What's Age Got to Do with It?

Father Time and Soaring Safety

Key Dismukes

PASCO Safety Seminar

4 November 2017

True or False?

1) If my stick and rudder skills are good, I can still fly safely.
2) If I have just completed a flight review with flying colors, I am safe to fly.
3) If my physician says I am in great shape, my flying skills should be fine.

Questions to Consider

- What aspects of pilot performance change with age?
- Do all aspects change at the same rate and in the same way?
- Is it all downhill?
- Do all pilots change at the same rate and in the same way?
- Will I know if my performance is deteriorating?
- How can I evaluate how my performance is affected?
- Are there ways to protect against the effects of age?
- Is there a set time to hang it up?

Focus of this Talk

- Provide a foundation to help you answer questions about aging pilots
  - Based on large body of scientific research (will not go into detail)
- Will not discuss frank pathology
  - Medical conditions such as hypertension, stroke, cataracts, etc.
  - Usually can detect and treat these conditions
- More subtle threat is gradual deterioration of cognitive processes
- Cognition = How the brain/mind takes in, processes, and uses information to perceive, remember, think, and take action

Two Distinct Modes of Cognitive Processing

1. Executive (a.k.a., "controlled"):

- Closely associated with thinking and awareness
- Slow, effortful, serial, small capacity (one step at a time)
- Attention & working memory
- Required for dealing with novel or difficult situations, planning, problem-solving, learning new skills
- Used, for example, when trying to program a flight computer you have not used before
- Emergencies, equipment failures, high workload situations challenge executive processing capacity limits

Two Distinct Modes of Cognitive Processing (continued)

2. Automatic:

- Develops over time from practicing specific tasks
- Fast, efficient, requires little mental effort
- Allows rapid processing of large amounts of information, recognition of vast array of patterns, skilled motor responses
- Normally robust and reliable, could not keep up with task demands without it

Piloting Combines Diverse Tasks

- Tasks require differing combinations of skill, knowledge, and thinking; thus differing mixture of executive and automatic
- Stick and rudder skills, with practice, become largely automatic
- Heavy demands on executive processing when:
  - Managing unfamiliar situations, dealing with emergencies, problem-solving, juggling heavy workload; e.g. when canopy flies open in flight
- Decision-making lies between the two modes
  - Fairly automatic when dealing with familiar situations; e.g., when to turn base to final
  - Requires more executive processing for unfamiliar situations; e.g., evaluating unfamiliar off-field landing site

How Does Age Affect Executive and Automatic Processes?

Good News and Bad News

Not So Good News

Executive processing declines throughout adulthood

- ↓ Information processing speed
- ↓ Attention switching and time-sharing
- ↓ Reasoning and problem-solving
- ↓ Rate of learning new information
- ↓ Working memory capacity and recall of old information

Happens to everybody, but rate of decline varies among individuals

But Wait!

Some individuals perform superbly in their 80's

- Bob Hoover, aerobatics
- Arthur Rubenstein, piano
- and others in various fields

If crucial executive processes inevitably decline, how could these individuals continue to perform so well?????

Some Good News

- Automatic processes are fairly resilient to aging
  - e.g., stick and rudder skills can remain high with consistent practice
- Domain knowledge can grow throughout life
  - Experience allows recognition of many situations and retrieval of appropriate response from memory; e.g., evaluation of land-out sites
- Quality of judgment can grow throughout life
  - e.g., “using superior judgment to avoid having to depend on superior skill”
  - Here, older pilots may remain forever ahead
- We may start out with more executive capacity than needed for many real-world activities
  - (but probably not for theoretical mathematics)

