

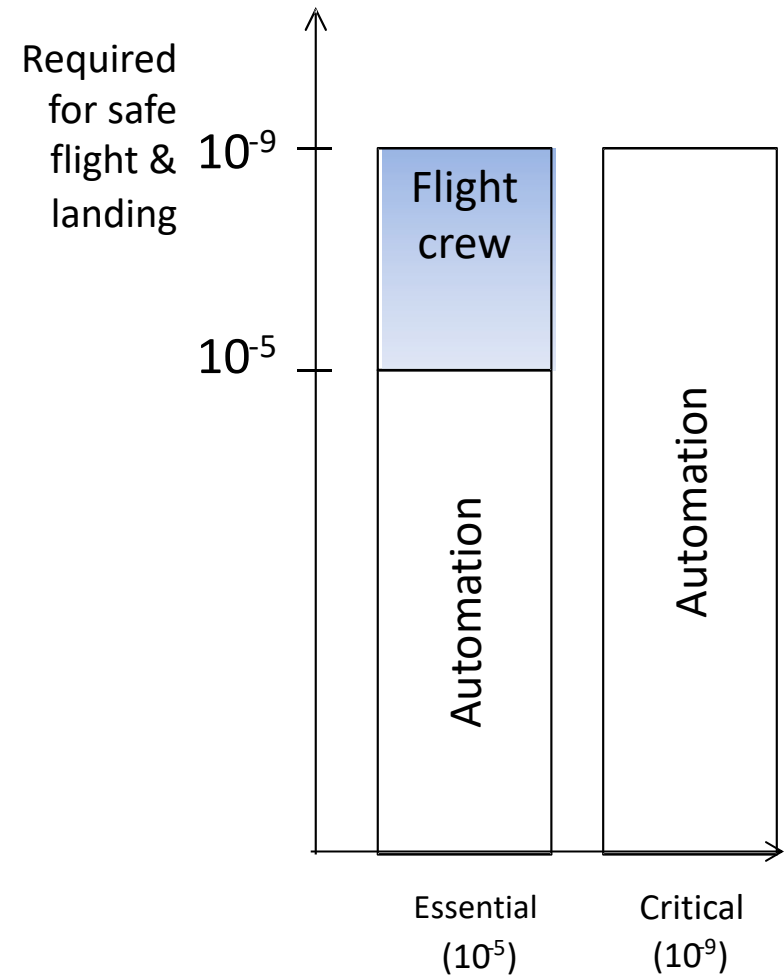
A Holistic Approach to Procedures

FSF Safety Forum
June 2023



We expect people to...

Autonomous Automation	Semi-Autonomous/Supervised	Supervised Automation
• Vehicle Stability • Propulsion System Stability	• Terrain Avoidance • Traffic Avoidance • Speed Envelope Protection	• 4-D Trajectory • Fuel burn • ...

