TRAINING UPRT FLIGHT INSTRUCTORS

David J Pilkington FRAeS

OZAEROS

UPRT Providers Conference

1 August 2022

Pilkington gave a masterly exhibition in the stock standard and now very dated ACA Super Decathlon *Little Nell*, including a half upward vertical roll, an elegant slow motion avalanche, and a remarkable knife-edge half-Cuban which he repeated in case his audience, like me, couldn't believe it was possible.

Flying Instructor of the Year

One of my flaws as a flight instructor is that I am an engineer so I try to avoid getting into that however this presentation does have some elements from an engineer's view.

2019 Winner – David Pilkington

30 Sept 95

AVIAT, Inc.
The Airport - Box 1149
South Washington Street
Afton, Wyoming 83110
Attn: Mr. Malcolm White

Dear Mr. White,

On 29 and 30 September 95, Mr. Lester Berven, an FAA flight test pilot from the Seattle ACO flight test branch reviewed your production flight test acceptance procedures for both the HUSKY A-1, and the Pitts S-2B. Mr. Berven also flew both aircraft, and completed a production flight test pilot standardization check for Messrs. Peter S. Pierpont and David J. Pilkington.

Based on the successful completion of the document review and the flight evaluation, Messrs. Pierpont and Pilkington are hereby authorized to conduct and approve production acceptance flights for both the HUSKY A-1 and the Pitts S-1, and S-2 (all variations).

Lester H. Berven
FAA Flight Test Pilot, ANM-160S
Seattle Aircraft Certification Office

has this day been admitted to the Degree of **Master of Science** in the Faculty of Technology having satisfied the requirements of the Senate in the subject of

AERODYNAMICS

4 Approval – to conduct the following pilot licence flight tests

(1) For subregulation 61.245 (3) of CASR 1998, I approve the approval holder to exercise the following privileges:

(a) conduct a flight test mentioned in paragraph 61.1250 (2) (c) for the grant of an aeroplane category training endorsement mentioned in table 61.1235:

(i) item 18, spinning training endorsement;

(ii) item 19, aerobatics training endorsement;

U.S. Department of Transportation
Federal Aviation Administration

Certificate of Designation

Reposing special trust and confidence in the integrity, diligence, and discretion of

DAVID J. PILKINGTON

who has been found to have the necessary knowledge, skill, experience, interest, and impartial judgment to merit special public responsibility, I hereby designate as

DESIGNATED ENGINEERING REPRESENTATIVE

with authorization to act in accordance with the regulations and procedures prescribed by the Federal Aviation Administration relating to this designation.

***Mr David Pilkington** (Australie)*

en reconnaissance des remarquables services rendus à l'aéronautique et aux sports aériens, et plus particulièrement à la voltige aérienne.