Two Contrasting Sets of Curves

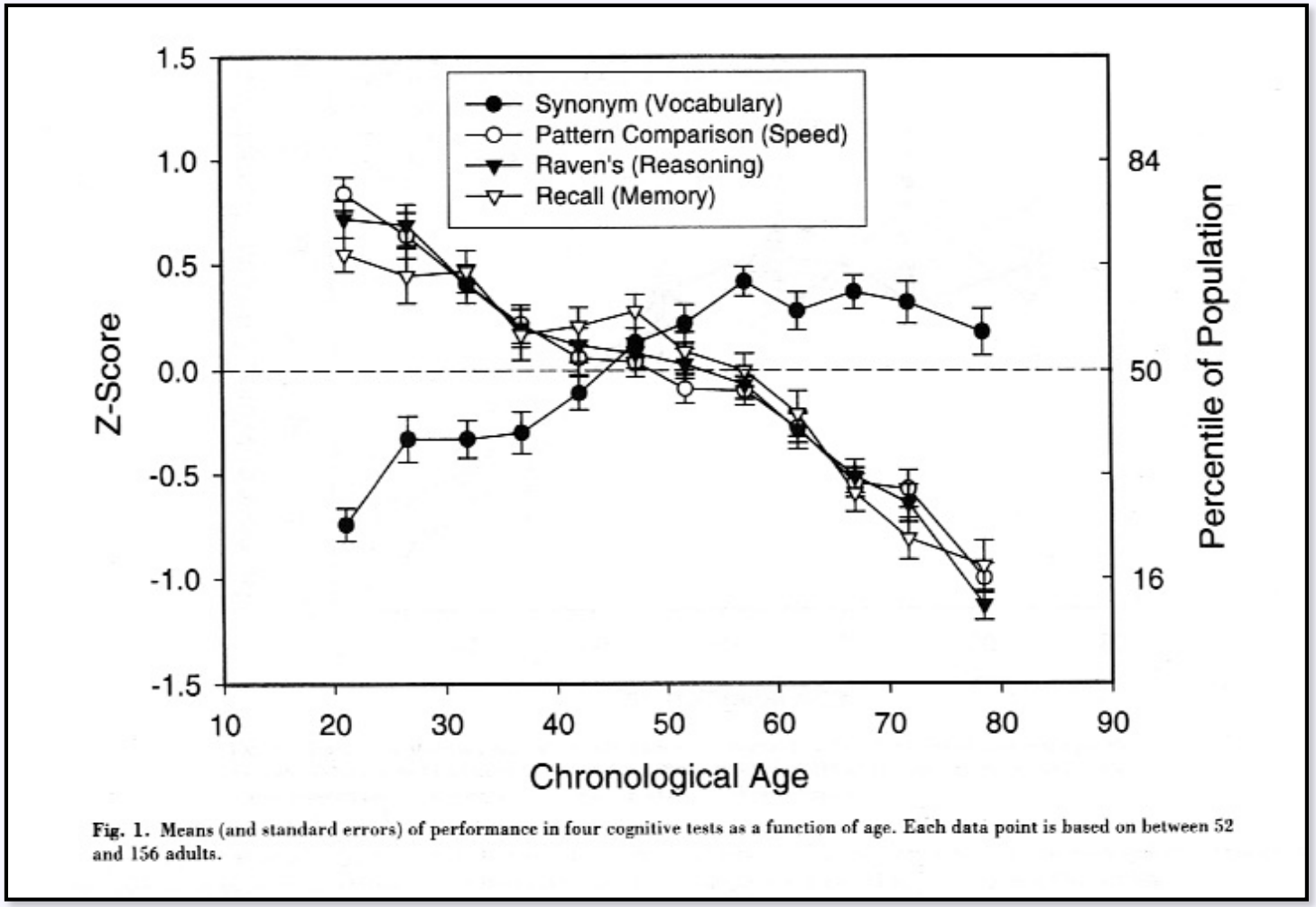


Fig. 1. Means (and standard errors) of performance in four cognitive tests as a function of age. Each data point is based on between 52 and 156 adults.

Salthouse, T.A. (2004). What and when of cognitive aging. *Current Directions In Psychological Science, 13*, 140-144.

