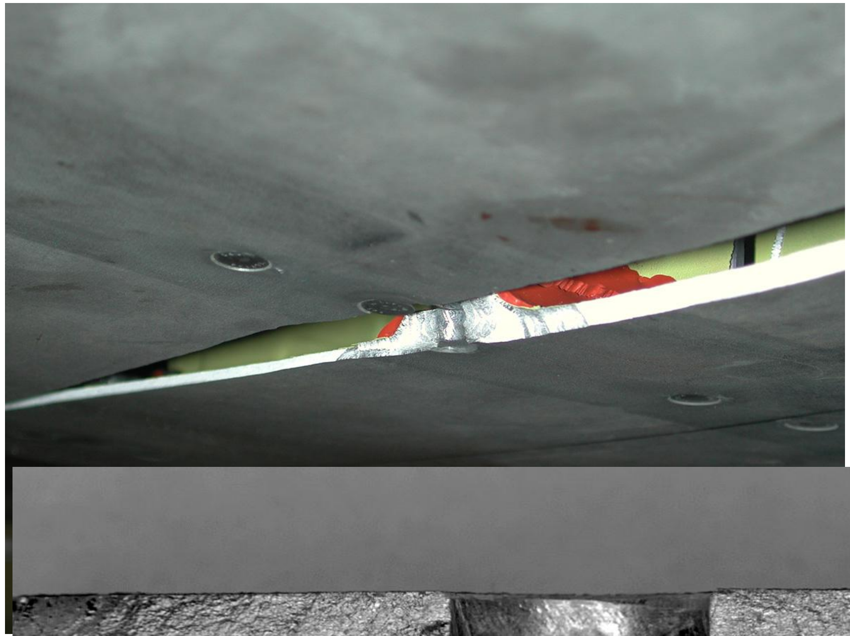
Material: 7050-T7451 Aluminium Alloy
Weight: ~ 500 kg (bare structure)
Fracture Critical

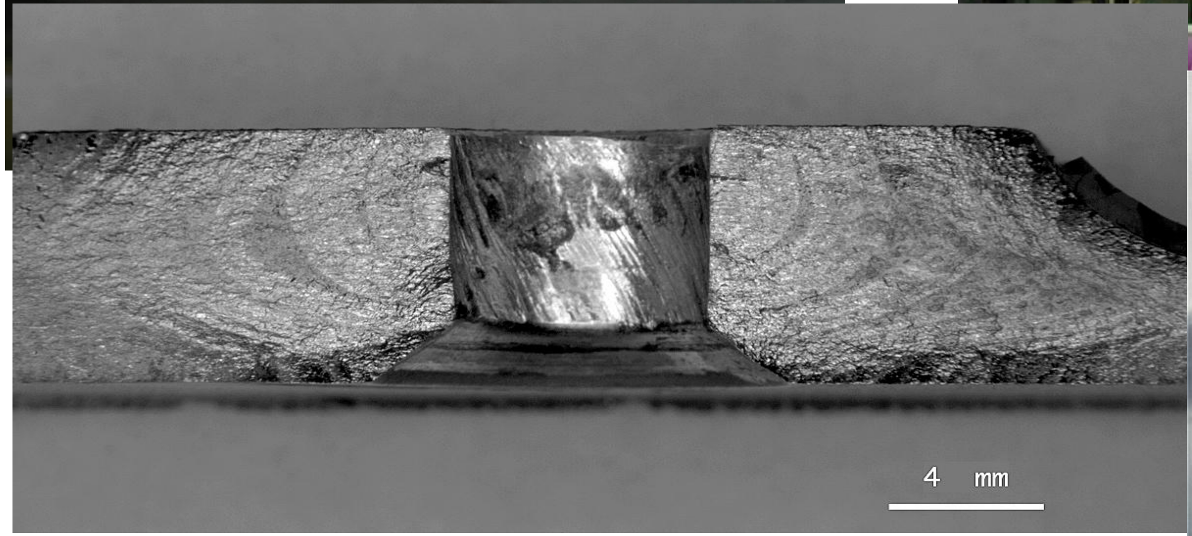
- Fleet life extension of > 10%
- $400M in real savings
- Delay purchase of JSF by 10 years

movie

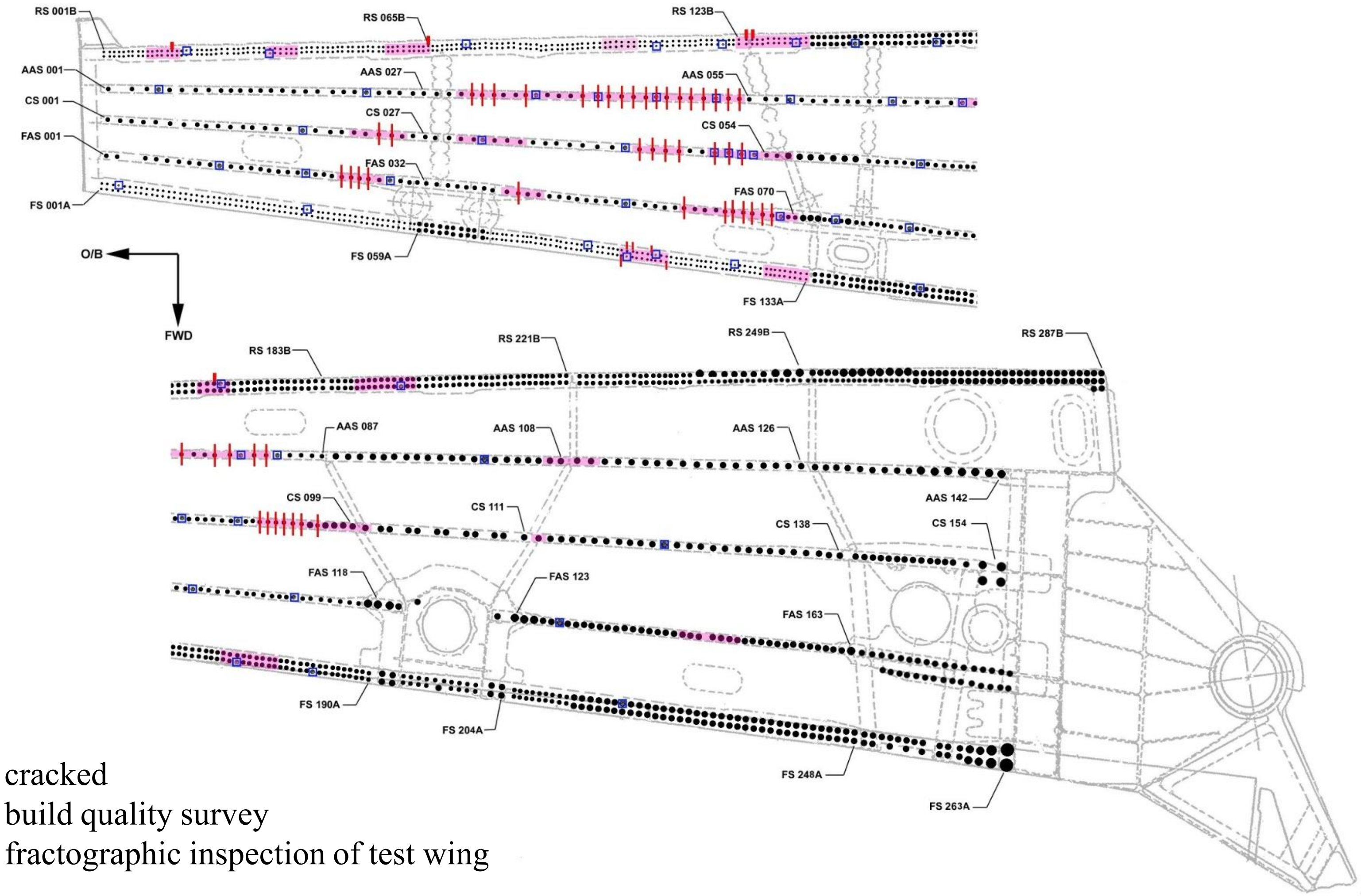
F111 Wing Tests

RAAF Sole Operator Program



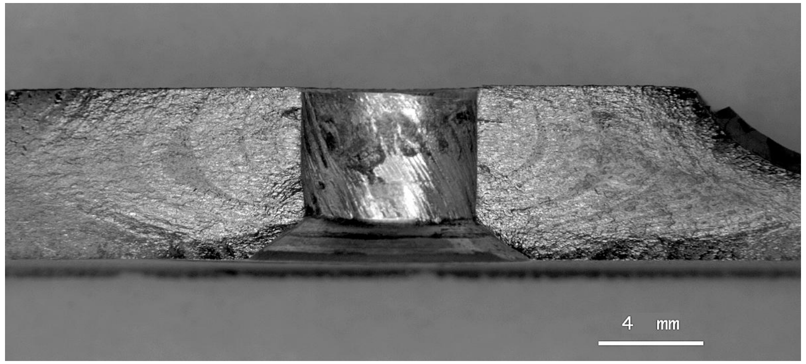


Quantitative Fractography (QF)

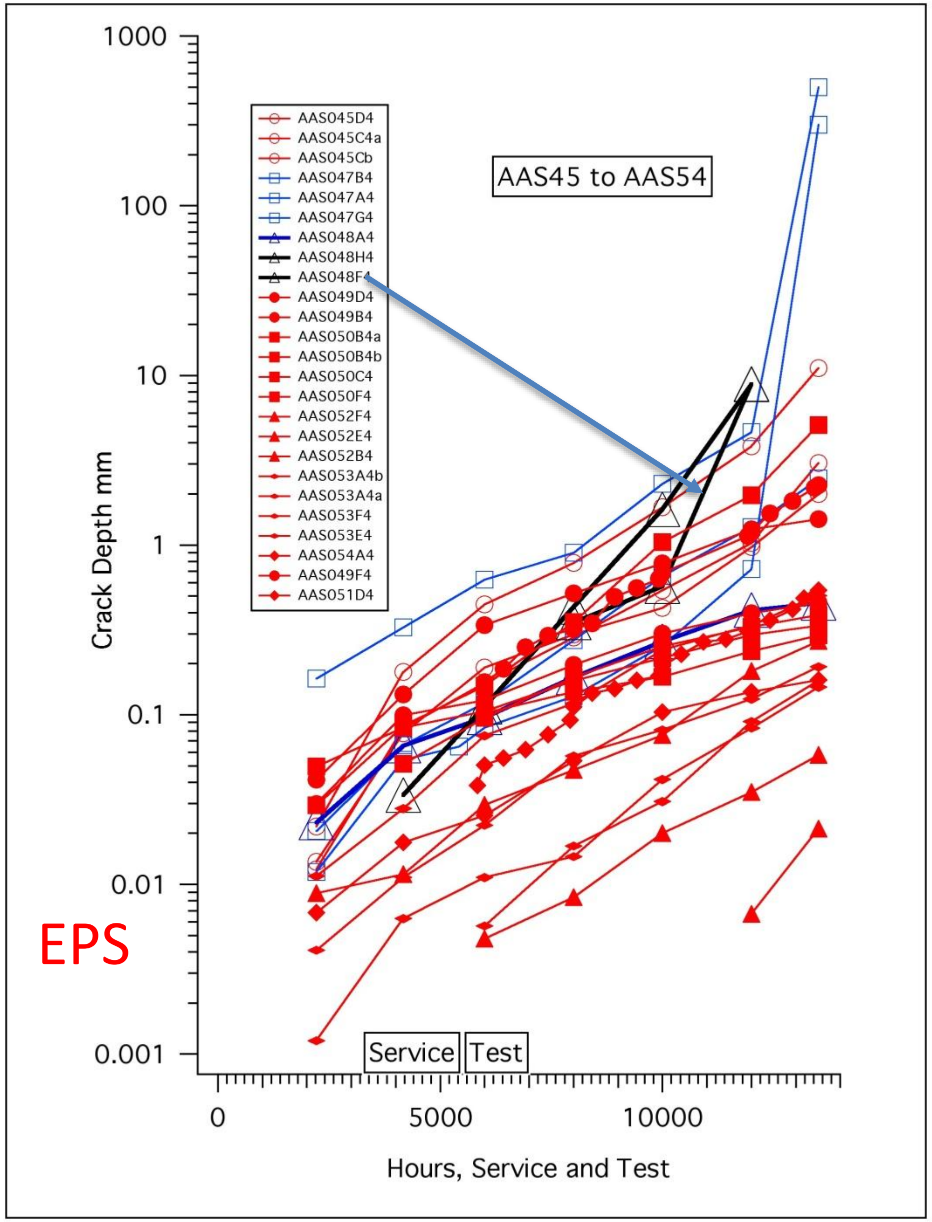


— cracked
□ build quality survey
■ fractographic inspection of test wing

Test Results from QF

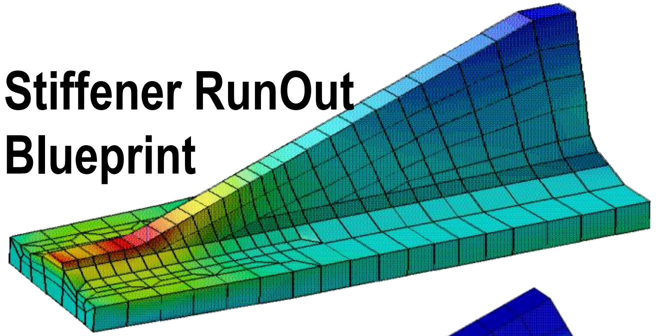


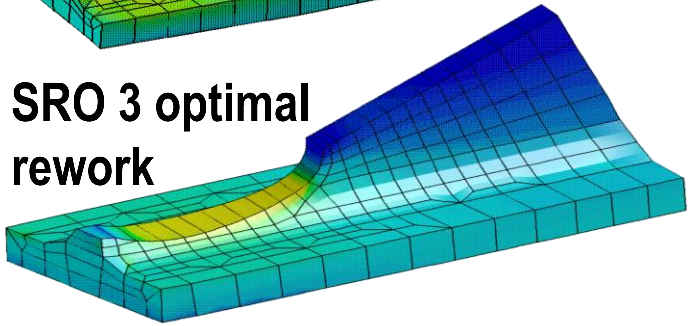
- High confidence due to CPLT marker bands
- Appeared in-service more severe than test
- Data ≈ Exponential
- Data used to life fleet wings; along with condition assessment

