What's the likelihood of failure?

Planes, strines and anguines

How do you go about making credible, consistent, and calibrated decisions when you're estimating likelihood of failure?

Sunscreen, insect repellent, and *The Ladybird Book of Legless Reptiles* packed, this was the tree risk assessment challenge that David Evans (VALID), along with Paul Muir and Claire Harbinson (Treework Environmental Practice), took to the antipodes earlier in the year. A whirlwind tour was put together by Australian seminar gurus ArbEvents, which called in on Auckland, Brisbane, Sydney, Melbourne, Adelaide, and Perth. This ground-breaking expedition saw over 250 mustard-keen arborists come along to have their likelihood of failure decision-making muscles given a good workout.

The fellowship

The quest to help arborists improve their likelihood of failure decision-making is an idea that David began to kick around with Paul in the lead up to the 2015 Arboricultural Association conference, where they both presented. As some of you know, before heading off to set up VALID as a non-profit, tree risk-benefit assessment system, David was one of the lead QTRA trainers, and a vital driver to its past development. What's more, likelihood of failure decision-making is a core part of his PhD research.

From hundreds of static load tests (SLT), and as a member of the SAG Baumstatik Group, for many years Paul has been building up a wealth of real-world field knowledge, whilst ploughing a solitary furrow as the only SLT practitioner in the village. The fellowship was completed when Claire, who has recently trained to do SLTs herself, joined. Claire brought along some critical, no-nonsense scrutiny born from a history of academic editing – which includes poking Duncan Slater's early research with an occasional fork.

A day of two halves

Hands-on participation, applying what was presented before lunch, was a crucial part of the plan. So, the second half of the day was spent out in the field, with split sessions and small numbers. Giving people the space to contribute was one of the main reasons for the success of the seminars.

David refereed 'Likelihood of Failure Club' using VALID, which he introduced at the 2015 AA conference. Version 1 was trialled at his sold-out Tree Academy Workshop at the ISA conference in Fort Worth, 2016. Version 2 was completed after a development review in preparation for the tour, the aim being that the likelihood of failure part of VALID now works as a qualitative SLT (Fig. 1).

Everyone spent equal time with Paul and Claire who shared a live re-enactment of an SLT on their own tablets and smartphones, which Claire had been busy setting up in the morning. In what, at first glance, appeared to be an unhinged piece of installation art, they were also confronted by the lower parts of the SLT tree plastered with laminated hieroglyphs (Fig. 2). What were these mysterious symbols? They're the tree telling you what the 'safety factor' (how much stronger it is than it needs to be) is at each point where stress and strain were measured. As I'm sure you can imagine, there was much debate about the reasons for the differences. And a lot of head-scratching about the widely accepted 'axiom of uniform stress' being so thoroughly challenged by field evidence.

Paul and Claire then walked everyone through how to use a neat bit of software called TreeCalc on their tablets (Fig. 3). TreeCalc calculates a 'basic' safety factor (no decay and no strength-loss) and 'residual' safety factor (with decay and strength-loss). If necessary, it also helps you work out how much reduction work is necessary to increase the safety factor, and reduce the risk to an acceptable level.

Making friends

An integral part of the campaign involved dabbling in social media for the first time. To this end, the team bribed a child to set up an ArbEvents Facebook page for them. Leading up to the seminars, complimentary nibbles about the content were released on Facebook. The main reason for these bite-sized teasers was to act as primers. However, some of the comments about the posts provided really useful insights. Two in particular stood out. There was a strong urge for strength-loss driven, and completely unnecessary, reduction pruning irrespective of the tree's 'residual' safety

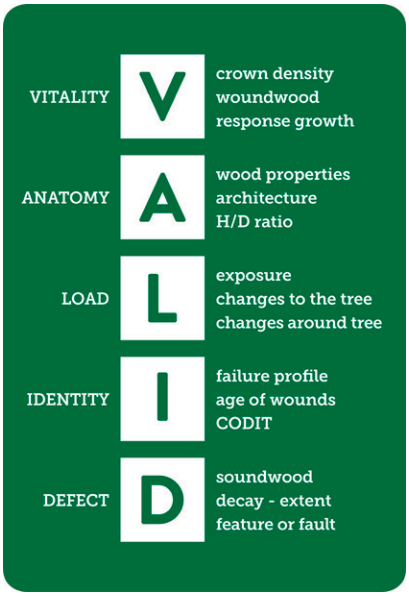

Figure 1. A qualitative Static Load Test.