Where the Curves Cross with Age Varies Among Individuals

- Decline in executive processes varies with:
  - Genetic inheritance, health, exercise, diet, consistency of mental activity, and degree of social engagement
- Growth/maintenance of domain knowledge and skill vary with:
  - Amount of practice, consistency, and currency
- Consequently, performance varies more among older pilots (at a given experience level) than among younger pilots (at a given experience level)

- Makes it hard to prescribe “one size fits all” guidelines for retirement

Piloting Performance Has Many Aspects

- Cannot measure on a single dimension
- An older pilot may
  - perform superbly on vanilla flight reviews but stumble in situations combining unfamiliar aspects, high workload, and/or time pressure
  - be more vulnerable to forgetting to perform intended actions such as completing an interrupted positive control check
- A particular skill can be maintained by frequent practice, but this does not protect other aviation skills not practiced regularly

Aviation Specific Studies

- Have focused on effects of age and expertise on performance
- Typical simulator tasks: executing ATC instructions, noticing conflicting traffic, monitoring engine gauges, accurate control in X-wind approach, landing decision judgment, etc.
- Age ranges: 19-79
- Measures of expertise: advanced ratings, flight hours, etc.
- Measures of cognitive functioning: speed of info. processing, short-term memory, mental flexibility, etc.

High-Level Summary of Results of Pilot Studies

- Flight performance decreased with age (averaged across individuals)
- Performance associated with declining cognitive functioning
- Higher FAA ratings associated with better performance
- Not clear whether higher expertise slows rate of decline of performance
- Quite clear that higher levels of expertise allow performance to remain adequate longer in life.

Need More Studies Specific to Piloting

- Studies are complex, expensive, and time-consuming
  - Hard to find funding
- Many questions remain, e.g.:
  - Do different flight skills decay at different rates?
  - How much practice required to maintain a particular skill?
  - Do older pilots have to practice more frequently to maintain a particular skill?
- More specific measures of expertise would be helpful

What's an Old Geezer Pilot Like Me to Do???

1) Exercise, exercise, exercise……

2) Healthy diet

3) Work with your physician to stay on top of medical problems

4) Cultivate a deliberate, systematic approach

5) Use checklists

6) Never, ever rush

7) Maintain high level of currency in all flight tasks

8) Use "sterile cockpit rule" with passengers and with preflight preparation

6) Gradually reduce exposure to high-workload, time-pressured situations; gradually reduce complexity of type of flying

7) Get training for new skills to keep the brain active

8) Be wary of fatigue, dehydration, and hypoxia. Go on oxygen earlier than FAA requires

How Do I Know When It's Time to Stop Flying Solo?

- No simple answer
- Consider keeping a self-appraisal log
  - Track getting behind the airplane, getting confused, not noticing or forgetting to do things, minor incidents
  - Track the good stuff, too
- Fly with a CFI more than every two years
  - Go far beyond vanilla BFR
- Consider going to 2-place ship with safety pilot
- Has it stopped being fun?