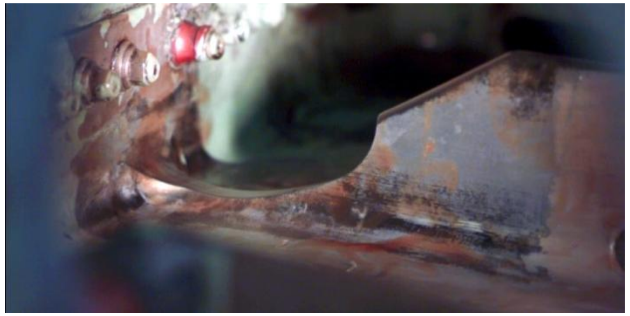


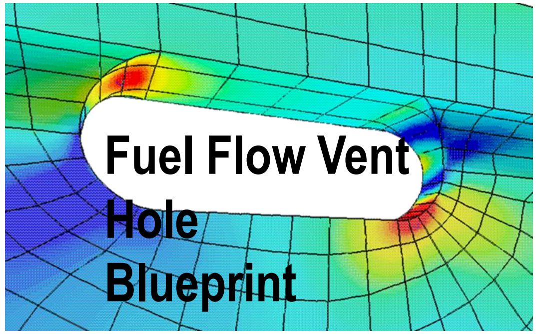
See [14-15]

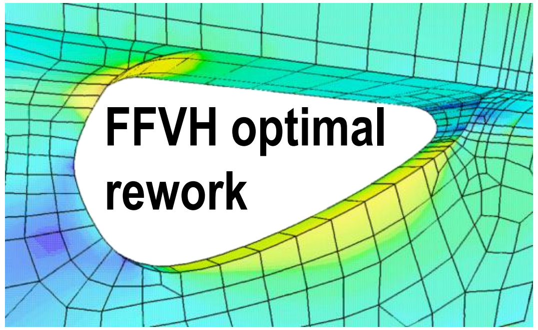
F-111 WING MODIFICATIONS

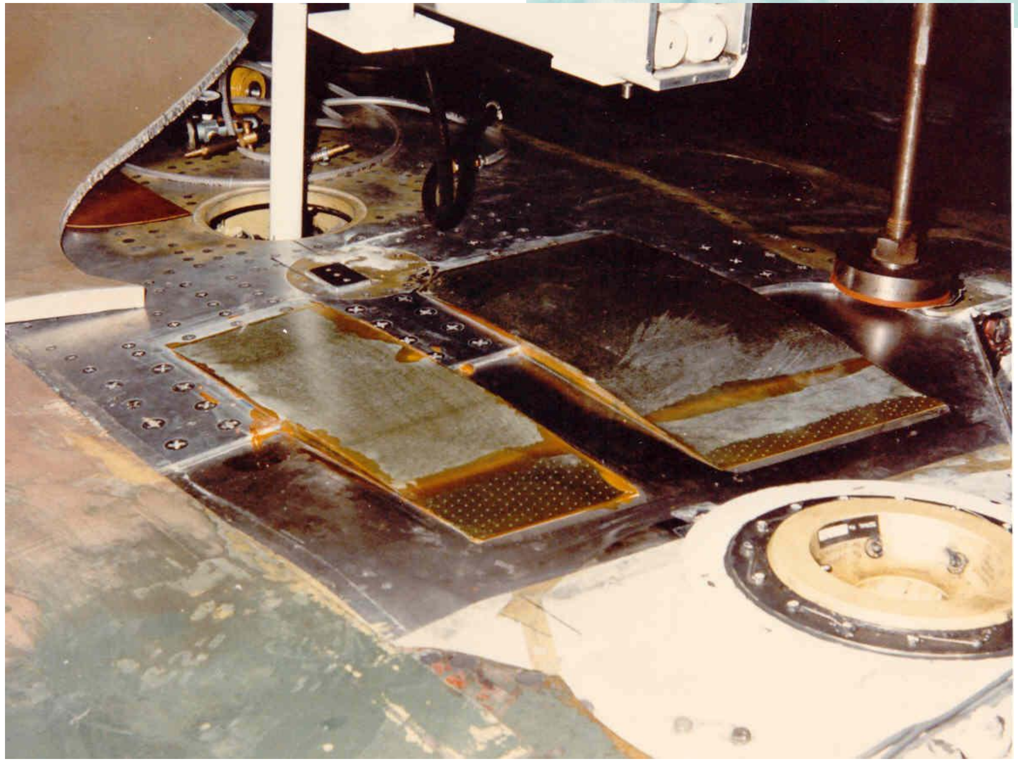












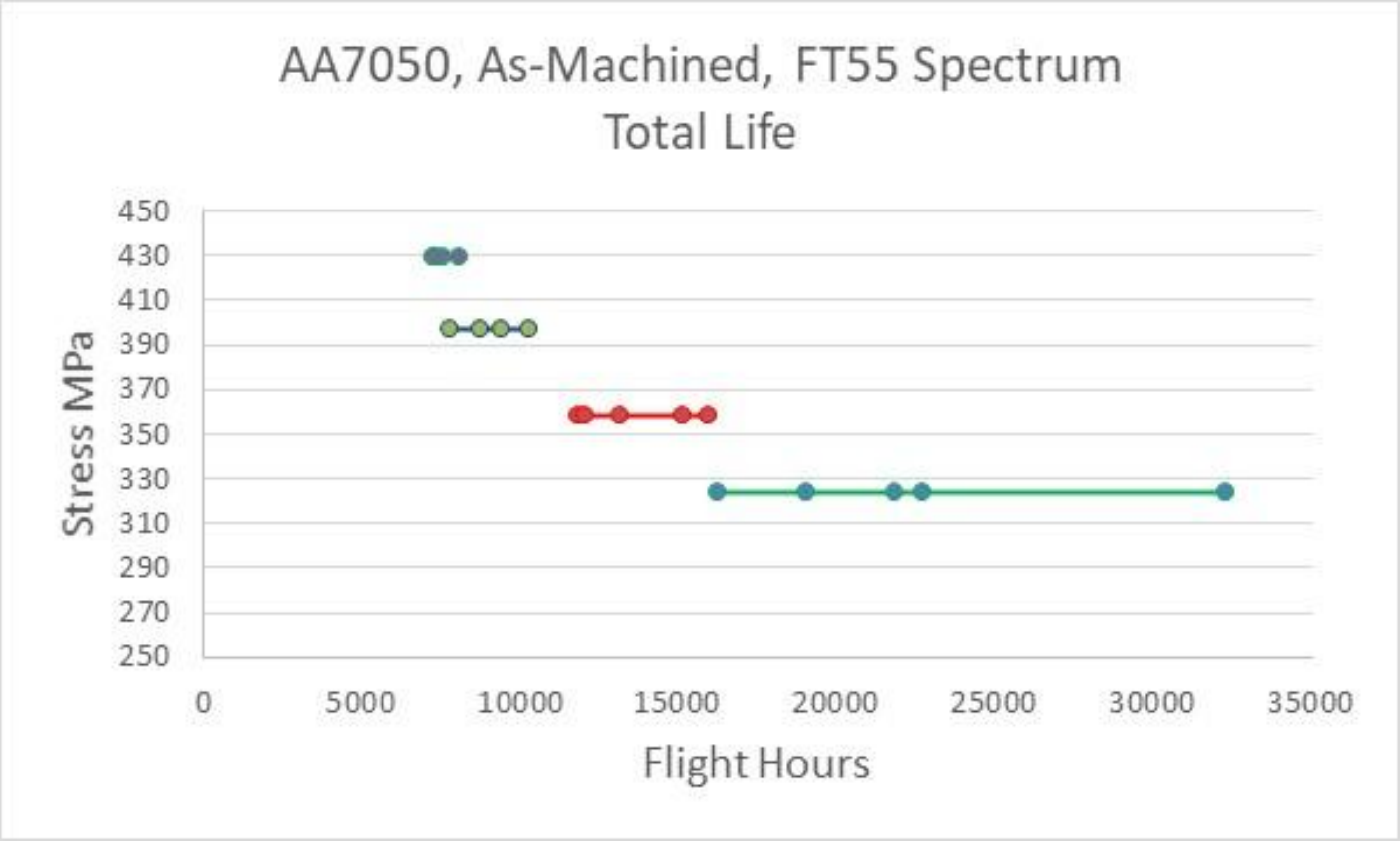
Boron/Epoxy Strengthening Doublers [14,16]

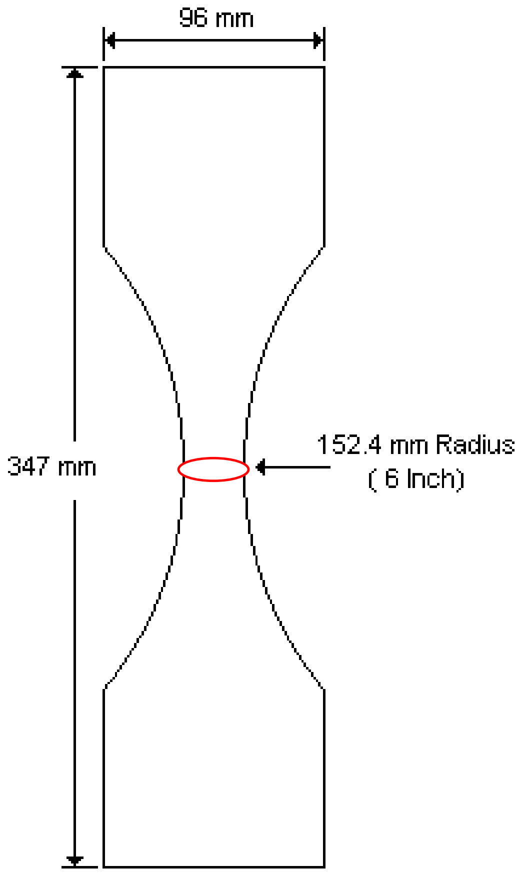
24

The journey continues

- With cracks….
- The critical importance of the short cracks or low ΔK regimes!
- Some novel fatigue analyses tools

In the beginning: Fatigue Coupon S-N Results [17]



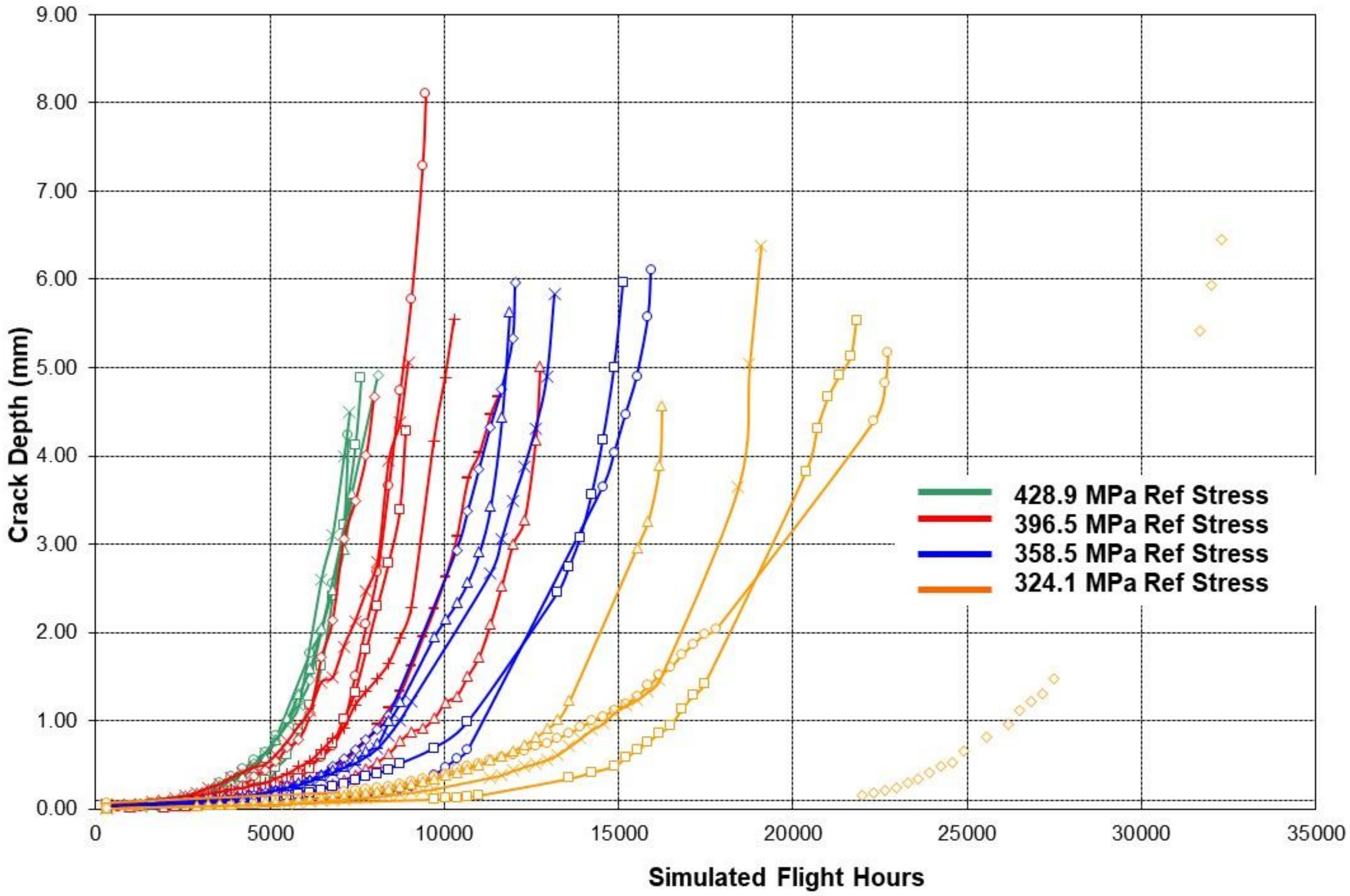


Specimen thickness: 6.25mm

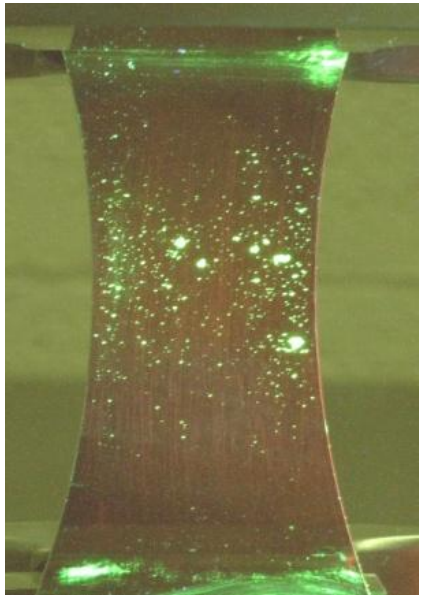
7050-T7451 Aluminum alloy

- Nominal test section is 28mm wide by 6.25mm thick
- Analytical K_t of 1.055
- Four or Five Coupons per Stress level