OZAEROS.COM.AU

OzAeros

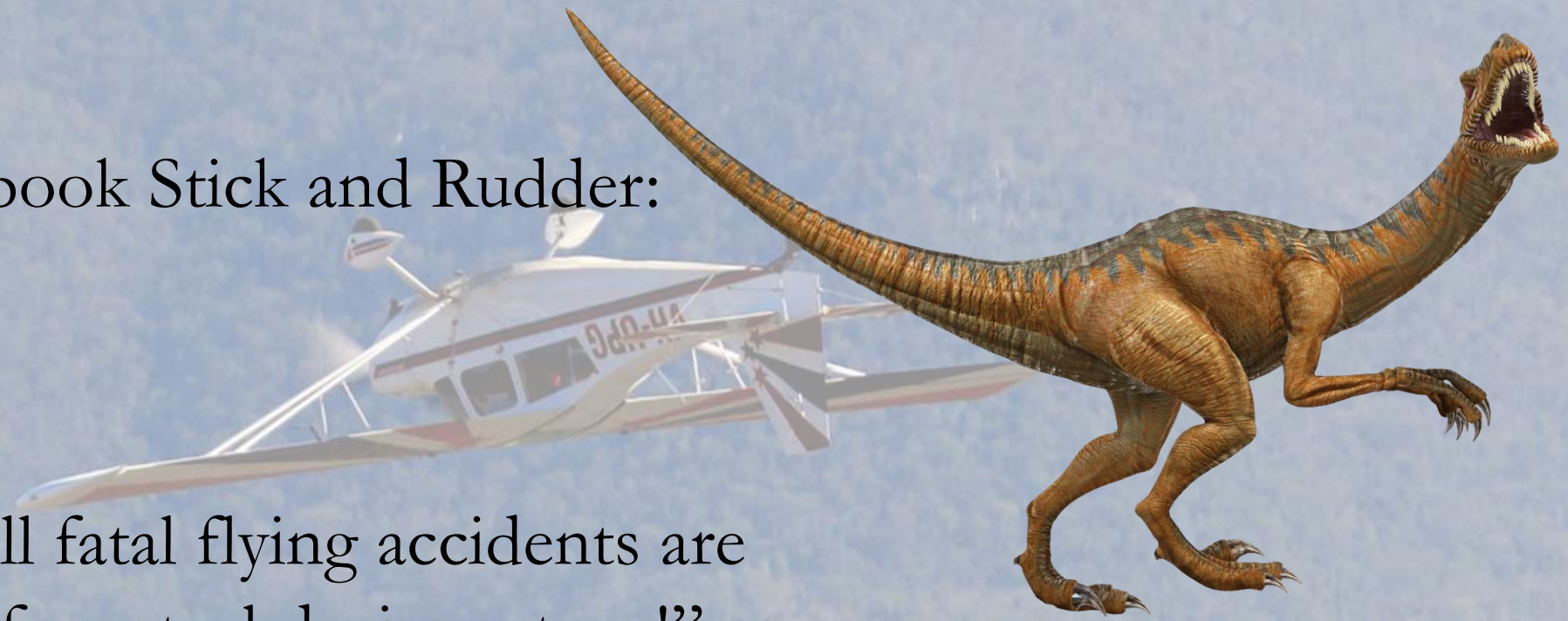
Developed and delivered UPRT courses since 2010

Trained aerobatic instructors since 2007

CAE

Why Dinosaurs?

From the 1944 book Stick and Rudder:



P190. “Almost all fatal flying accidents are caused by loss of control during a turn!”

78 years later not much has changed!

Content

- Dinosaurs & the Cesspit of Misinformation
- EASA Advanced UPRT
  - On-aircraft training
  - Theory
  - UPRT Instructor
- Spin & Aerobatic TE
  - Scope
  - Underpinning Knowledge
- Conclusions

Why Dinosaurs?

Buoyed by the anonymity of the keyboard, these largely fossilised creatures ….. exist in a **cesspit of misinformation, half-baked truths** and misshapen facts …..

..a great proportion of them were indeed **white men over the age of sixty … the human equivalent of t-rex.** …..

Head-to-head combat very rarely works, and sardonic articles aside, **the best procedure for safety promotion** is a combination of leading by example—stay current; fly regularly; be present at **education awareness seminars**; keep an open mind; read blogs, publications and opinion pieces; ask questions of specialist experts and those with more experience than yourself;

and remain cheerful and in good humour—**never resort to personal insult** and mind your manners.

You lost me when you insult us dinosaurs however I agree there is a cesspit of dangerous misinformation.

The Unreachables are they unteachable?

By **Kreisha Ballantyne** - Dec 18, 2017 10482

Extracts from two ATSB reports – AO-2017-096 and AO-2014-114

"… the ATSB … investigation identified incorrect incipient spin recovery guidance provided by CASA."

Reading the report of this Chipmunk spin accident makes me so angry!

That flight manual had been in the aeroplane for about 50 years and for much of that time was mandated by CASA.

What is the root cause of this misinformation?

Indicates deficiencies in the training of spin instructors.

"The flight instructor …. **did not teach the method to recover from a developed spin that was appropriate** … **The spin recovery methods taught by the flying school** were inconsistent across instructors and training material, and were **not always appropriate for the Chipmunk aircraft type** used by the school. The approval for the accident aircraft's flight manual had been revoked, and

the flight manual in use lacked the spin recovery instructions."

https://youtu.be/0U57BbbZfm8

Video of that spin accident

Cesspit of misinformation …..

3.13.1 Manoeuvring speed (V_A) is the speed above which full deflection of the elevator control will exceed aircraft structural limitations. Below V_A the aircraft will stall before structural limits can be exceeded. V_A will be specified in the aircraft's flight manual and placarded on the instrument panel. Full control deflection of any flight control should be avoided above this speed.

b. V_A should not be interpreted as a speed that would permit the pilot unrestricted flight-control movement without exceeding airplane structural limits, nor should it be interpreted as a gust penetration speed. Only if $V_A = V_s \sqrt{n}$ will the airplane stall in a nose-up pitching maneuver at, or near, limit load factor. For airplanes where $V_A > V_S \sqrt{n}$, the pilot would have to check the maneuver; otherwise the airplane would exceed the limit load factor.