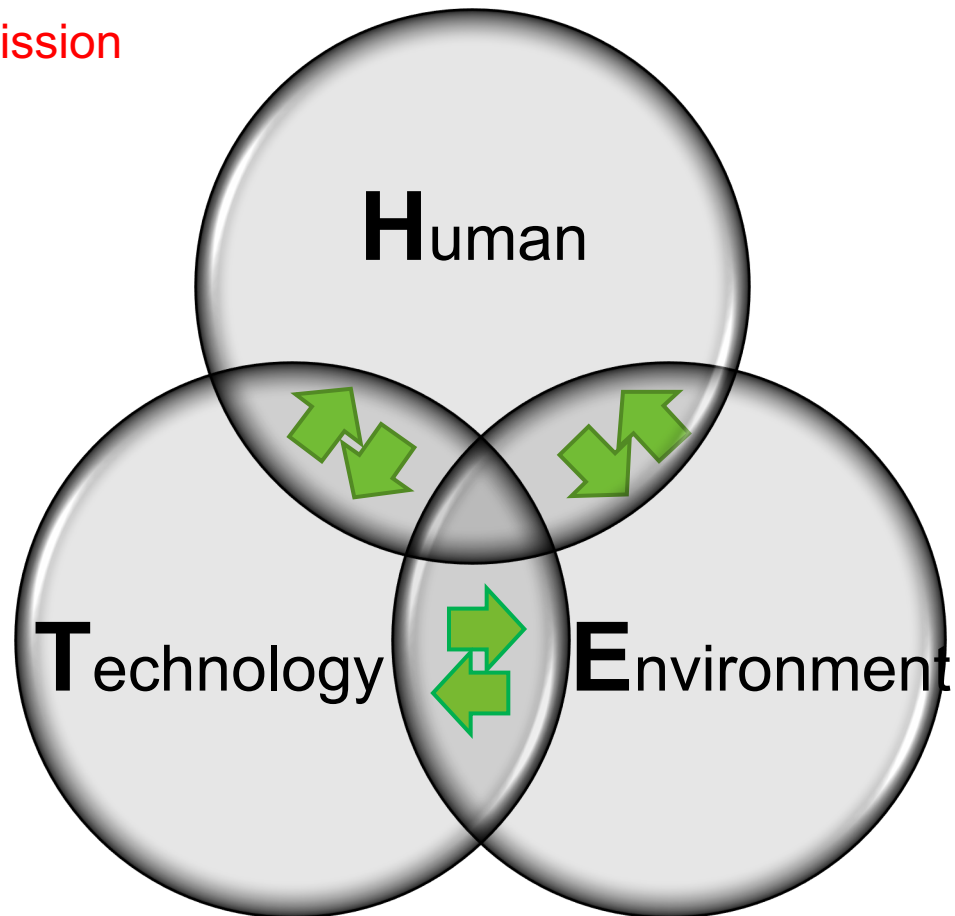


Flightcrew “mind the gap” between 10E9 hazard and 10E5 automation

How do we approach the design of procedures?

- By understanding the complexity of the operation.
- By creating a clear, coherent, consistent, and comprehensive guidance throughout.
- THE Model, the 4C's and the 4P's.