More Information

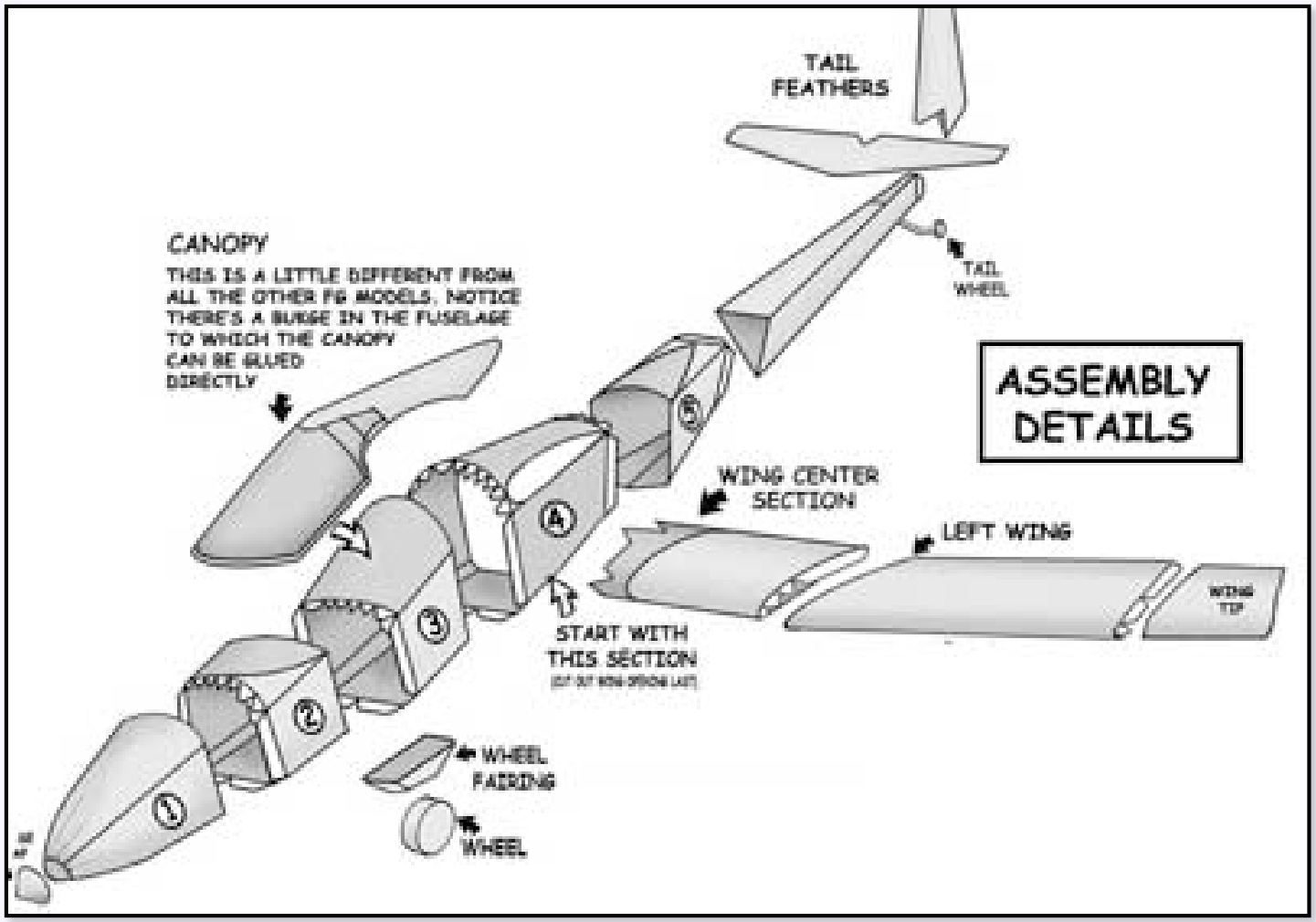
Jim Darke, Fly by Night Services///original photo Peter Kelly

Dismukes, R.K. (2015). Cognition, aging, and the soaring pilot. *Soaring*, 79 (10), 35-37.

Tsang (2003). Assessing cognitive aging in piloting. In (Tsang & Vidulich, Eds) Principles and Practice of Aviation Psychology Erlbaum: Mahwah, NJ.

Yesavage, J.A., Jo, B., Adamson, M.M., Kennedy, Q., Noda, A., Hernandez, B., Zeitzer, J., Friedman, L.F., Fairchild, K. Scanlong, B.K., Murphy, G., & Taylor, J. (2011), Initial cognitive performance predicts longitudinal aviator performance. *Journal of Gerontology: Psychological Science*, 10, 444-453.

Questions??


TAIL FEATHERS
TAIL WHEEL
CANOPY
THIS IS A LITTLE DIFFERENT FROM ALL THE OTHER F6 MODELS. NOTICE THERE'S A BURGE IN THE FUSELAGE TO WHICH THE CANOPY CAN BE GLUED DIRECTLY
ASSEMBLY DETAILS
WING CENTER SECTION
LEFT WING
WING TIP
START WITH THIS SECTION
WHEEL FAIRING
WHEEL
1
2
3
4
5