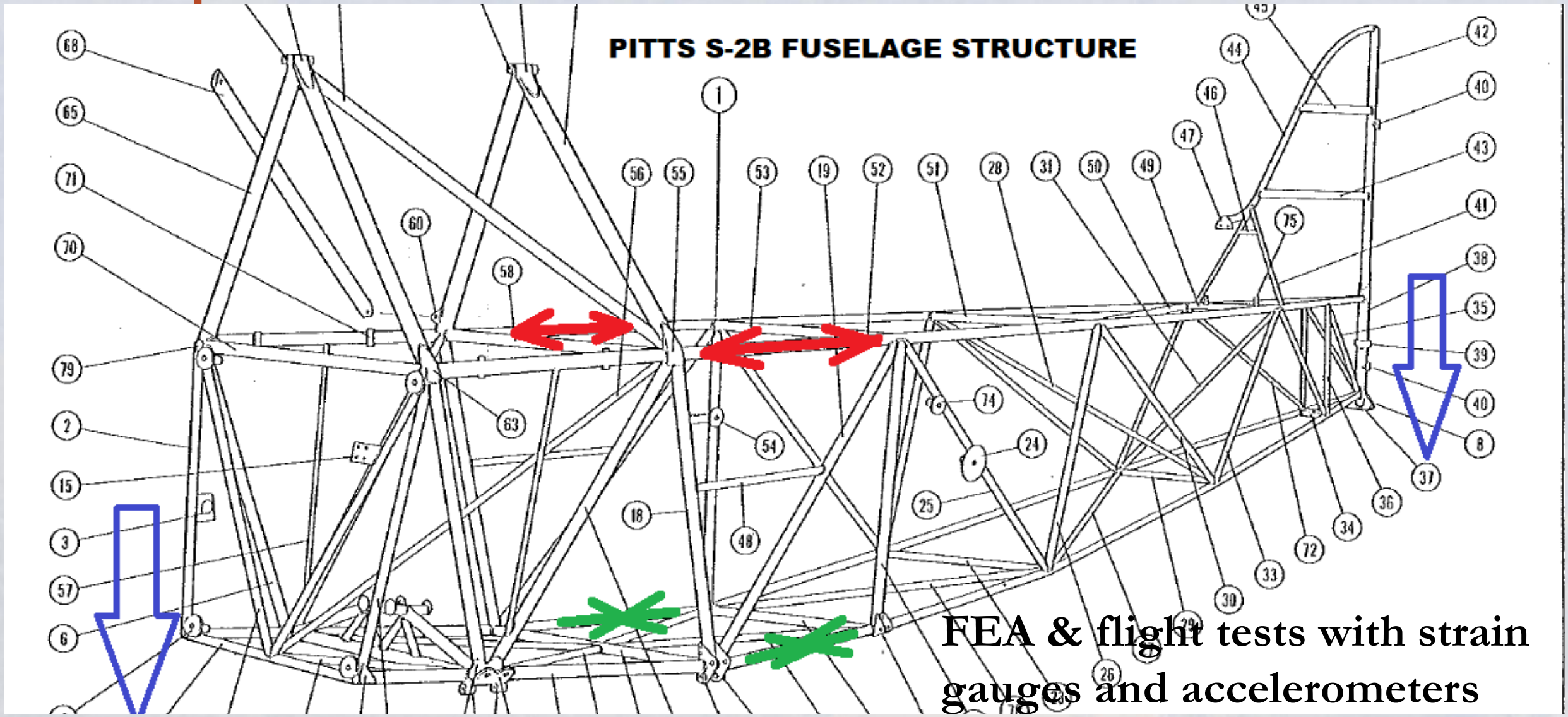
48. What is the design maneuvering speed V_A?

a. The design maneuvering speed is a value chosen by the applicant. It may not be less than $V_s \sqrt{n}$ and need not be greater than V_c, but it could be greater if the applicant chose the higher value. The loads resulting from full control surface deflections at V_A are used to design the empennage and ailerons in part 23, §§ 23.423, 23.441, and 23.455.