Figure 2. What do these mysterious symbols mean?

Figure 3. TreeCalc working at the coal face.

factor, and a fundamentally flawed belief that hollow trees are somehow stronger because they are more flexible. Such revelations, amongst other eye-openers, helped to focus on what points to particularly address on the day. These really useful titbits are still available to have a look at if you search 'ArbEvents' on Facebook.

In a nutshell

The main lessons learned from the seminars were:

- VALID brings arborists together
- t/R ratios are usually worse than useless
- Safety factors are way more important than strength-loss

Figure 4. Claire Harbinson and Paul Muir 'working out' in Auckland.

Also, having hundreds of arborists play Likelihood of Failure Club, has helped reveal some of the decision-making behaviour that will be central to David's research.

No one expects the unexpected

A cornerstone of likelihood of failure decision-making is accounting for and dealing with uncertainty. As were the logistics of putting together and running this pioneering tour. But even Donald Rumsfeld's 'unknown unknowns' might have struggled to include what happened in Flagstaff Gardens, Melbourne. Paul and Claire were taking their group on the field exercises when an interloper appeared and decided this was just the right time and place to start practising the bagpipes. David still strongly denies tipping the guy $10. This only just beat the Perth venue having to be switched at the last minute because there were too many snakes. Which begs an interesting risk-related question: how many snakes are just enough?

Tree risk: what's the likelihood of failure?

Would you like to see how cutting-edge decision-making can change the way you look at likelihood of failure in your tree risk assessments?

Frank Rinn and David Evans have teamed up to present a day-long seminar aiming to shine a spotlight on how you can boost your ability to make credible, consistent, and calibrated likelihood of failure decisions. Set in the context of the most recent developments in tree risk-benefit assessment, the morning presentations will outline the foundations on which the practical, hands-on afternoon field sessions are built. A thought-provoking day will provide you with essential knowledge in biomechanics. The ifs and buts of likelihood of failure decision-making. And an unmissable opportunity to calibrate your likelihood of failure estimates with other arborists.

This event, ideal for anyone undertaking tree inspections or making decisions about tree risk, will include indoor and outdoor sessions on:

- Engineering principles, bio-mechanics, and trees
- Safety factors and strength-loss
- What does sonic tomography tell you about breaking safety?
- How useful and how bad is drilling?
- The Static Load Test
- Component parts of likelihood of failure
- VALID Tree Risk-Benefit Assessment
- Field exercises – Significance of decay assessment
- Field exercises – Likelihood of Failure calibration exercises

Dates and locations:

- 10 July, Edinburgh
- 12 July, York
- 14 July, Cobham, Surrey
- 8 August, Bristol
- 10 August, Penkridge, Staffordshire

Each workshop will be priced at £160 +VAT for AA members and £200 +VAT for non-members. Book via the AA website – *www.trees.org.uk/Training-And-Events*

Frank Rinn *studied Physics at Glassen and Heidelberg University. After completing his masters thesis, Frank developed the method of needle resistance drilling and eventually started his own company, RINNTECH. Frank owns national and international patents and trademarks such as RESISTOGRAPH® and ARBOTOM®. Frank is an expert in inspecting trees and timber structures. He gives lectures and training and spends much of his time volunteering in the arboriculture industry world-wide and as the Executive Director of ISA Germany.*

David Evans *is the Director of VALID, a non-profit organisation delivering training and guidance in tree risk-benefit assessment and management. VALID is a ground-breaking approach to tree risk assessment which is a best-of-worlds, third way that marries the benefits of both quantitative numbers and qualitative words. The VALID prototype was presented at the UK Arboricultural Association's 50th conference, to considerable acclaim. Before he set up VALID, for more than a decade David was one of the lead Quantified Tree Risk Assessment (QTRA) trainers, and an invaluable contributor to QTRA's past development. He is currently dipping his toes back into the academic stream by undertaking a PhD into Tree Risk-Benefit Assessment.*