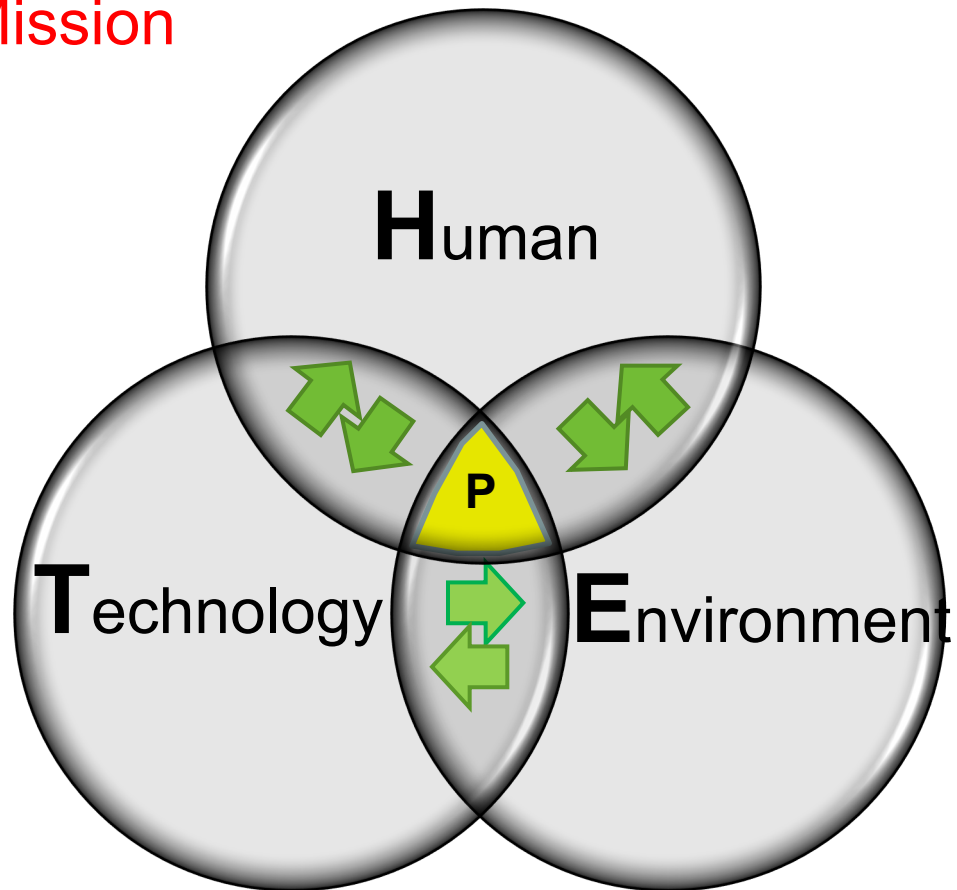
Mission

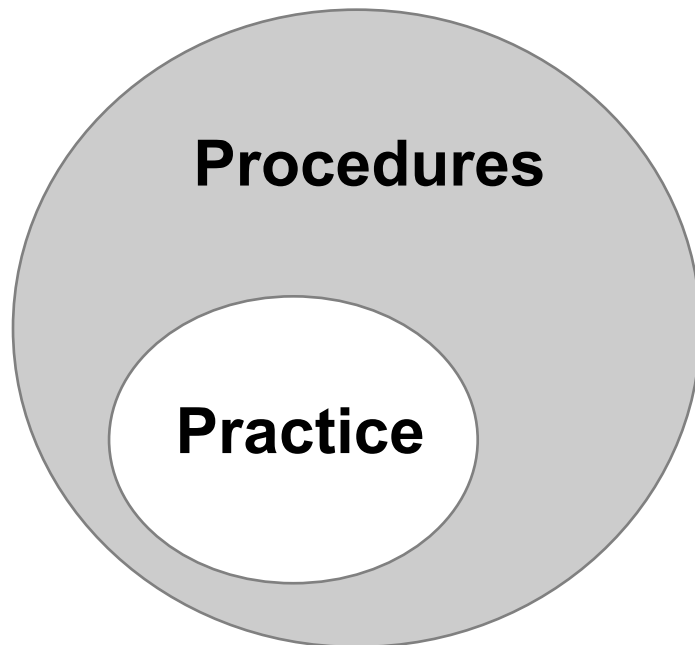