- From CASA CAAP 155-1 Aerobatics
- V_A is specified by FAR 23 and explained by USA FAA AC 23-19.
- For example: the Pitts S-2B
  - Stall speed per the POH is 60 mph CAS
  - Limit load factor is 6
  - $V_S \sqrt{n}$ = 147 mph CAS
  - POH states that V_A is 154 mph CAS
  - If maximum up elevator at 147 mph results in 6 G then pulling maximum up elevator at the V_A of 154 mph will get … 6.6G … exceeding the limit load factor!
- Pitts S-2A & S-2C: different stall speeds but exactly the same V_A as the S-2B!
- What about the S-2S … S-1S …. S-1T?

There is dangerous misinformation around for many aircraft!

Cesspit of misinformation …..



…. half-baked truths

Only if $V_A = V_s \sqrt{n}$ will the airplane stall in a nose-up pitching maneuver at, or near, limit load factor. For airplanes where $V_A > V_S \sqrt{n}$, the pilot would have to check the maneuver; otherwise the airplane would exceed the limit load factor.

2.4 SNAPPED MANEUVERS:

NOT NEW:
CAP 10 AFM extract in Sport Aerobatics Magazine of 1987
- refer IAC's Technical Tips Manuals

Recent wind-tunnel tests have shown that quick variations of the angle of attack can increase substantially the maximum coefficient of lift of airfoils (unsteady flow). For this reason, the full and quick deflection of the elevator at speeds below or equal to the maneuvering speed (146 mph) can cause the overstepping of the limit load factors and could cause breaking.

Pitts S-2B test data:
Max elevator at 139 mph: 6 G
but V_A is 154 mph
so that will get 7.4 G!!

It does not take much use like that to break the fuselage!

Pitts AD & SB 24 Fuselage Longerons
"mark the accelerometer face with red lines at +6 and -3 G"

MEANWHILE IN THE USA

"Wagstaff, a six-time U.S. Aerobatic Team member advocated upset training along with "unlearning" of bad habits."

The origin of those bad habits is their initial training.

https://www.aopa.org/news-and-media/all-news/2018/july/31/patty-wagstaff-headlines-ntsb-safety-forum

EASA Advanced UPRT

Customers require courses based on EASA Advanced UPRT so instructors require knowledge and skills in delivering it.

"The advanced UPRT course shall …. comprise at least:

3 hours of dual flight instruction with a flight instructor for aeroplanes FI(A) qualified in accordance with point FCL.915(e) and **consisting of advanced UPRT** in an aeroplane qualified for the training task."

Compare with PPL:

"at least one hour of dual instrument flight time in an aeroplane"

"EASA have confirmed in an email to me that it is supposed to be **3 hours of ACTUAL UPRT** (exactly as specified when I wrote the original requirement as part of EASA RMG.0581)."

EASA Advanced UPRT

"(e) The course is considered to **have been satisfactorily completed if** the trainee is able to successfully:

(1) apply strategies to mitigate psychological and physical effects;

(2) recognise upsets;

(3) apply correct recovery techniques from **upset scenarios as specified** in point (d)(2)."

EASA Advanced UPRT FCL.915(e)

"(a) While the purpose of advanced UPRT course is to expose students to psychological and physiological effects, **students' responses** and actions on controls may take any conceivable variations, including some which **can initiate spin entry or, most importantly, can highly aggravate the upset or loss-of-control they are supposed to recover from.**

(b) The advanced UPRT course in accordance with point FCL.745.A **is not aerobatic training and only requires training for the incipient spin** as well as uncoordinated side slipped stalls which are prone to initiating spins. Full spin training or the development of spin recovery proficiency is reserved for the training course in accordance with point FCL.915(e)."

Despite it not being aerobatic training there is much in common here with the training of aerobatic instructors in dealing with the UA recovery elements.

"(c) Even though most flights will go exactly as planned without an unanticipated departure from controlled flight, **the instructor is responsible for the safety of flight despite anomalies or unexpected student inputs.**

(d) Even in a case where an aeroplane is not certified for intentional flat or aggravated or inverted spins, it does not mean that mishandled student recovery avoids placing the aeroplane in such a situation. **Some student inputs will take the aeroplane uncontrolled far beyond the normal scope of the aerobatic rating** as defined in point FCL.800. Those situations might also have the **potential to draw the aeroplane outside its certified flight envelope** (e.g. overloads, snap-roll departures above limit speed, spin or inverted spin when not certified for, flat spins, etc.). Most importantly, those resulting situations could **startle the instructor.**"

Private video of this incipient spin description.

