T6
Leadership
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What Aircrews Can Teach Testing Teams

Presented by:

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Peter Varhol is a well-known writer and speaker on software and technology topics, having authored dozens of articles and spoken at a number of industry conferences and webcasts. He has advanced degrees in computer science, applied mathematics, and psychology, and he is director of practice strategy at Kanda Software. His past roles include technology journalist, software product manager, software developer, and university professor.
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What Aircrews Can Teach Testing Teams

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About me

- International speaker and writer
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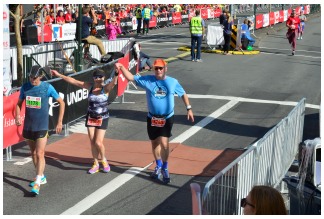

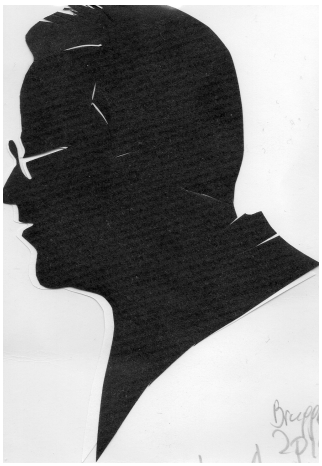

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- QA Evangelist, test manager
- Subject matter expert on testing for TechTarget's SearchSoftwareQuality.com
- International and domestic conference presenter
- Marathon runner & running coach

I Was a Pilot at 17

- I discovered that flying was boring
  - I couldn't do barrel rolls (well, maybe once)
  - And checklists galore
- You go through the same ritual every single time
  - Walkaround, check physical appearance, oil, and fuel
  - Preflight checklist
  - After ignition, check magnetos, flaps, control surfaces, instruments
- Flying is supposed to be boring
  - If it is exciting, you are in trouble

Crew Resource Management

- Accidents occurred because of
  - Crew inattention
  - Poor communications
  - Lack of teamwork
- People died
  - And airlines needed to address that
- Technology and automation help
  - Although sometimes they hinder

Is It Effective?

- In 2009, Colgan Air Flight 3407 crashed outside of Buffalo with the loss of 49 lives
- In 2018, Southwest Flight 1380 suffered a catastrophic engine failure, causing the death of one person
- These were the only fatalities on US carriers during that nine-year period

Why We Care

- Software is expensive to build
- It is increasingly being used for safety-critical systems
- Software has and will continue to kill people
- We need people systems to mitigate the damage
- That should be one of the central roles of testing teams

United Flight 232

- On July 19, 1989, United Flight 232 suffered a catastrophic engine failure
- This engine failure took out the primary hydraulic system
- It also took out both backup hydraulic systems
- There was no way to control the aircraft
- United and McDonnell Douglas maintenance told the crew it was impossible to lose all control, so no procedures existed

So This is It, We're Going to Die

The Crew Came Through in a Crisis

- One captain, one first officer, one flight engineer, one off-duty check pilot
- They established a very minimum of control using only engine thrust
  - Starboard and port engines only
- They divided responsibilities
  - Radio, throttles, turn and bank, other instruments, damage assessment, ideas
- They worked collaboratively, with the captain still in command

The Result

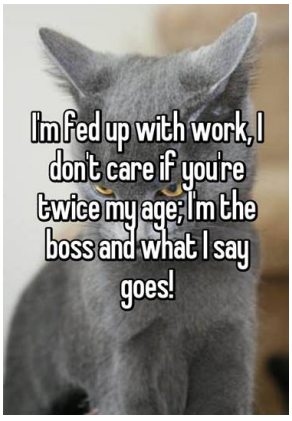
- Crash landing at Sioux City, Iowa airport
- People still died
- But most lived
  - No one should have lived through this
- What was the difference?
  - Professionalism, respect, innovation, crew resource management
  - Willingness to admit that they didn't know the answer
  - And to rely on each others' skills with their lives

Asiana Flight 214

- On July 6, 2013, Asiana Airlines Flight 214 crashed on landing at SFO
- The captain made several errors in configuring the aircraft for landing
  - Autolanding off, which also shut off auto-throttle
  - Engine power went to idle
- The crew were unwilling or unable to question those errors
- "Over-reliance on automation and lack of systems understanding by the pilots were cited as major factors"
- The flight crew didn't think they could question the captain

What Had to Change

- The captain was the final authority, and crews were to respect the captain's expertise and not question him
- But the captain can't be an expert in everything
- And is human
- We need to question authority
  - And we are not good at doing so



Why Do Accidents Occur?