Fatigue Coupon Crack Growth QF Results



Each point is 1 block of crack growth from Quantitative Fractography (QF)



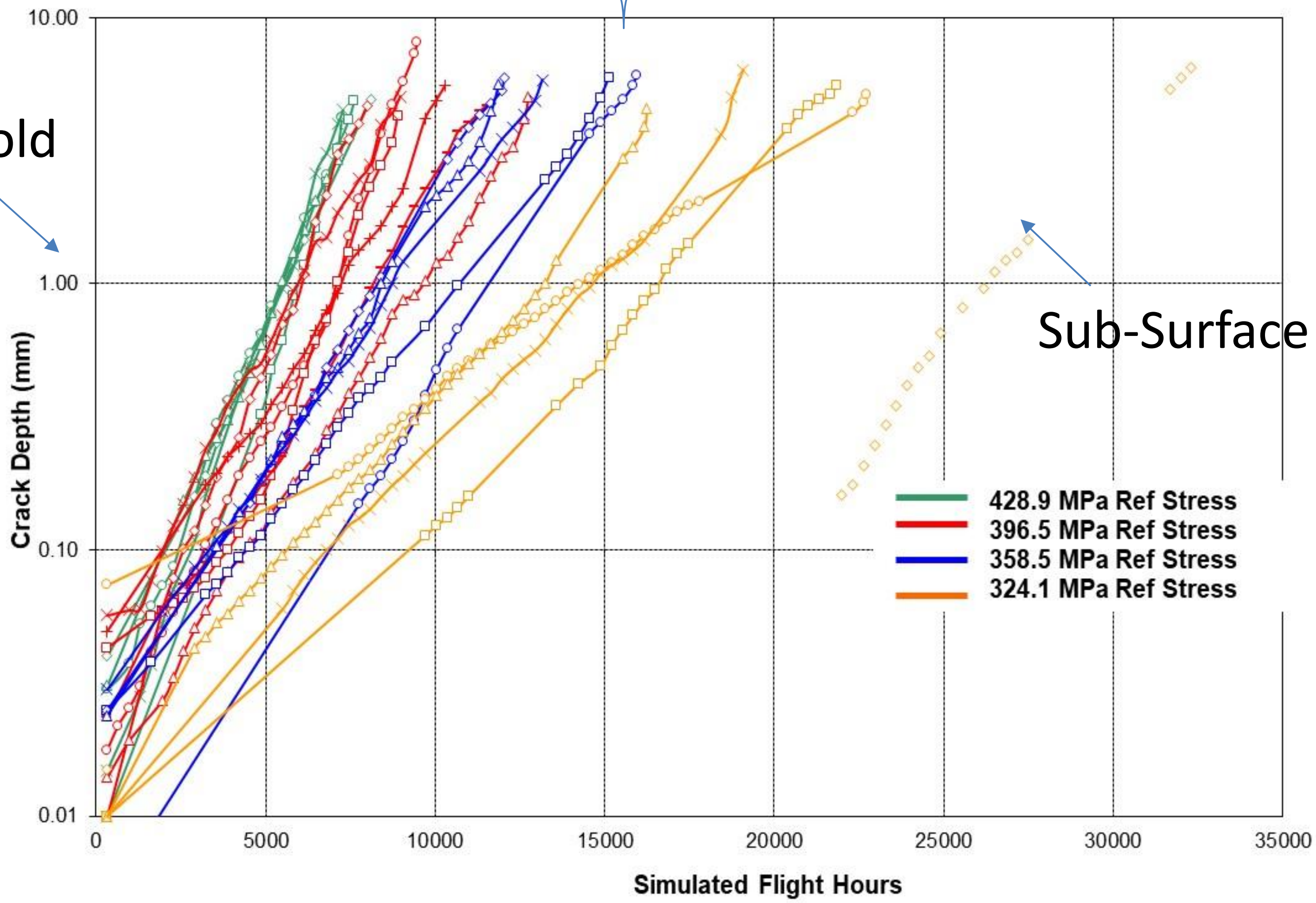
Lead Cracks Only

Fatigue Coupon Crack Growth Results - Exponential

Near-Surface Nucleated

NDI Threshold

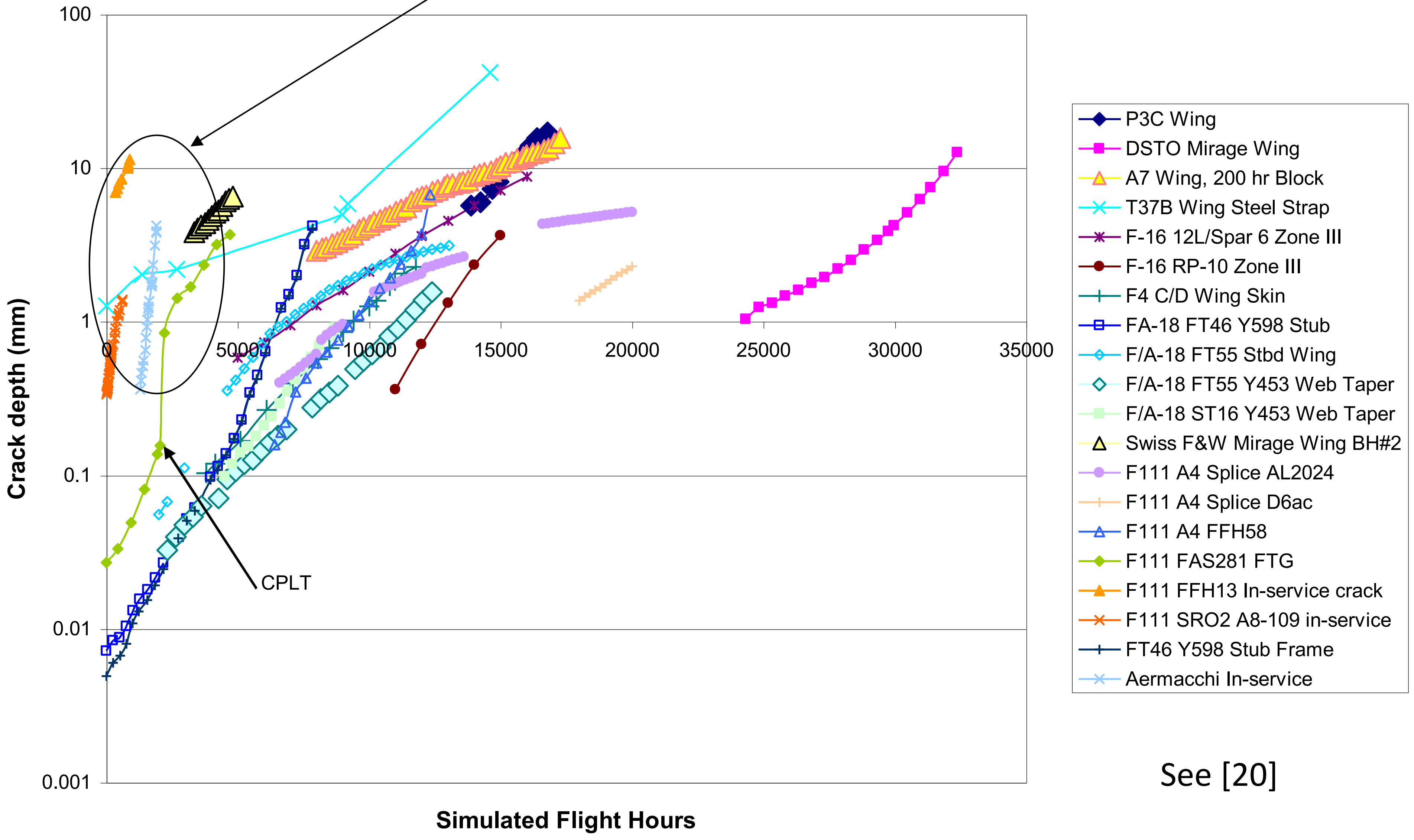
Short cracks



Sub-Surface Nucleated

See [1, 18-30]

A few In-Service and FSFT results



See [20]

Ye ol' 1963 Paris Re-Visited [18]

ICF Jun 17

$$\frac{da}{dN} = C\Delta K^{m} = C\left(\beta \Delta S \sqrt{\pi a}\right)^{m} \qquad \textbf{(1)}$$

$$ln\left(\frac{da}{dN}\right) = \; ln\, C + m\; lnK \quad (\mathbf{2})$$

Integrating:

$$a_f = a_0 e^{C\pi(\Delta\sigma\beta)^2 N_f}$$

For **m = 2** **(3)**

$$a_f = \left[a_0^{\left(1-\frac{m}{2}\right)} + N_f C\left(1-\tfrac{m}{2}\right)\left(\Delta\sigma\beta\sqrt{\pi}\right)^m \right]^{\left(\frac{1}{1-\frac{m}{2}}\right)}$$

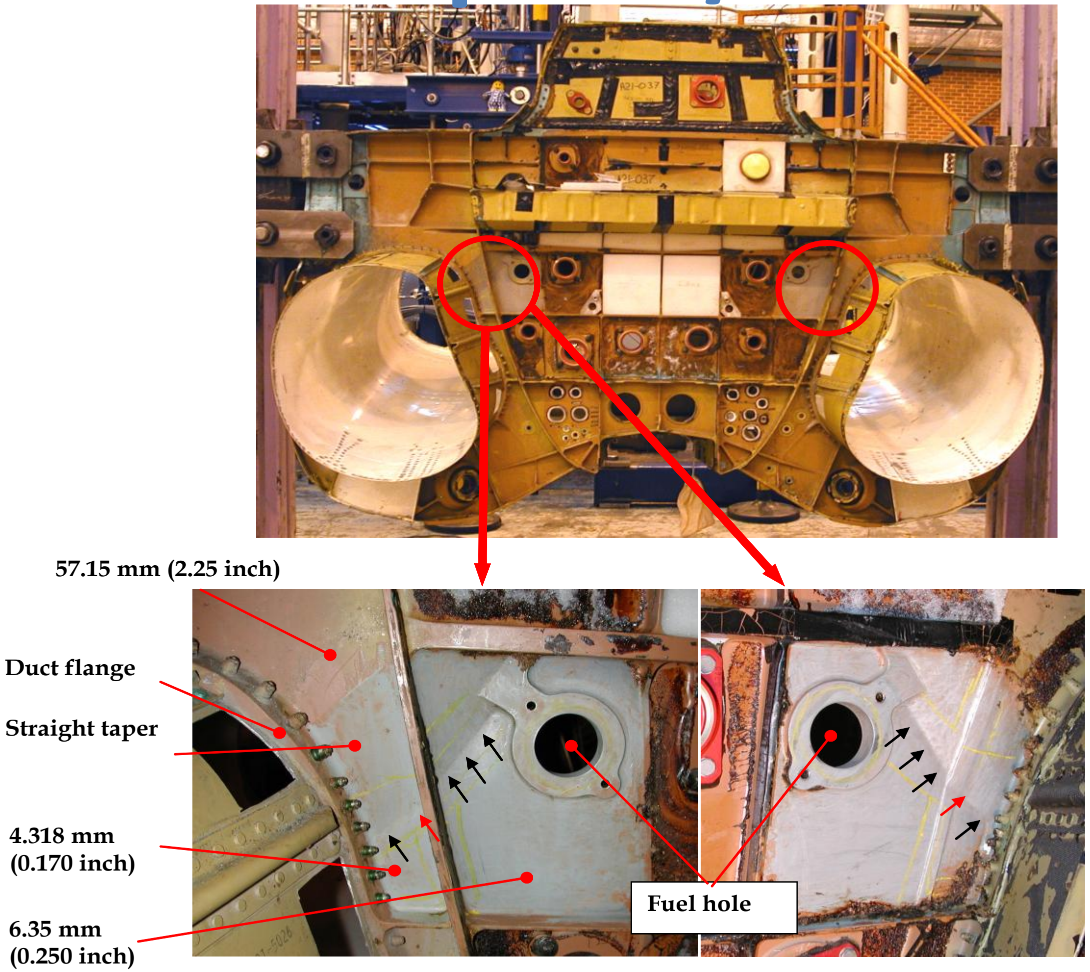
For m≠2 **(4)**

LEFM

Where a is the crack length at cycle *N*, *ΔK* is the stress intensity range (or similitude parameter), constant width correction factor β, and *C* and *m* are nominally material constants, a_0 is the initial crack size, a_f is the final crack size and σ *(or S)* is the far field stress.

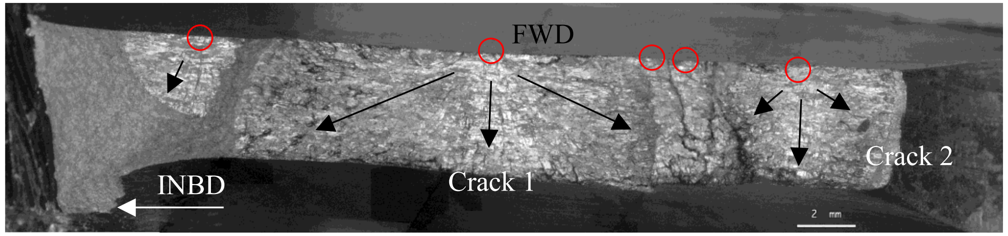
What about the long-neglected Equation 3 ….???.