"**'Incipient spin'** refers to a transient flight condition in the post-stall regime where **an initial, uncommanded roll in excess of 45°** has resulted from yaw asymmetry during a stall and which, if recovery action is not taken, will lead rapidly to a developing spin. Prompt recovery during this Annex I to ED Decision 2019/005/R Page 7 of 50 incipient spin stage will **normally result in an overall heading change**, from pre-stall conditions, **of not more than 180°**."

EASA UPRT INSTRUCTOR

There is much classroom work for the instructor trainee to be competent in delivering this theory.
https://flightsafety.org/toolkits-resources/past-safety-initiatives/airplane-upset-recovery-training-aid/
https://www.icao.int/safety/LOCI/AUPRTA/index.html

- FCL.745.A Advanced UPRT Course
  - **Deliver theoretical knowledge (5+ hours)**
  - Deliver specified flight training (3+ hours)
  - FCL.915(e)

" (e) For the reasons specified in point (d), instructors should:

(1) be trained to the extent of proficiency on the specific type of aircraft they use to deliver the course;

(2) have **academic understanding of the factors assisting or deterring spin recoveries (upright and inverted spins),** altitude requirements for safe recovery margins, and other operational considerations;

(3) demonstrate that they have the **ability to early recognise abnormal situations, timely take action, and safely recover from all the conditions that they may encounter in the delivery of training**

EASA UPRT INSTRUCTOR

- FCL.915(e)

" (e) For the reasons specified in point (d), instructors should:

(4) **demonstrate their ability to recover from all spin types**, not only from spins entered intentionally, but from spins of **unannounced direction of autorotation**, and from **all potential spin variations**, including:

(i) normal (non-aggravated) spins;

(ii) **flat spins;**

(iii) **accelerated spins**; and

(iv) **transition spins** (incorrect recovery resulting in reversal of rotation)."

The UPRT instructor is only intending to do 1/2 turn of a spin yet EASA requires them to demonstrate competence in all of these spin modes which an Australian spin instructor is not even required to know about.

UPRT INSTRUCTOR PREREQUISITES

FCL.915(e)

"**have at least 500 hours of flight time as pilots of aeroplanes, including 200 hours of flight instruction**

have completed a UPRT instructor training course at an ATO

shall only be exercised if instructors have, during the last year, received refresher training at an ATO … assessed to the satisfaction of the HT"

"Successful completion of the course requires that the instructor:

(1) demonstrates the resilience to be able to recover from any feasible upset in the aircraft to be used for training;

(2) demonstrates the ability to provide instruction to achieve the objectives of the advanced UPRT course to a wide range of trainees; and

(3) **manages the physiological and psychological well-being** of students during training."

UPRT INSTRUCTOR TRAINER

"**have 25 hours of flight instruction experience" of UPRT**

"have completed an assessment of competence for this privilege"

"recency requirements" – annual refresher training

EASA UPRT instructors: "…. it is **recommended that candidates either hold an aerobatic rating** for aeroplanes or have equivalent experience."

In Australia the flight exercises involve aerobatics so a UPRT instructor requires an aerobatic training endorsement.