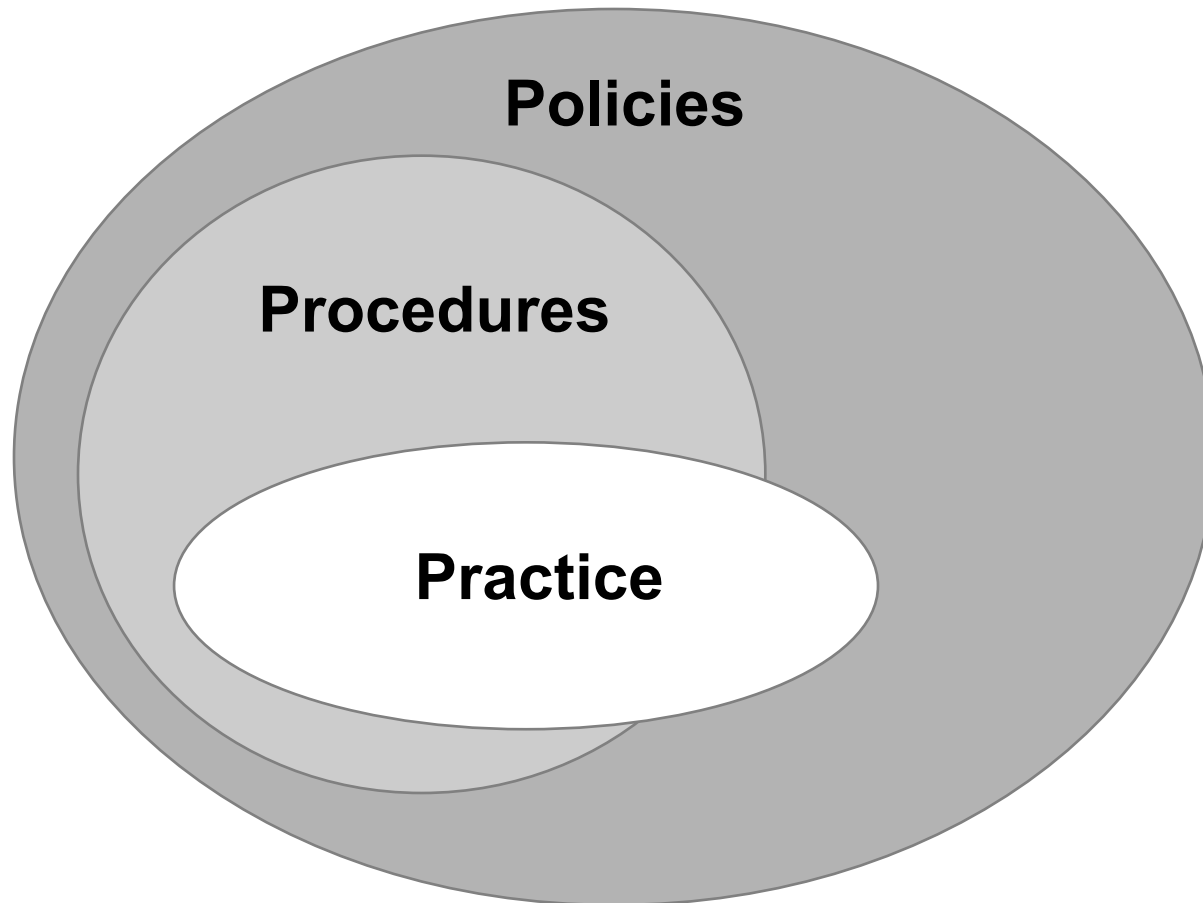
THE Model

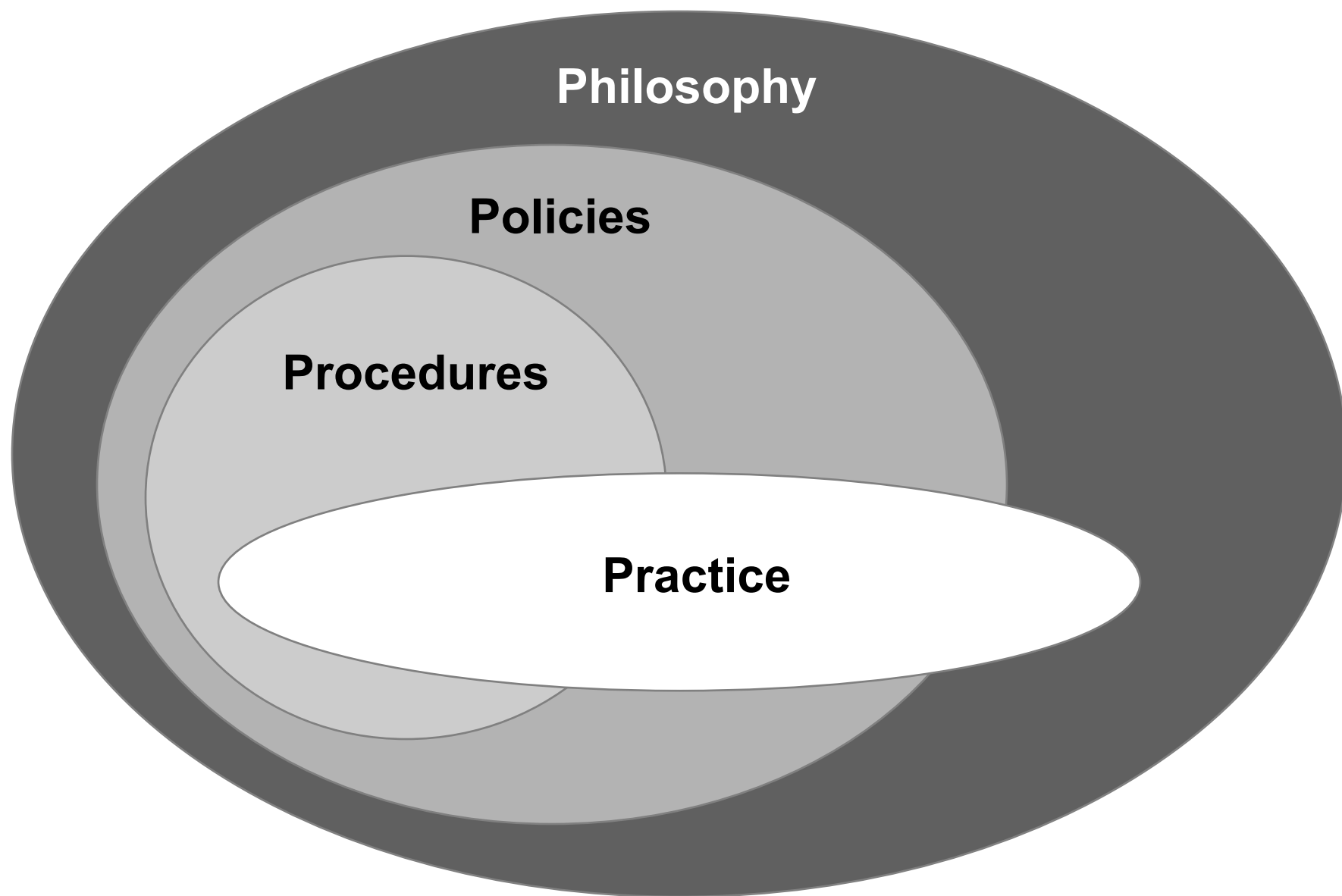
Culture

Mission