An Example: F/A-18 FSDT “Web-taper”



RHS Forward Face

RHS Aft Face



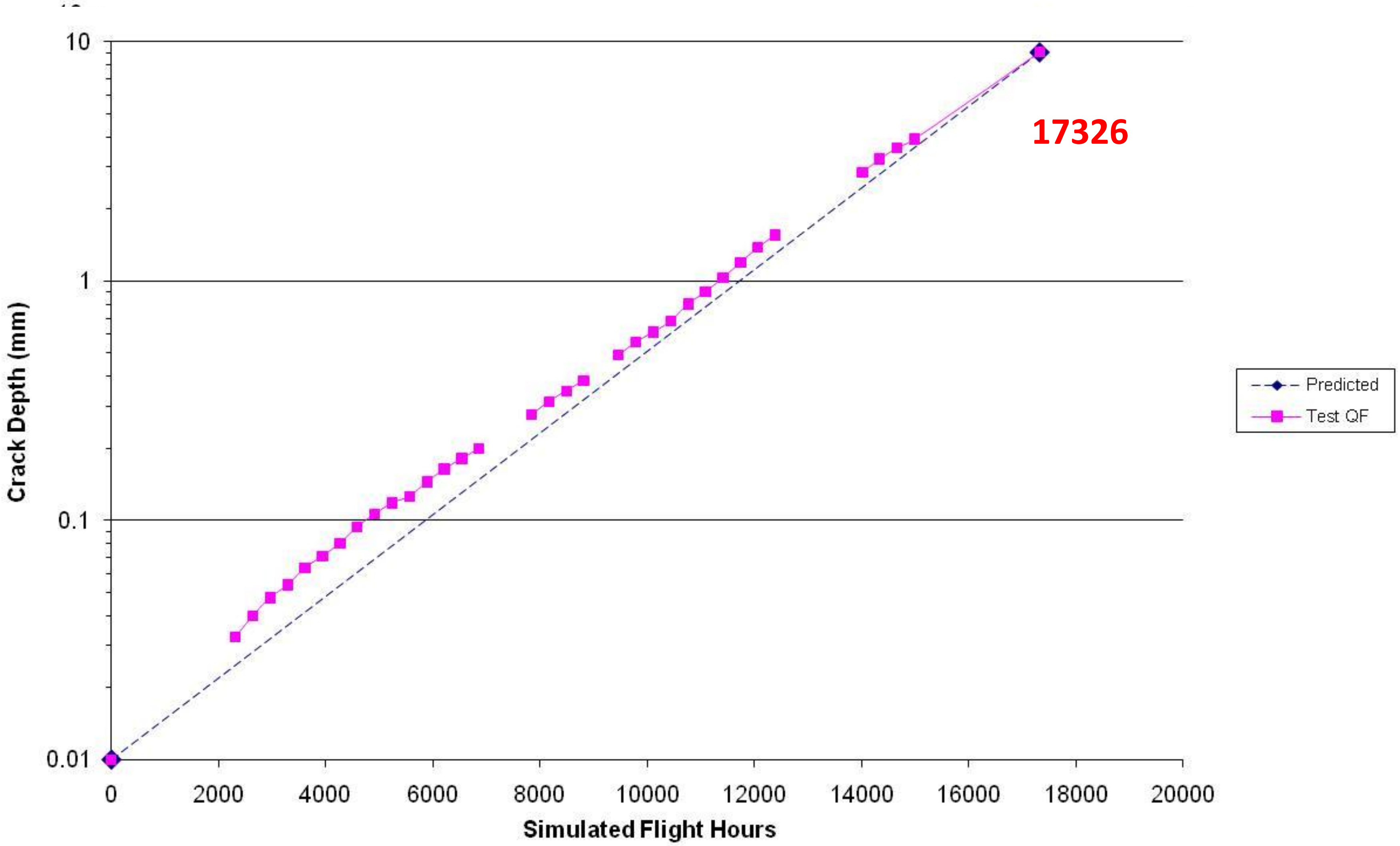
Complex geometry

High Stresses

Multiple origins

Teardown: At 17326 SFH crack depth was 9.04mm deep (FT55)

My Prediction: F/A-18 FSDT “Web-taper” Crack



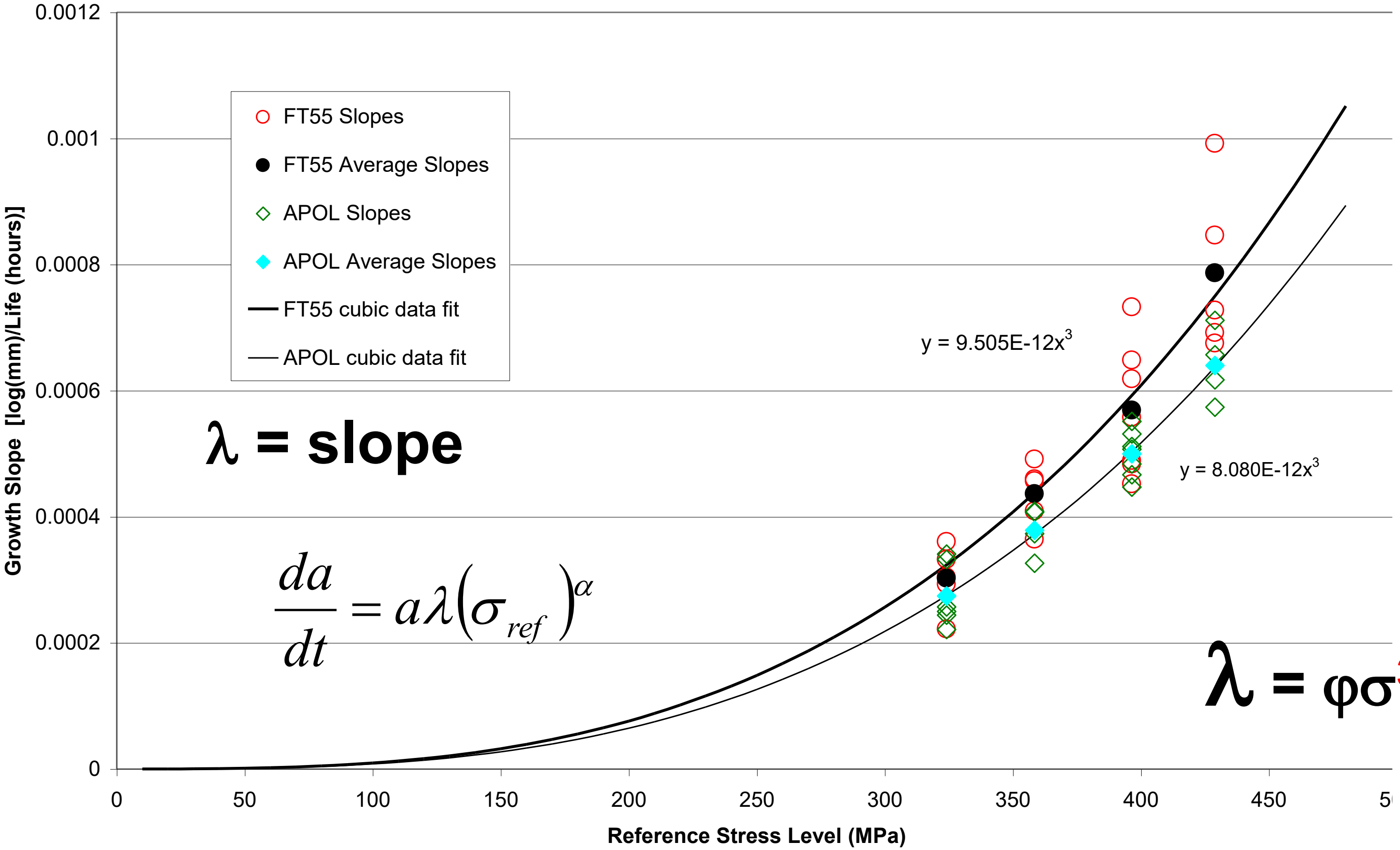
Typical NOT Surrogate, See [21-23]

Cubic Rule [29-31]

(Frost and Dugdale model (circa 1958 [29]) – Constant Amplitude

Predict lives for same spectrum, material and Kt, at different stresses.

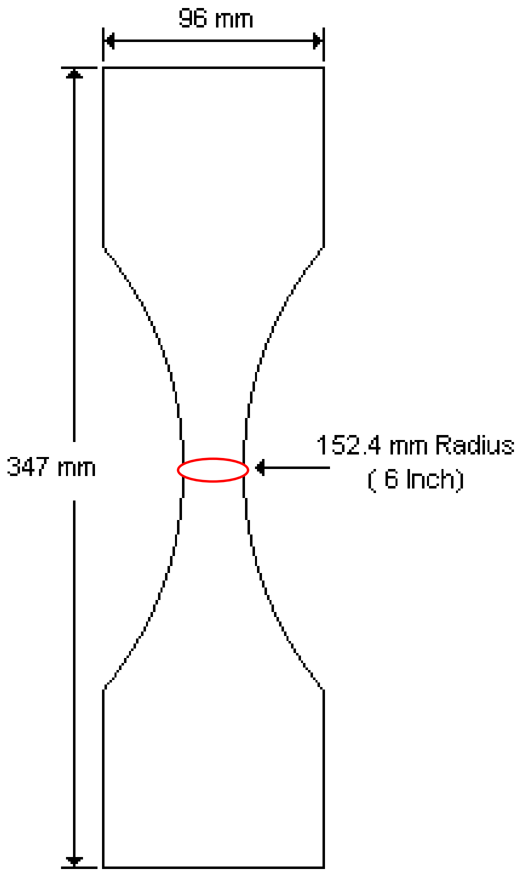
From previous
QF data.
Best fit = Cubic



λ = slope

$$\frac{da}{dt} = a\lambda\left(\sigma_{ref}\right)^{\alpha}$$

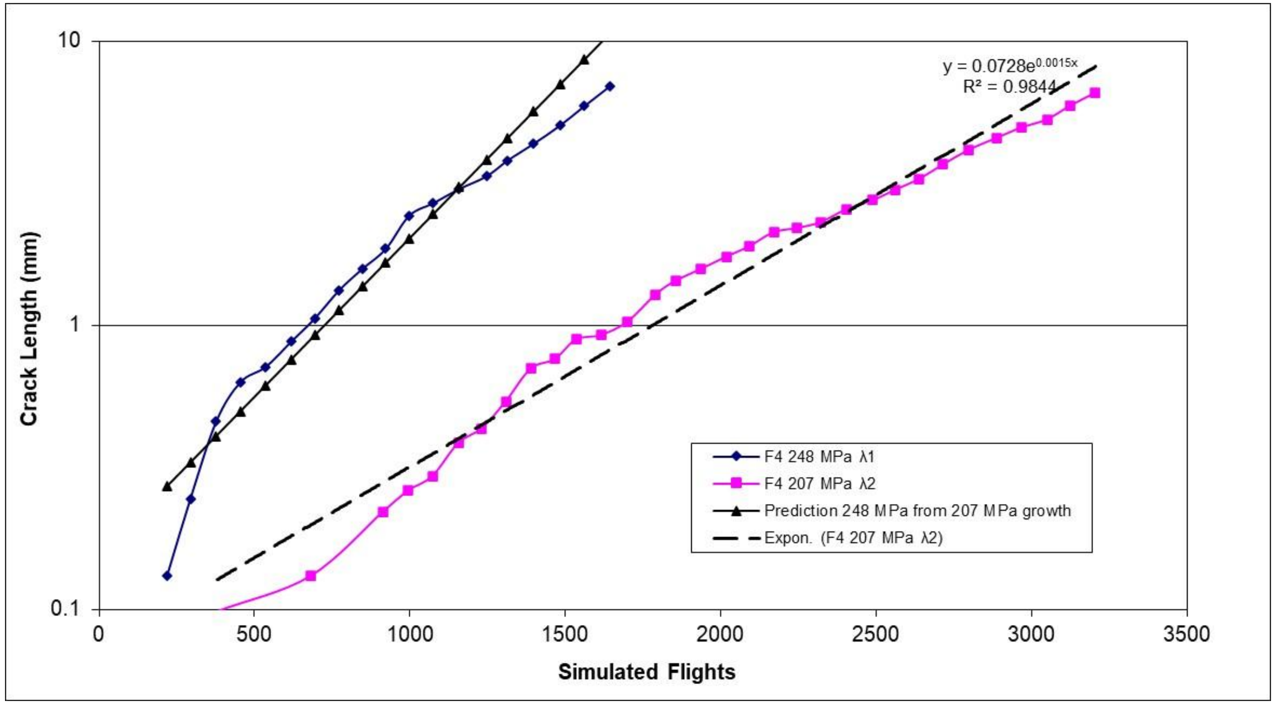
$\lambda = \varphi\sigma^{3}$



Cubic Prediction – F- 4 coupon test data

Used in RAAF Hornet, Pc9 and P3C etc structural **repair** manuals

$$a_2 = a_{0_2} \, e \left(\frac{\sigma_2}{\sigma_1}\right)^3 \lambda_1 N$$



See [30]

USAF Damage Tolerance Design Handbook. 1998. Wright Patterson AFB, USA

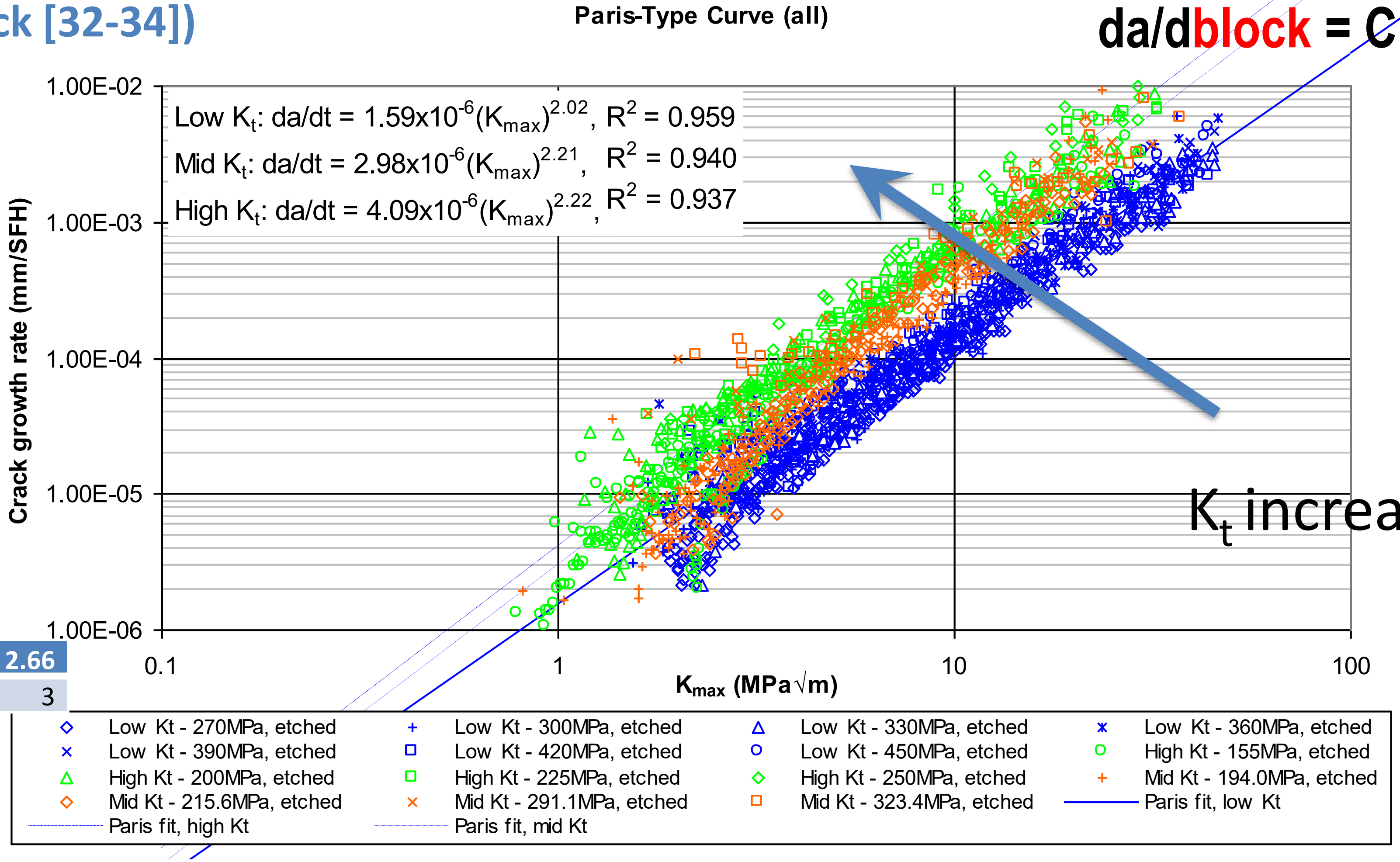
Effective Block Approach [35-37]