- Accidents are largely caused by the inability of crews to respond appropriately to the situation in which they find themselves
  - Mostly human/crew error
  - HMI error
- CRM is a management system which makes optimum use of all available resources - equipment, procedures and people - to promote safety and enhance the efficiency of flight operations
- https://www.skybrary.aero/index.php/Crew_Resource_Management

How Does Crew Resource Management Help?

- The captain still has final authority
- But the captain listens to everyone
- And subordinates can question the captain
  - And not get into trouble for doing so
- And subordinates should question the captain

Employing Crew Resource Management

- Opening or attention getter
  - Address the individual
- State your concern
- State the problem as you see it
- State a solution
- Obtain agreement

How This Might Work In Testing

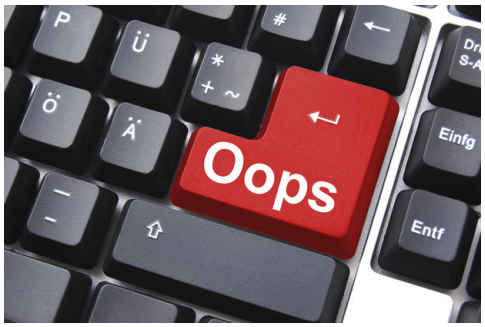
- “Susan, do you have a moment?”
- “This group of tests is exiting with a fatal error.”
- “I can’t tell if the problem is with the tests or the application.”
- “But we’re blocked until we can address it.”
- “I think we need to run the tests manually until we can find the problem.”
- “It will take a little extra time, but we can’t continue like this.”
- “Does that work for you?”

Lessons to Testing

- S--- happens
- A sense of humor is essential
- Use the skills of the entire team
- Automation can be a crutch
- We need training
- Use those checklists

S--- Happens

- The various gauges for all three hydraulic systems were registering zero
- Or, in a testing world:
  - Our app just failed in production
  - The cloud facility just went offline
  - We can't see our application
- The way you prepare for that is training and practice



A Sense of Humor is Essential

- Sioux City Approach: "United Two Thirty-Two Heavy, the wind's currently three six zero at one one; three sixty at eleven. You're cleared to land on any runway."
- Haynes: “Roger. You want to be particular and make it a runway, huh?”
- I served in the United States Air Force
  - If no one is going to die, it can’t be all that important
- Levity is appropriate in /any/ tense situation

Use the Skills on Your Entire Team

- Captain Haynes:
  - We had 103 years of flying experience there in the cockpit, trying to get that airplane on the ground, not one minute of which we had actually practiced, any one of us. So why would I know more about getting that airplane on the ground under those conditions than the other three.”
- Every team member has contributions that matter
  - You need to solicit those contributions

Teams Need to Prepare for Disaster

- You should practice crises
- They can be real or simulated
  - Let one team member at a time devise scenarios
  - The more complex, the better
- Write down the results and practice those scenarios again

Air France Flight 447

- Air France Flight 447 was a flight from Rio de Janeiro to Paris, which crashed on 1 June 2009
- Flight crew included a captain and two first officers
- The autopilot disengaged because blocked pitot tubes were no longer providing valid airspeed information, and the aircraft went to a lower level of automation
- The first officers lost situational awareness, leading to a stall
- The airliner literally fell into the ocean from 39,000 feet
- The airliner had been in the air for 3.5 hours
  - In that time, it had been flown manually for 3 minutes

Automation Can Be a Crutch

- Automation is great for consistency in operation
  - It is not so good when things start going wrong
  - Or when something unexpected happens
- Automation failures in aircraft can produce catastrophic resul
- You can't automate something you can't do yourself
  - You won't be able to tell whether or not you succeeded