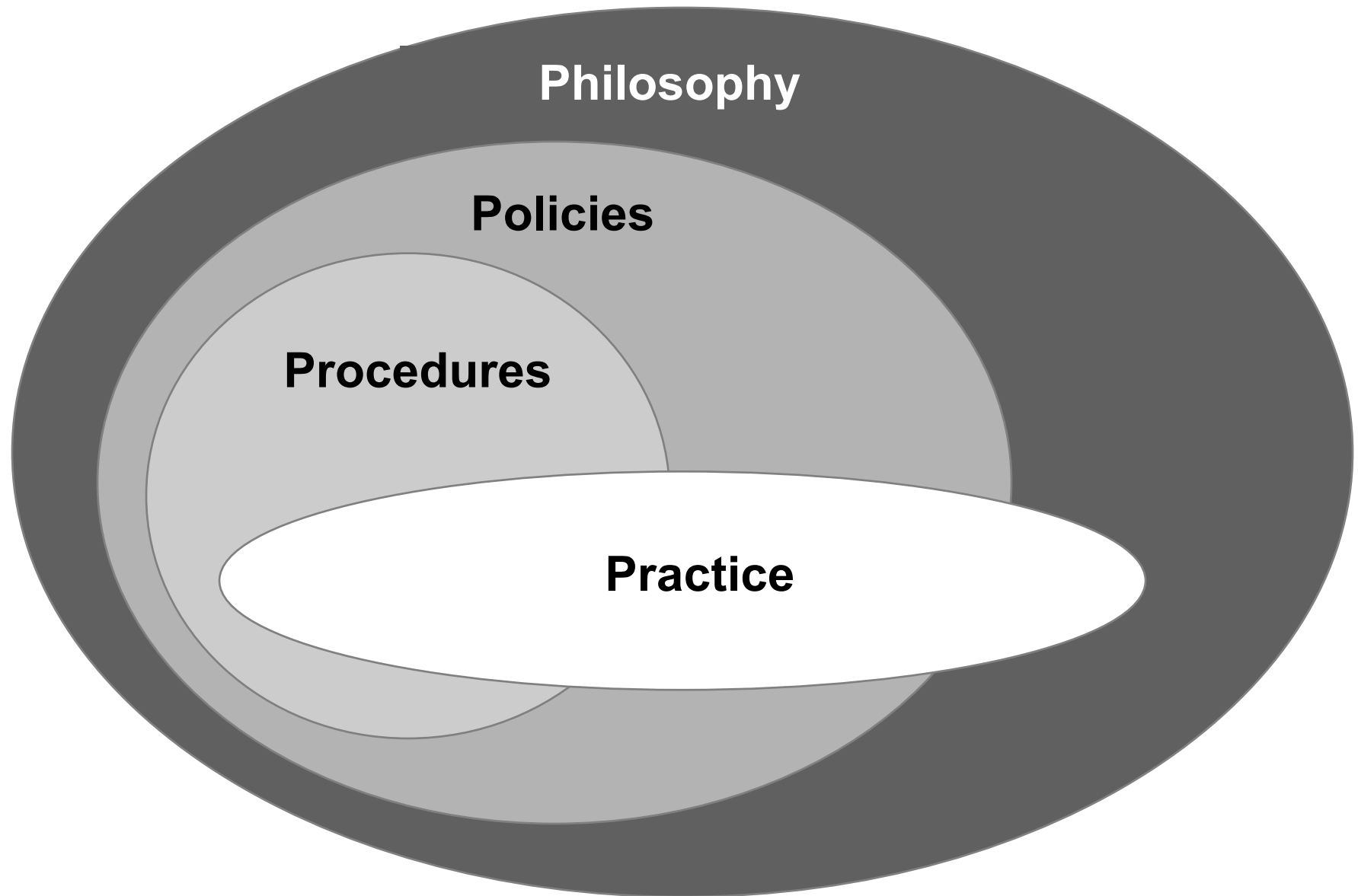








The 4P's



**Figure 1. Mean Number of Problems on Target
Items per Flight**