$da/dblock = a\lambda(\sigma_{ref})^3$

(Gallagher's mini-block [32-34])

$da/dblock = C\,(K_{ref})^2$

Treat a Block of Variable Amplitude data like Contant Amplitude



Net	1.04	2.1		2.66
Gross	1.04	2.15		3

Hornet spectrum, AA7050 at 3 K_t values

The Hartman-Schijve Variant [34-38]

$$da/dN = D^* (\Delta\phi)^{\alpha}$$

$$\frac{da}{dN} = \left(\frac{D\left(\Delta K - \Delta K_{thr}\right)}{\sqrt{\left(1 - \frac{K_{\max}}{A}\right)}} \right)^{\alpha}$$

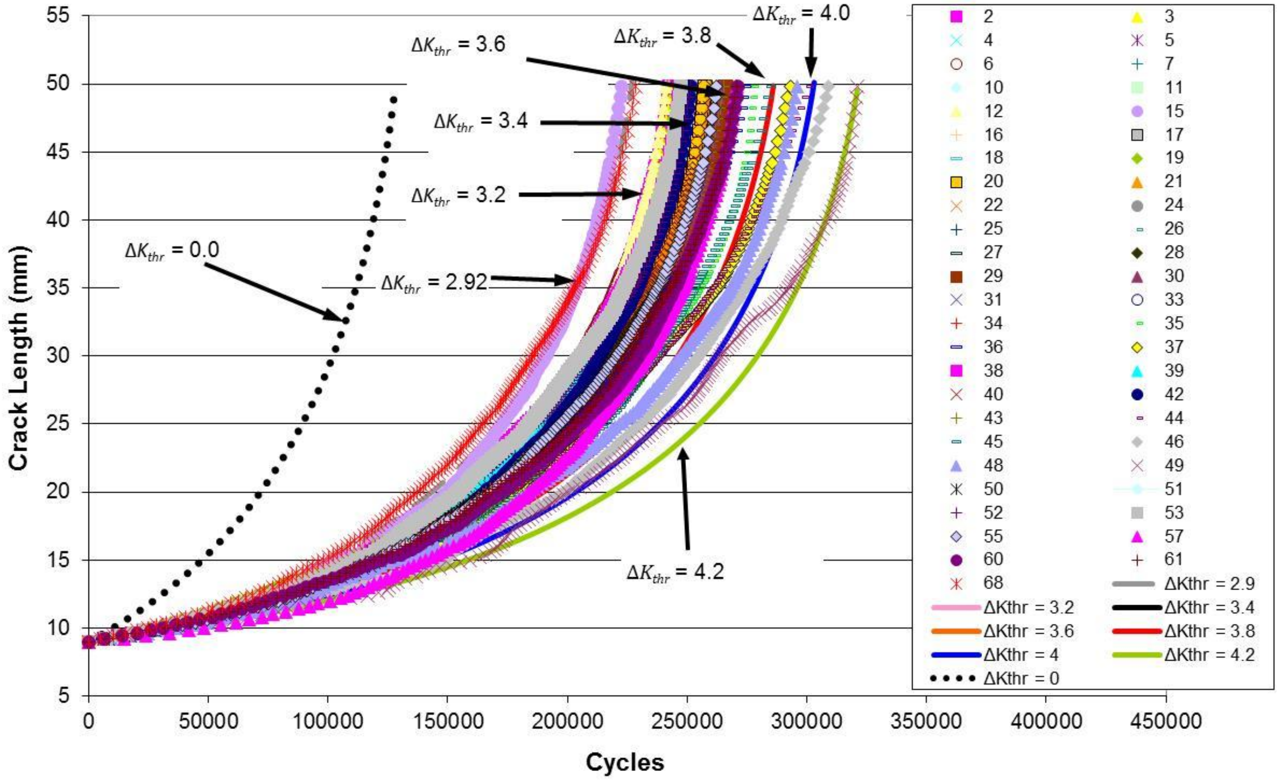
Where A is a constant related to fracture toughness

This equation has the advantage that it allows D to be determined directly from the slope of ONE da/dN versus ΔK curve (α~ 2)

Note: different ΔK_{thr} for short & long cracks
Not ASTM 647 fatigue test standard value of ΔK at da/dN of 10^{10} m/cycle

Fits BOTH short & long crack growth rate data. Short cracks are important!!

Variability in CG rate? E.g. Hillberry et al. data [37]



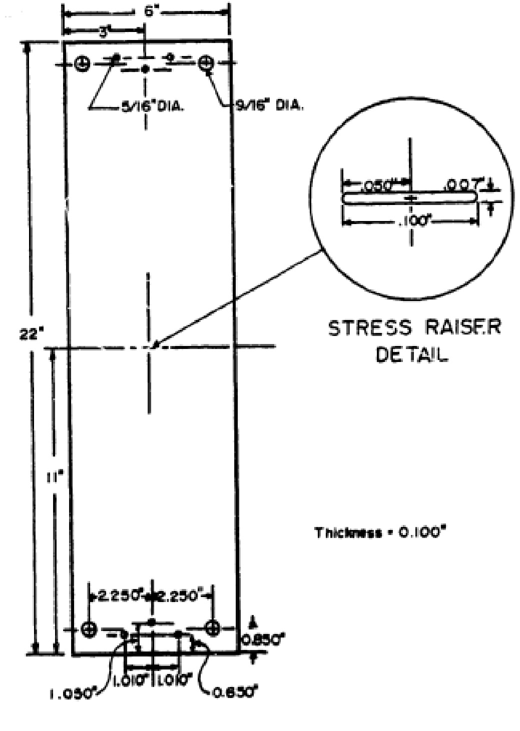
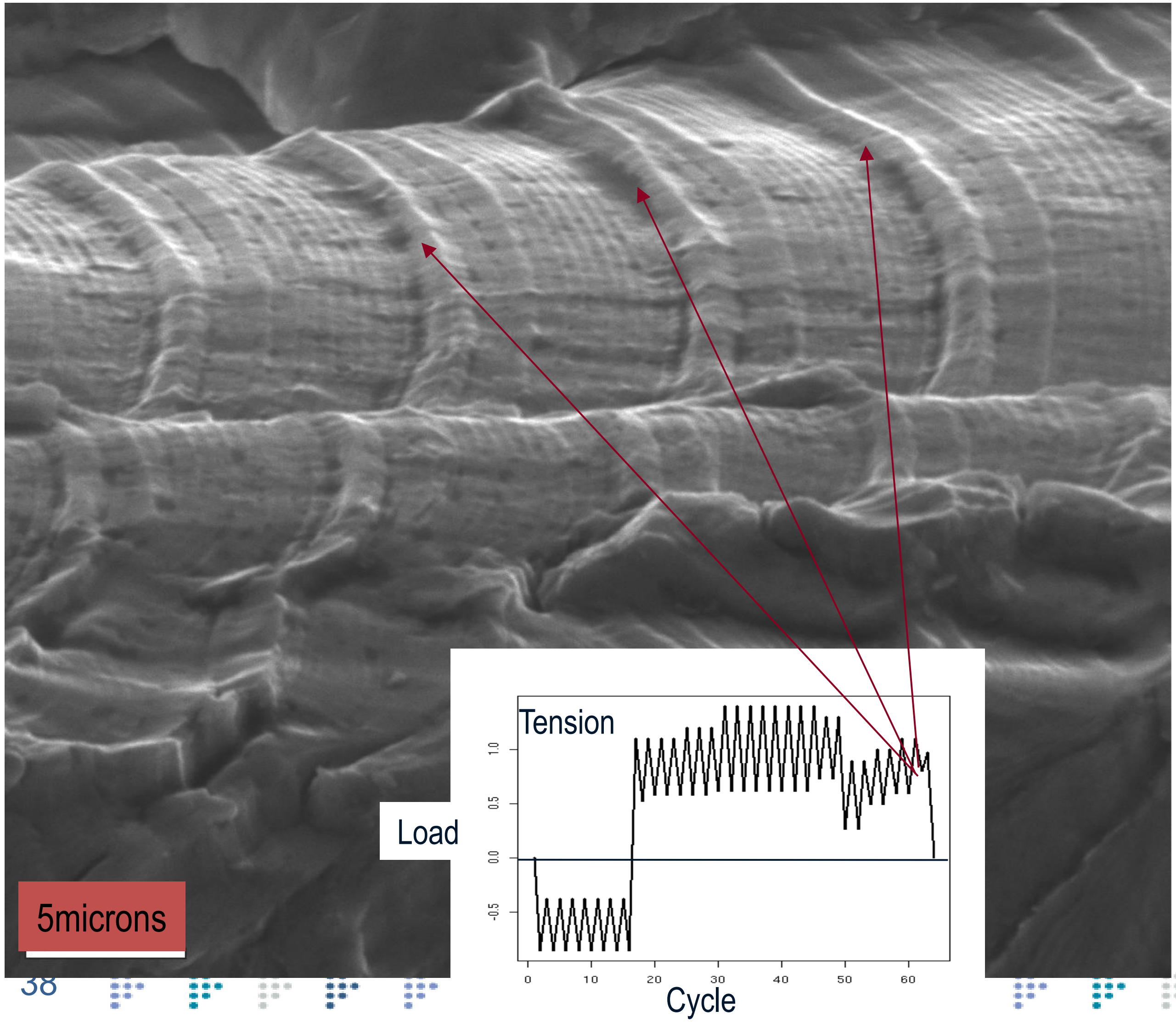


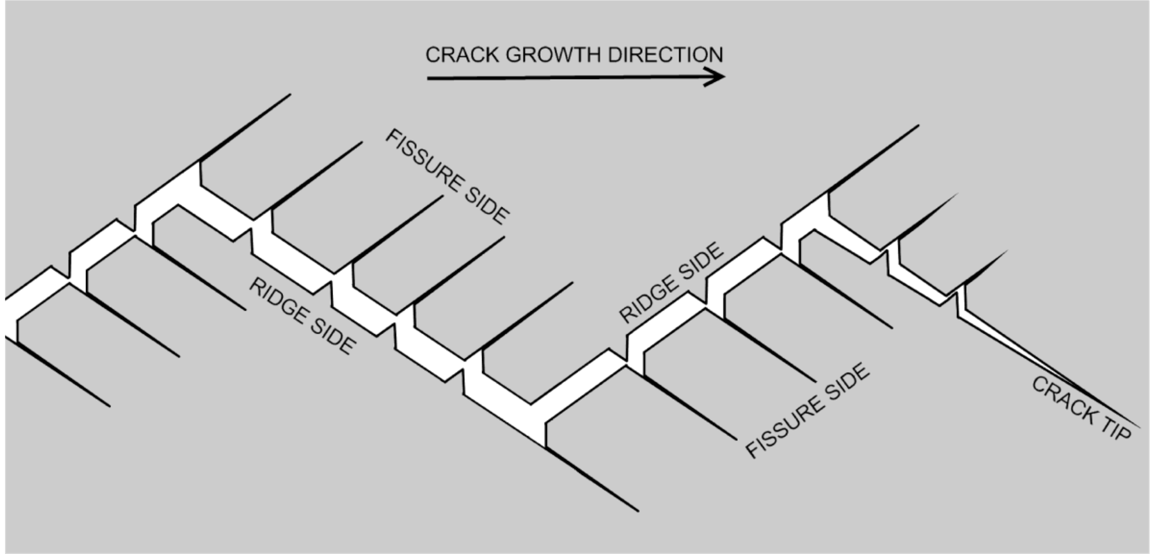
Figure 21. Test Specimen

Crack growth data from Virkler et al. [39] AA2024-T3 and computed variability with various ΔK_{thr}*./*
Half-crack length plotted.
Also collapses Stress Ratio (R) data….