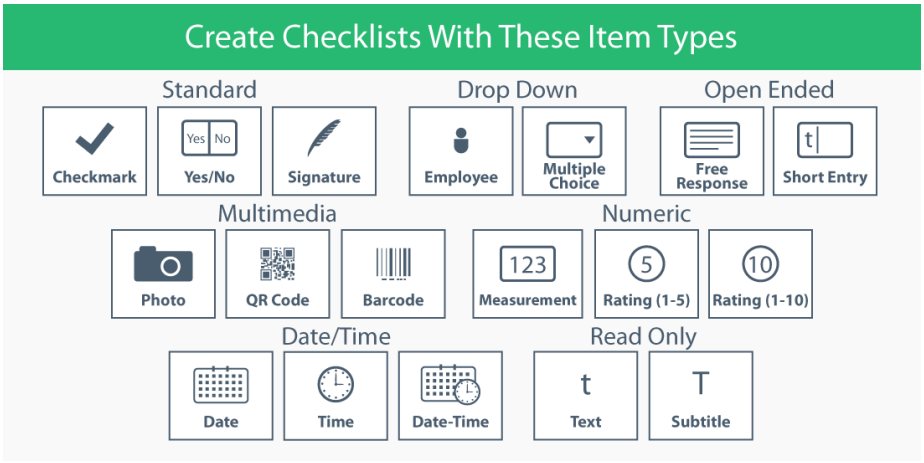
We Need Training

- In systems and software, yes
- But also in team communication
- And in recognizing and dealing with crises
  - Knowing when a situation is not normal
  - Reacting calmly and accurately

The Power of Checklists

- Checklists are part of our daily lives; they
  - relieve the cognitive load of remembering to do's
  - organize complicated decision-making
  - reduce risk in complicated activities by ensuring that critical tasks are not overlooked.

Types of Checklists



Using Checklists in Software Testing

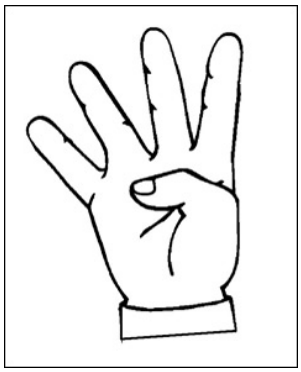
- Checklists can be used to:
  - Replace Test Cases
  - Supplement Test Cases
  - Verify Entry and Exit Criteria
  - Sanity Testing
  - Ambiguity Reviews
  - Test Estimates

Types of Testing Checklists

- Test Project Set Up
- Application Specific Regression
- Testing type specific
  - Website Graphics
  - Browser Dependencies
  - Usability checks

Four Overarching Lessons

- Everyone on the team has value to contribute
- The leader doesn't know everything
- Your automation sometimes lies like a rug
- Keep situational awareness at all times



Everyone Has Value to Contribute

- Sometimes that value is hard to quantify
  - Your tester is the only domain expert
  - Your production operations person is also your best script writer
- Sometimes the team needs to work to unlock that value

The Leader Doesn't Know Everything

- The leader as the final authority doesn't exist
- A testing team leader is a coach, advocate
  - Makes sure the team performs at a high level
- The leader weighs recommendations
  - But it is a team effort

Your Automation Can Lie Like a Rug

- It's usually user error
  - You don't know how it supposed to work
  - You never bothered with the manual, or weren't trained
- You came to rely on it rather than your own skills
- But your automation screwed you
  - And you don't know it
  - Because you never did it manually

Situational Awareness!

- What is Situational Awareness?
  - "The perception of environmental elements and events with respect to time or space, the comprehension of their meaning, and the projection of their status after some variable has changed."
- Know where you are, at all times, your environment, and your interaction with it
- And know what you need to do at all times

A Final Lesson

- You are not alone

Conclusions

- Crew Resource Management can be applied to testing and Agile/ DevOps teams
- Practice non-conforming situations regularly
  - Make up unlikely scenarios; chances are they will happen
- Structured practices and communications may make work boring, but they help when things start going wrong