Spin Training Endorsement

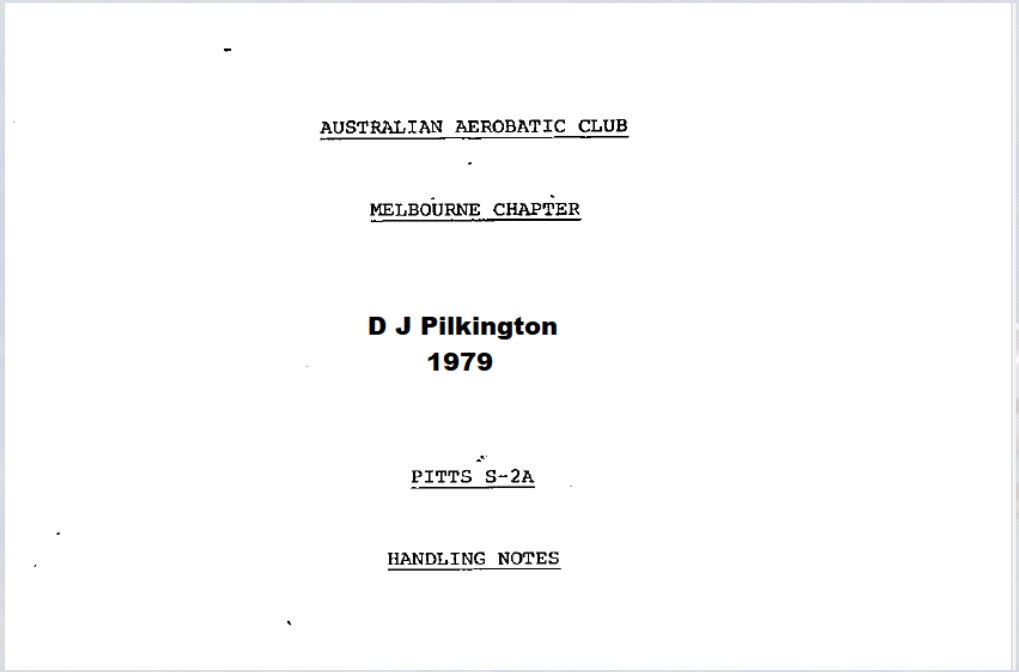
- Not specifically required for UPRT as Aerobatic TE provides for spinning
- Generally, Aerobatic TE holders do the Spin TE

Opinion: Instructors should know -

more than the characteristics of just one type

about aggravated spin modes in addition to flat

Aerobatic Training Endorsement



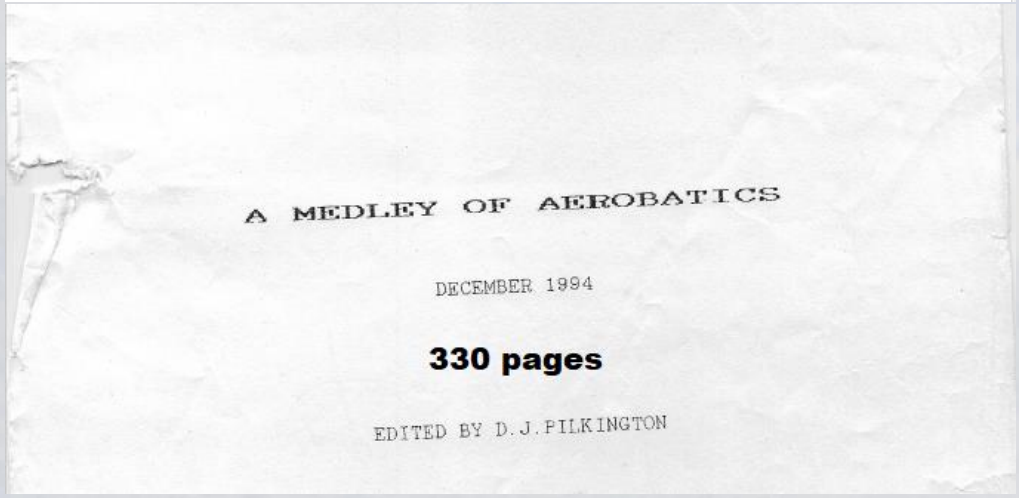
AUSTRALIAN AEROBATIC CLUB

MELBOURNE CHAPTER

D J Pilkington
1979

PITTS S-2A

HANDLING NOTES



A MEDLEY OF AEROBATICS

DECEMBER 1994

330 pages

EDITED BY D.J.PILKINGTON

- Teaching advanced aerobatics for 40+ years
- Gr3 FIR 1995
- **Background as an engineer so emphasised importance of underpinning knowledge.**
  - CASA's CAAP 155-1 in 2007 "To provide information and guidance …"
  - Part 61 introduced requirements for underpinning knowledge
- **CASA's aerobatic instructor training** course template: "MOS: FIR-TE19.3; FAE-1 Review – Underpinning knowledge required for unit FAE-1 and FIR-TE19"
  - **Only 2.0 hrs**!
- **Opinion: much more time required to ensure that the appropriate scope of all underpinning knowledge is understood.**

Conclusions

Go beyond the MOS!

EASA Advanced UPRT is the baseline

UPRT is NOT aerobatics and NOT spin training

Appropriate knowledge is extremely important!