Cracks and Fissures [39-41]



- Loading changes the plane on which growth occurs.
- This changes the profile of crack surface.
- It produces ridges on one side which match depressions on the other.
- Alternative crack formation mechanism



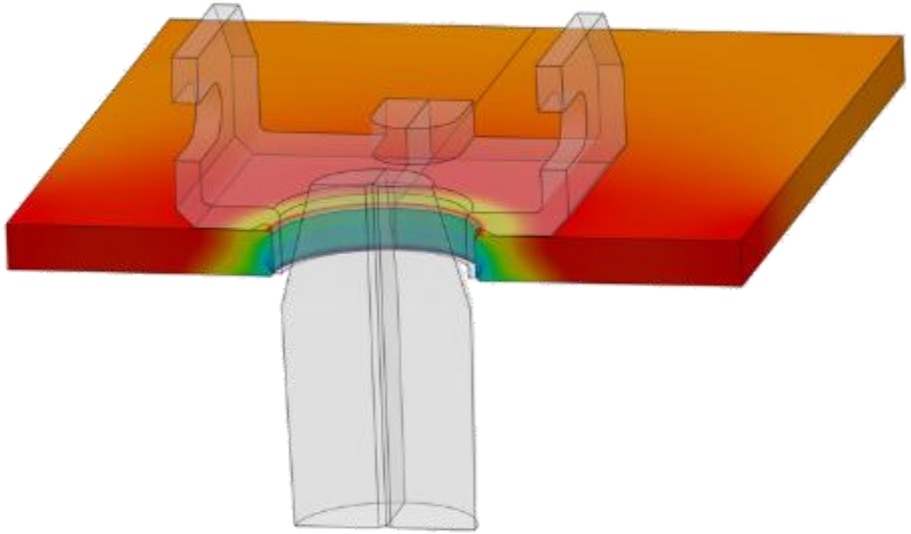
Corrosion #$%@^&

PARTWORKS

- We can "handle" pitting corrosion, see [43]
- Prevention better that repair

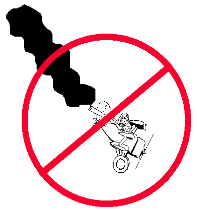
- Elephant: Corrosion in fracture critical parts

F35B on deck showing signs of corrosion causing discolouration – Source: ***US Finds Solution to Corrosion Problem on F-35 Jets,* Aeronaut Media 13 Jul 25**



Cold Expanded & Bonded Bush Mod or Repair [42]

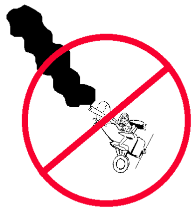
Conclusions

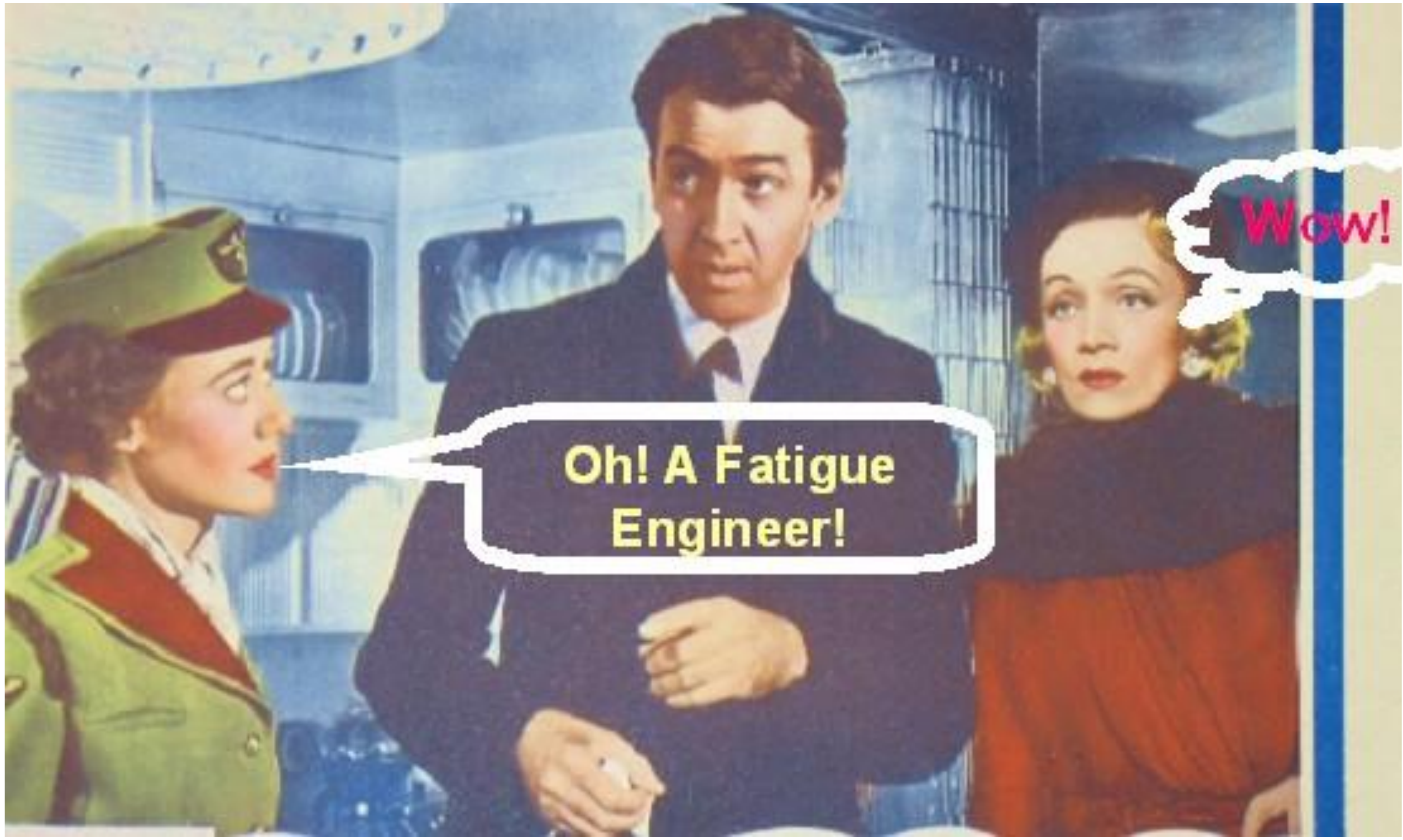


- Vigilance required for Continued Safety
- I have been on a fabulous ASI journey
- We did some good things and learnt much
- Many achievements made possible because of a sovereign Air Force with sovereign ASI expertise
- Much more to learn – I wish you all a successful journey
- ASI is much more than fatigue! Fatigue is all about cracks and we have some useful tools
- Master the rules before you bend them!

Now Available

Questions





No Highway in the Sky

Bibliography

1. Molent L. Aircraft Fatigue Management, SpringerBriefs in Applied Sciences and Technology, 2024
2. Rees, D. and Molent, "Analysis Of Candidate Bonded Repairs For Cracks In The Weep Holes Of USAF C141 Aircraft", ARL-Tech Note- 62, Dec 1993
3. Schweinberg W.H. and Fiebig J.W., Case histories: advanced composite repairs of USAF C-141 and C-130 aircraft, Advances in the bonded composite repair of metallic aircraft structure, Baker, A.A., Rose, L.R.F. and Jones, R. (eds.), Elsevier Science Ltd, 2002.
4. Butkus, L. Residual Strength of Bonded Repairs After 10 Years of Service, ASIP, Nov 2006.
5. Molent, L., Enke, N., Wallace, G. and Jones, R., Thermomechanical analysis of bonded repaired skin splice joint specimens, ARL-TECH-R-24, Jan 1994
6. Molent, L., Structural Investigations into the Collapse of the Wing Leading Edges of Orion P-3C, proc. PICAST2 - AAC6, Melbourne 20-23 March 1995
7. Moon R.N. and Bell T.C, Discussion of structural limit and ultimate load levels in aircraft strength and rigidity, White Paper, Lockheed Martin, 1 August 1994
8. Molent, L., Wallace, G. and Currie, A., "Crack Growth and Repair of Multi-site Damage of Fuselage Lap Joints", ARL-STR-TM-534, Feb. ‘90
9. Molent, L. and Jones, R. Crack growth and repair of Multi-Site Damage of fuselage lap joints, Engineering Fracture Mechanics Vol. 44, No. 4, pp. 627-637, 1993
10. Jones R, Molent L and Pitt, S. Understanding crack growth in fuselage lap joints. Theo and App Fracture Mechanics 2008; 49:38-50

Bibliography cont’

11. McDonald M et al. In Situ Thermoelastic Stress Analysis of the F-35 - An Improved Approach to Airframe Structural Model Validation, ASIP TX, 2015.
12. Molent L. A brief history of structural fatigue testing at Fishermans Bend Australia. Advanced Materials Research Vols. 891-892 (2014) pp 106-114
13. Main B, Molent L, Singh R and Barter S. Fatigue crack growth lessons from thirty-five years of the Royal Australian Air Force F/A-18 A/B Hornet Aircraft Structural Integrity Program, Fatigue 2020; 133:.
14. Swanton G, 40 Years of F-111 Aircraft Structural Integrity Support by the Defence Science and Technology Organisation, Proc of AIAC 2013, Melbourne, 10-11 Mar 2009.
15. Boykett R, Walker K and Molent L. Sole operator support for the RAAF F-111 fleet. 11th Joint NASA/FAA/DOD Conference on Aging Aircraft, Phoenix, 21-24 Mar 2008
16. Molent, L., Callinan, R.J. and Jones, R. Design of an all Boron/Epoxy reinforcement for the F-111 wing pivot fitting: Structural Aspects, J. Composite Structures 11 (1989) pp57-83
17. Pell R.A., Molent L. and Green A. The fractographical examination of F/A-18 aluminium alloy 7050-T7451 bulkhead representative coupons tested under two service spectra and two stress levels, DSTO-TR-1629, Oct 2004
18. Molent L, Barter SA and Wanhill RJH. The Lead Crack Fatigue Lifing Framework, J Fatigue; 33 (2011) 323–331
19. Molent, L., S.A. Barter and Wanhill, RJH. The lead crack concept 30 years on, Proc. ICAF, Delft, the Netherlands, July 2023.
20. Molent, L. Fatigue Crack growth from flaws in combat aircraft. J Fatigue 32 (2010) 639-649

Bibliography Con't

21. Molent, L. and Fox, MR. Crack-like effectiveness of some discontinuities in AA2024, Fatigue Fract Eng Mater Struct. 2023;1–14
22. Gallagher JP and Molent L. The equivalence of EPS and EIFS based on the same crack growth life data, Fatigue 2015; 80:162-170
23. Molent L., A review of equivalent pre-crack sizes in aluminium alloy 7050-T7451, Fat Fract Eng Mat Struct 2014;37: 1055-74
24. Wanhill, R.J.H., Molent, L. and Barter, S.A. (2023) Milestone Case Histories in Aircraft Structural Integrity. In: Aliabadi, Ferri M H and Soboyejo, Winston (eds.) Comprehensive Structural Integrity, 2nd Edition, vol. 1, pp. 325–348. Oxford: Elsevier.
25. White P., Molent L. and Barter S., Interpreting fatigue test results using a probabilistic fracture approach, Fatigue 27/7 pp752-767, 2005
26. Jones, R., Molent, L. and Pitt, S., Crack growth of physically small cracks, International Journal of Fatigue 29 (2007), 1658-1667Molent L, Barter SA, A comparison of crack growth behaviour in several full-scale airframe fatigue tests, Int J Fatigue (2007); 29: 1090-1099
27. Molent L, Barter SA, A comparison of crack growth behaviour in several full-scale airframe fatigue tests, Int J Fatigue (2007); 29: 1090-1099
28. Wanhill, R.J.H., Molent, L. and Barter, S.A., Fatigue crack growth and lifing analyses for metallic aircraft structures and components, Springer briefs in Applied Science and Technology, the Netherlands, 2019.
29. Frost NE and Dugdale DS. The propagation of fatigue cracks in test specimens. Journal Mechanics and Physics of Solids 1958; 6: 92-110

Bibliography con't

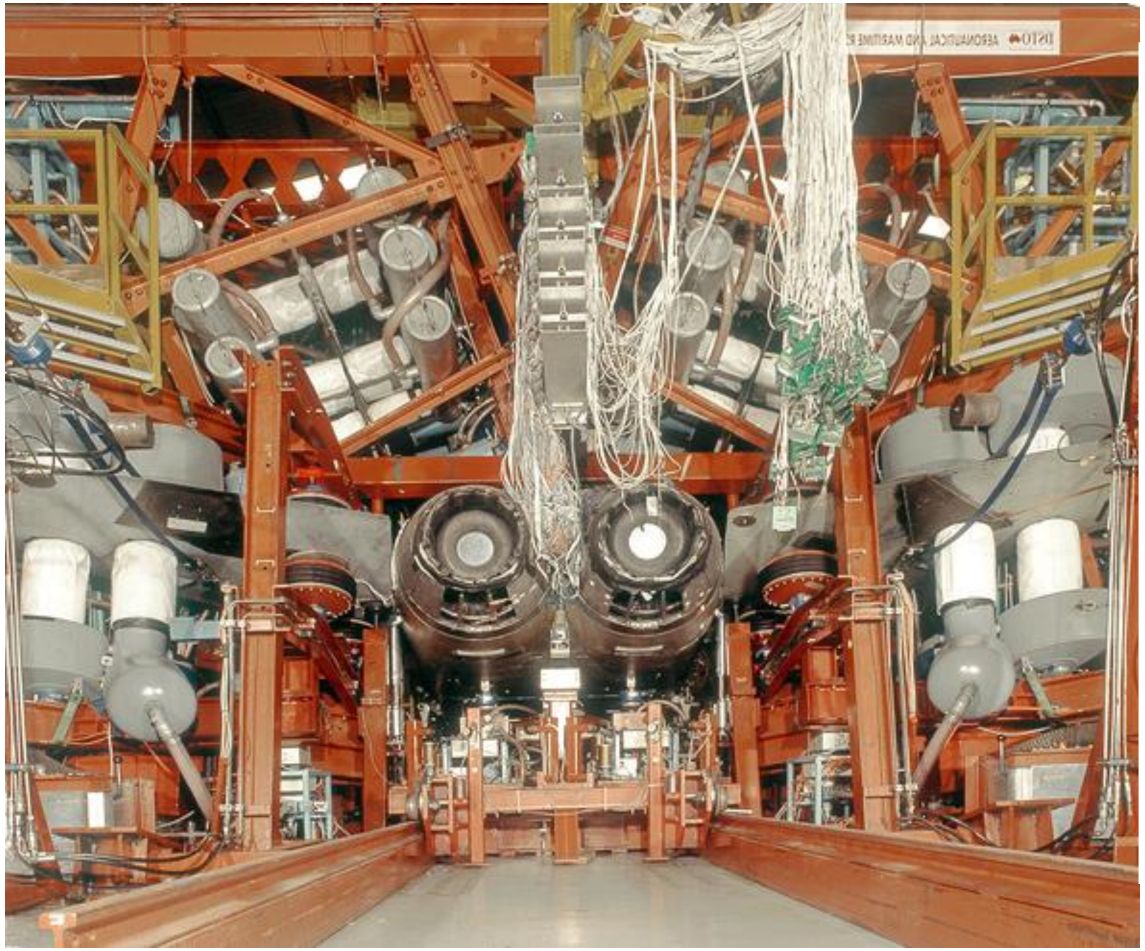
30. Barter S., Molent L., Goldsmith N. and R. Jones. An experimental evaluation of fatigue crack growth. Journal Engineering Failure Analysis, Vol 12/1 pp 99-128, 2005.
31. Molent L. and Jones R., A stress versus crack growth rate investigation (aka stress – cubed rule), Int J Fatigue 2016; 87:435-443.
32. Gallagher J. & Stalnaker H.D., (1978) Mini-block approach with characteristic stress)
33. Gallagher JP and Stalnakert HD, Developing normalised crack growth curves for tracking damage in aircraft, Aircraft Feb 1978.
34. Gallagher, J P. Estimating fatigue-crack lives for aircraft: techniques, Exp. Mech.,16 (11), 425-433, 1976
35. Molent, L., McDonald, M., Barter, S., Jones, R., Evaluation of Spectrum Fatigue Crack Growth using Variable Amplitude Data, Fatigue (2007); 30/1; 119-137
36. Zhuang W.Z., McDonald M, Phillips M and Molent L. Effective block approach for aircraft damage tolerance analyses. J Aircraft Vol. 46, No. 5, Sept–Oct 2009.
37. Huynh J, Molent L and Barter S. Experimentally Derived Crack Growth Models for Different Stress Concentration Factors; J. Fatigue 2008, Vol 30/10-11 pp 1766-1786
38. Hartman, A. and Schijve J. The effects of environment and load frequency on the crack propagation law for macro fatigue crack growth in aluminum alloys. Eng Fracture Mechanics 1970;1(4), pp 615-63
39. Jones R, Molent L, Walker K. Fatigue crack growth in a diverse range of materials. J. Fatigue 40 (2012) 43–50

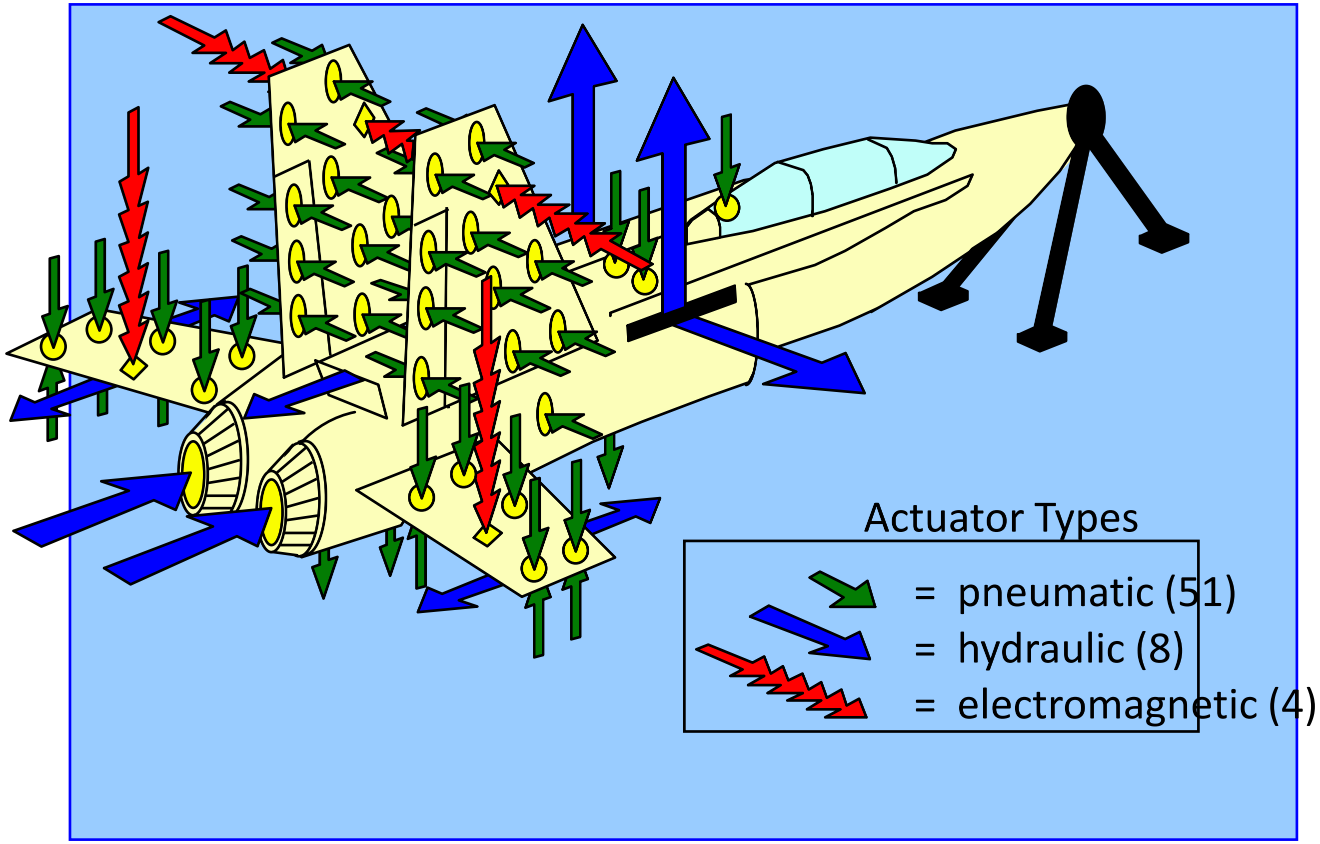
Bibliography Cont'

40. Jones R, Molent L and Barter S. Calculating crack growth from small discontinuities in 7050-T7451 under combat aircraft spectra. J Fatigue 2013; 55: 178-182.
41. Molent L. and Jones R. The influence of cyclic stress intensity threshold on fatigue life scatter, Int J Fatigue, 2015; 82: 748-756
42. Virkler DA, Hillberry BM. and Goel PK., The statistical nature of fatigue crack propagation. Technical Report AFFDL-TR-78-43, 1978, USA: Air Force Wright Aeronautical Laboratory, Ohio
43. White, P. A guide to the program EASIGRO for generating optimised fatigue crack growth models. DST-Group-TR- 3566, DSTO, Melbourne, Australia, Feb 2019
44. White P, Barter S and Molent L. Observations of crack path changes caused by periodic underloads in AA7050-T7451; Int Journal of Fatigue 30 (2008),1267-1278.
45. Krkoska M., Barter S.A., Alderliesten R.C., White P., Benedictus R., Fatigue Crack Paths in AA2024-T3 and AA7050-T7451 Treatment When Loaded with Simple Underloads Spectra, in proc. of Crack Paths 2009.
46. Restis J et al., Bolt Hole Corrosion and Fatigue Damage Repair in Hybrid Structure, ASIP 2022.
47. Molent, L. and Wanhill, R. Management of Airframe In-Service Pitting Corrosion by Decoupling Fatigue and Environment. Corros. Mater. Degrad. 2021, 2, 493–511
48. Molent L and Haddad A. A critical review of available composite damage growth test data under fatigue loading and implications for aircraft sustainment, Composites Struct 2020; 232: 111568
49. Molent, L. and J.D. Roberts, Bonded Repair Application to the Boeing 747-400 Pressure Test Article - August 1990, ARL-STR-TM-573, Mar '92

Back-up Slides

FT46 – Simultaneous manoeuvre and buffet





Caveats (departure from exponential) [1,18]

- Sub-surface (in vacuum)
- Residual stresses
- Quasi static tearing
- Periodic Overloads
- Change in geometry
- Slow starting crack (e.g. multiple local nucleation sites)
- Growth towards neutral axis (load shedding)
- Discontinuity not initially crack-like
- Change in Usage

Top NAVAIR Priority post Gulf1

NAVAIR

VIDEO RECORDER/CAMERA SYSTEM

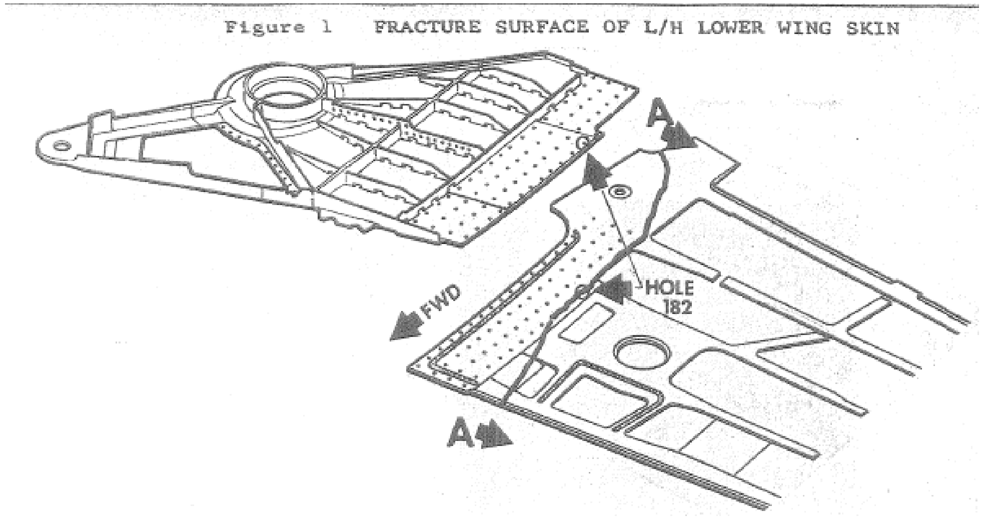
F/A-18

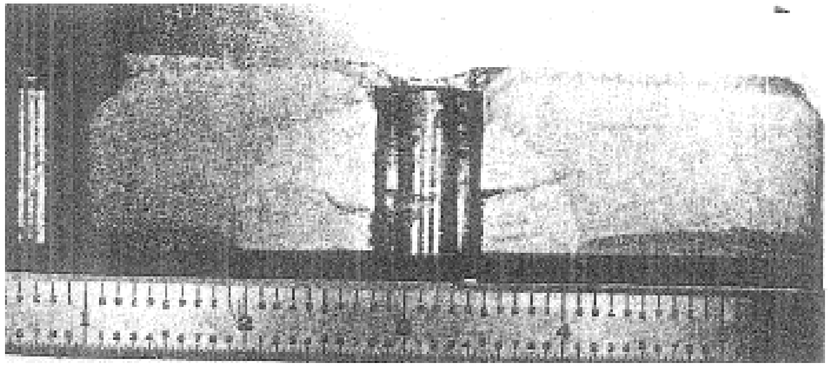
- DESIGN REQUIREMENTS
  - UTILIZE OFF-THE-SHELF TECHNOLOGY TO MAX. EXTENT POSSIBLE
  - MAINTAIN COMMONALITY BETWEEN F/A-18C/D AIRCRAFT
  - 2 HOUR RECORDING TIME
  - ENHANCED RESOLUTION
  - GREATER COMMONALITY WITH EXISTING COMMERCIAL & PRIVATE PLAYBACK EQUIPMENT

12/16/91

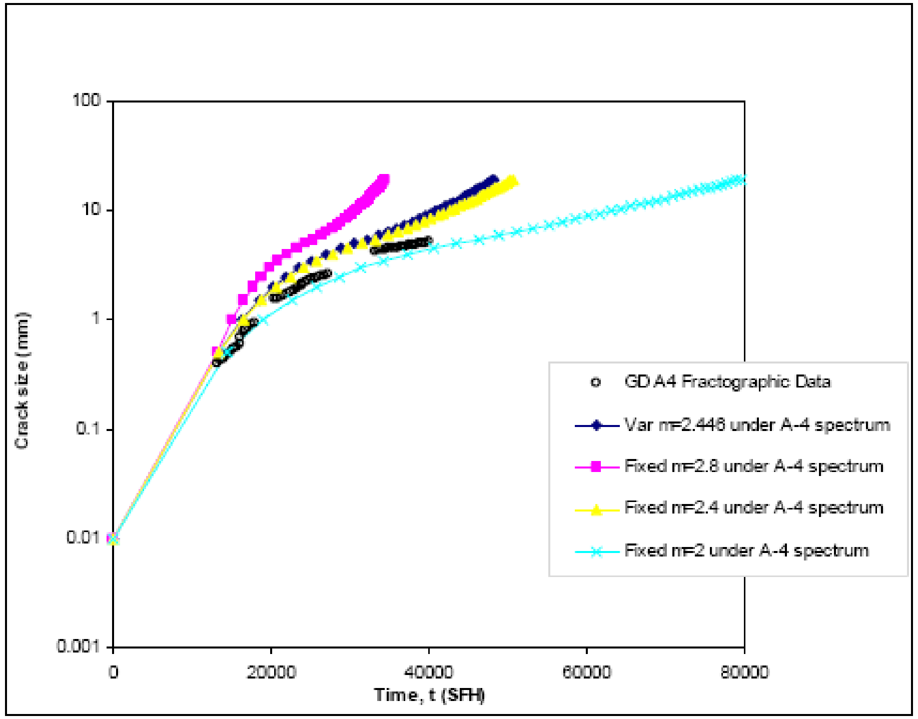
Boeing 747-400 FSFT Bonded Repairs 1990 [49]

EBA Example (varying m)



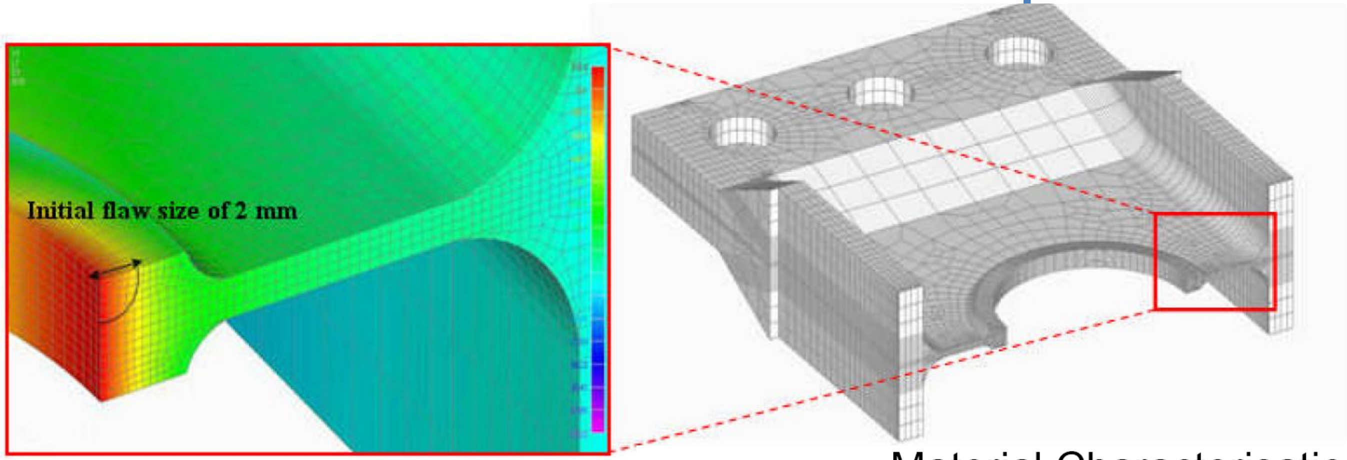


m =2 best (i.e. exponential)

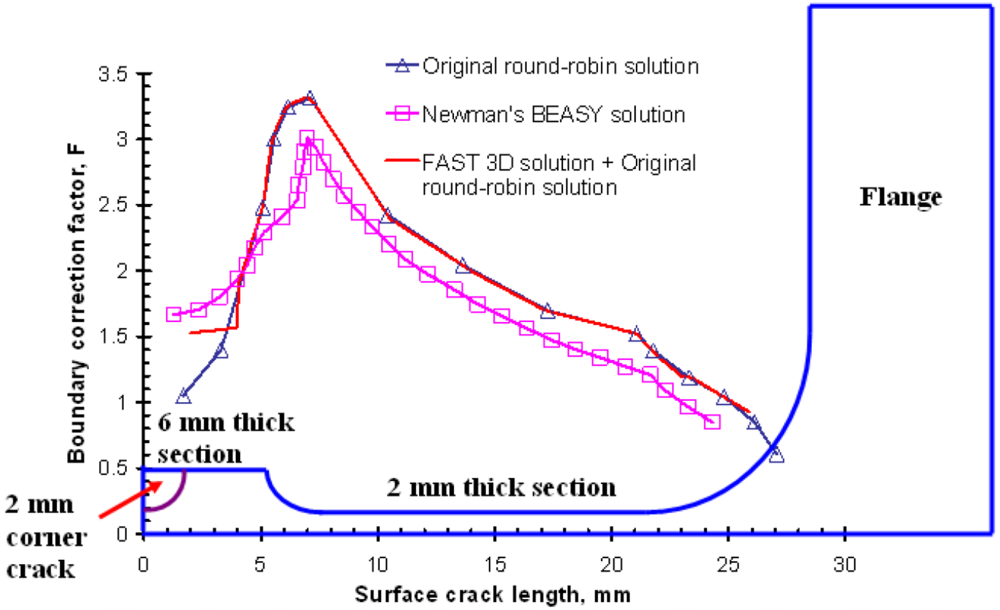


EBA prediction of the OEM's F111 (A4) full-scale fatigue test data (FZS-12-327, 1972)

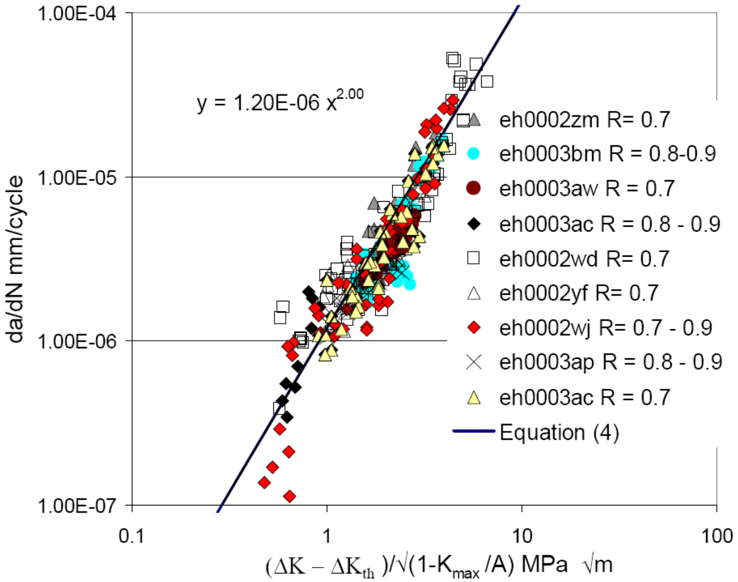
H&S VA example; AA7010-T73651 flanged plate with lightening hole tested to ASTRIX spectrum

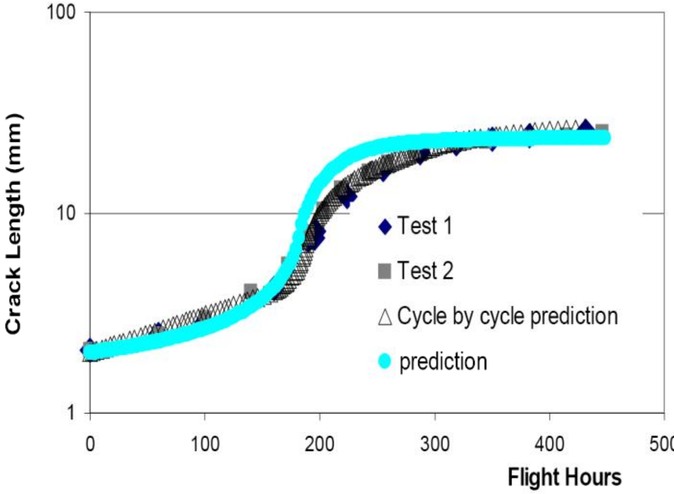


Data courtesy Prof Irvine Cranfield. Analyses by Prof R. Jones, Monash.



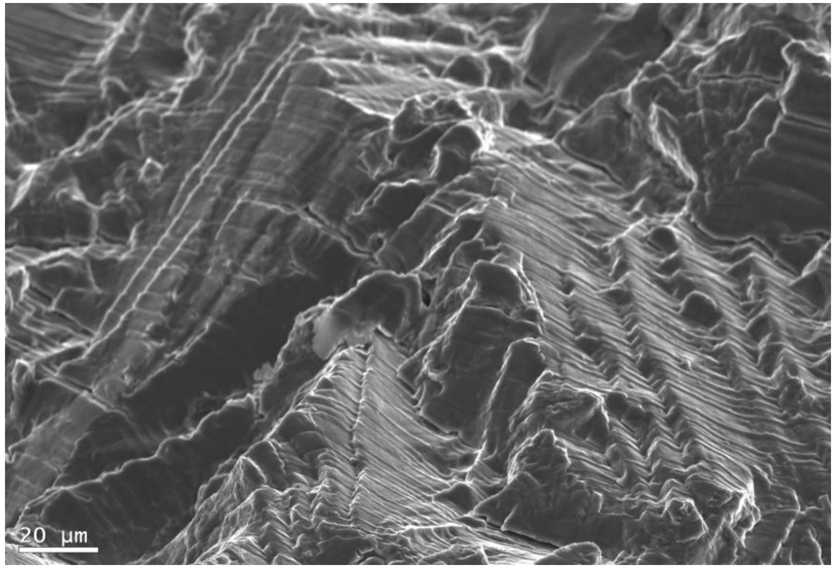
Material Characterisation

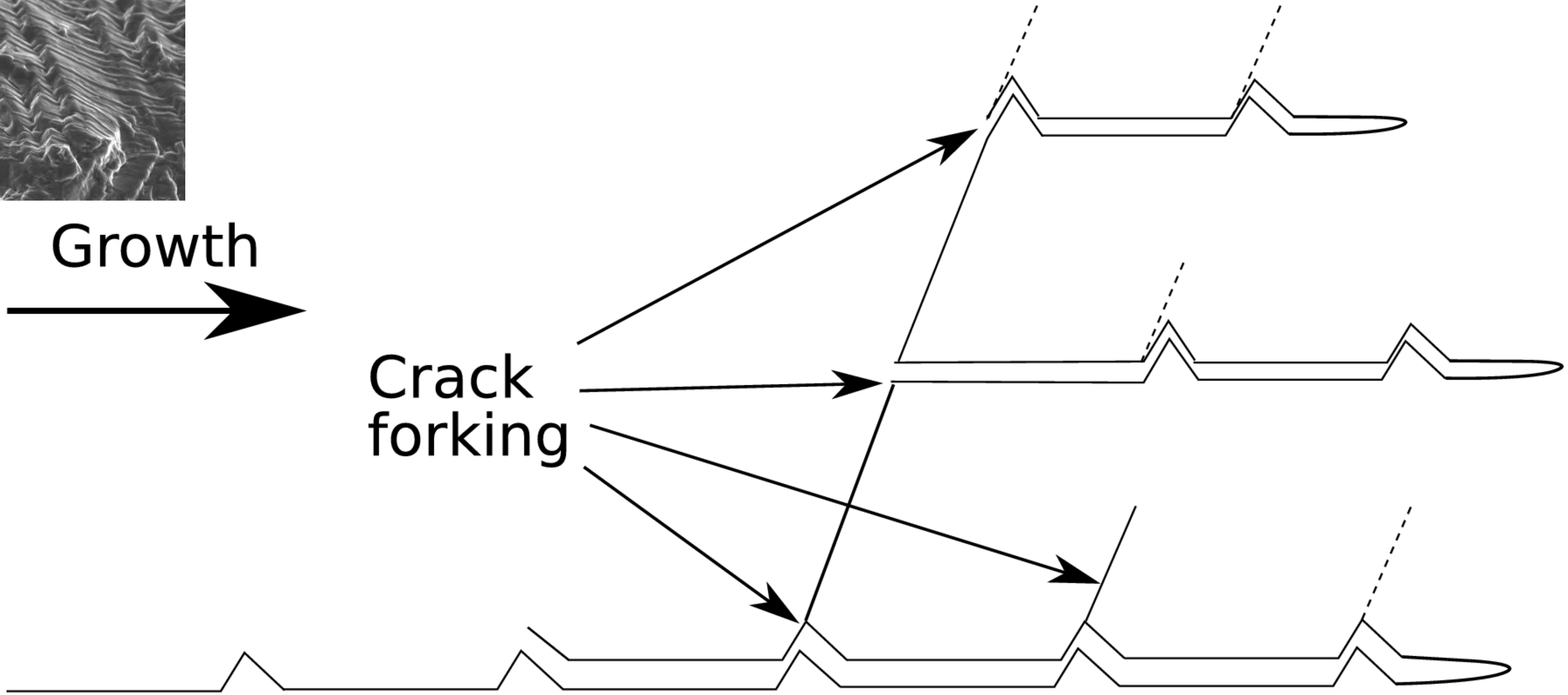




PREDICTION

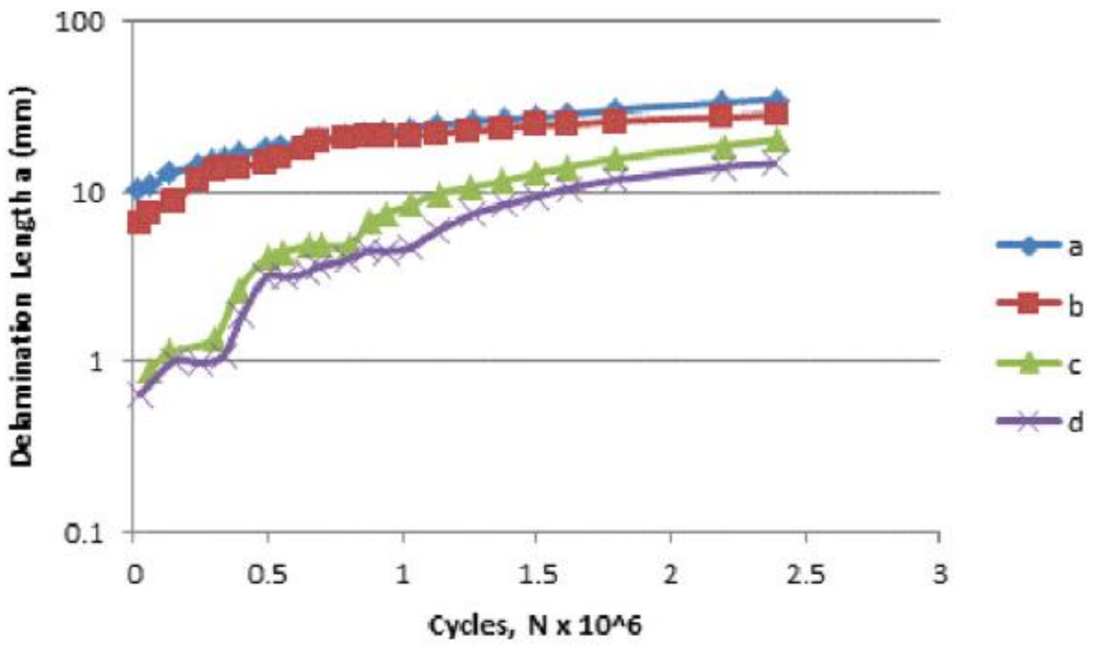
Periodic underloads produce a family of fissures [44,45]





Damage Growth in Composites [48]

- Challenging the no growth design/sustainment basis
- General behaviour: Short period rapid growth followed by plateau



Development of delamination cracks in the interface between bonded metallic sheets and a composite laminate under cyclic loading (Δσ = 198 MPa, R= 0.1) as a function of fatigue cycles, where the lengths of four delamination cracks in a specimen are shown

Molent et al. ASIP Conference Presentations

1. K. Walker and L. Molent, ‘Development of an automated procedure for correlation of two sets of range mean pair fatigue sensor data’, In Proc: ASIP Conference 1991.
2. L. Molent, ‘A Review of a Strain and Flight Parameter Data Based Aircraft Fatigue Usage Monitoring System’, In Proc: ASIP Conference 1996,
3. L. Molent, ‘Proposed Specifications for a Unified Strain and Flight Parameter Data Based Aircraft Fatigue Usage Monitoring System’, In Proc: ASIP Conference 1998.
4. S. Barter, K. Sharp, L. Molent and G. Clark, ‘Repair and Life Assessment of Critical Fatigue Damaged Aluminium Alloy Structure Using a Peening Rework Method’, In Proc: ASIP Conference 2000.
5. L. Molent, S. Barter, D. Conser and P. White, ‘Overview of the F/A-18 Aft Fuselage Combined Manoeuvre and Dynamic Buffet Fatigue Test’, In Proc: ASIP Conference 2002.
6. S. Barter, L. Molent and M. McDonald, ‘Fleet Fatigue Life Interpretation from Full-Scale and Coupon Fatigue Tests’, In Proc: ASIP Conference 2005,
7. S. Barter, L. Molent and L. Robertson, ‘Using Service Growth from Teardown to Aid Aircraft Lifing’, In Proc: ASIP Conference 2009,
8. L. Molent, S. Barter and W. Foster, ‘Verification of an Individual Aircraft Fatigue Monitoring System’, In Proc: ASIP Conference 2011
9. L. Molent, ‘The Influence of Pitting Corrosion on Structural Integrity’, In Proc: ASIP Conference 2013,
10. B. Main, S. Barter, W. Foster, M. Gordon, L. Molent and L. Weibler, ‘Hornet Outer Wing Static Testing (HOWSAT) Program for RAAF Classic Hornet Service Life Management’, In Proc: ASIP Conference 2015,
11. L. Molent, C. Forrester, N. Rajic and A. Groszek, ‘Durability and Damage Tolerance of Composite Structure: Preliminary Investigations’, In Proc: ASIP Conference 2017,
12. K. Walker, R. Evans, X. Yu, L. Molent, B. Main, J. Hodges and M. Hill, ‘Analytical modelling of fatigue crack behavior under representative spectrum loading in the F/A-18 A/B Y508 wing root shear tie’, In Proc: ASIP 2018.
13. B. Main, L. Molent, R. Singh and S. Barter, ‘Lessons from 35 years of the RAAF F/A-18A/B ASIP’, In Proc: ASIP 2022.