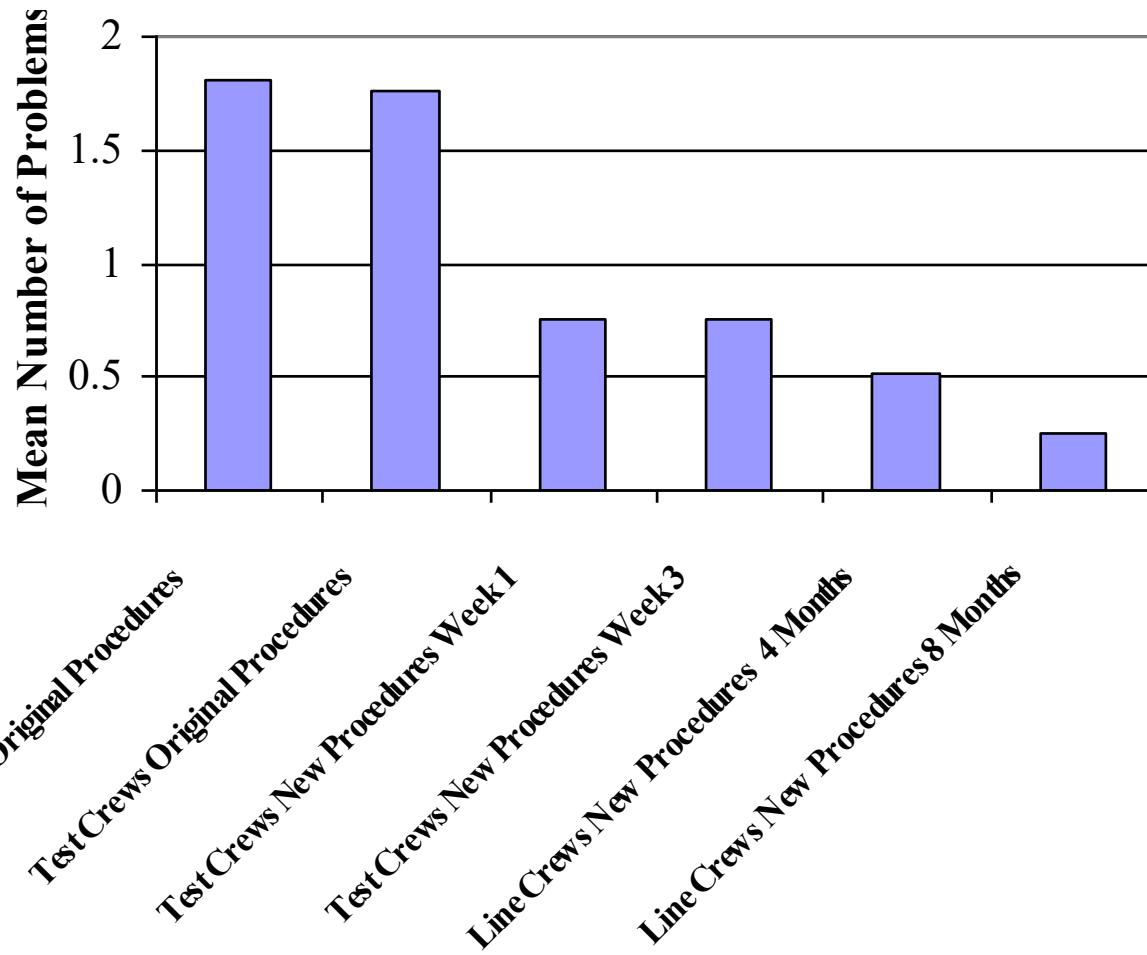


Figure 2. Average standard deviation in proportion of problems

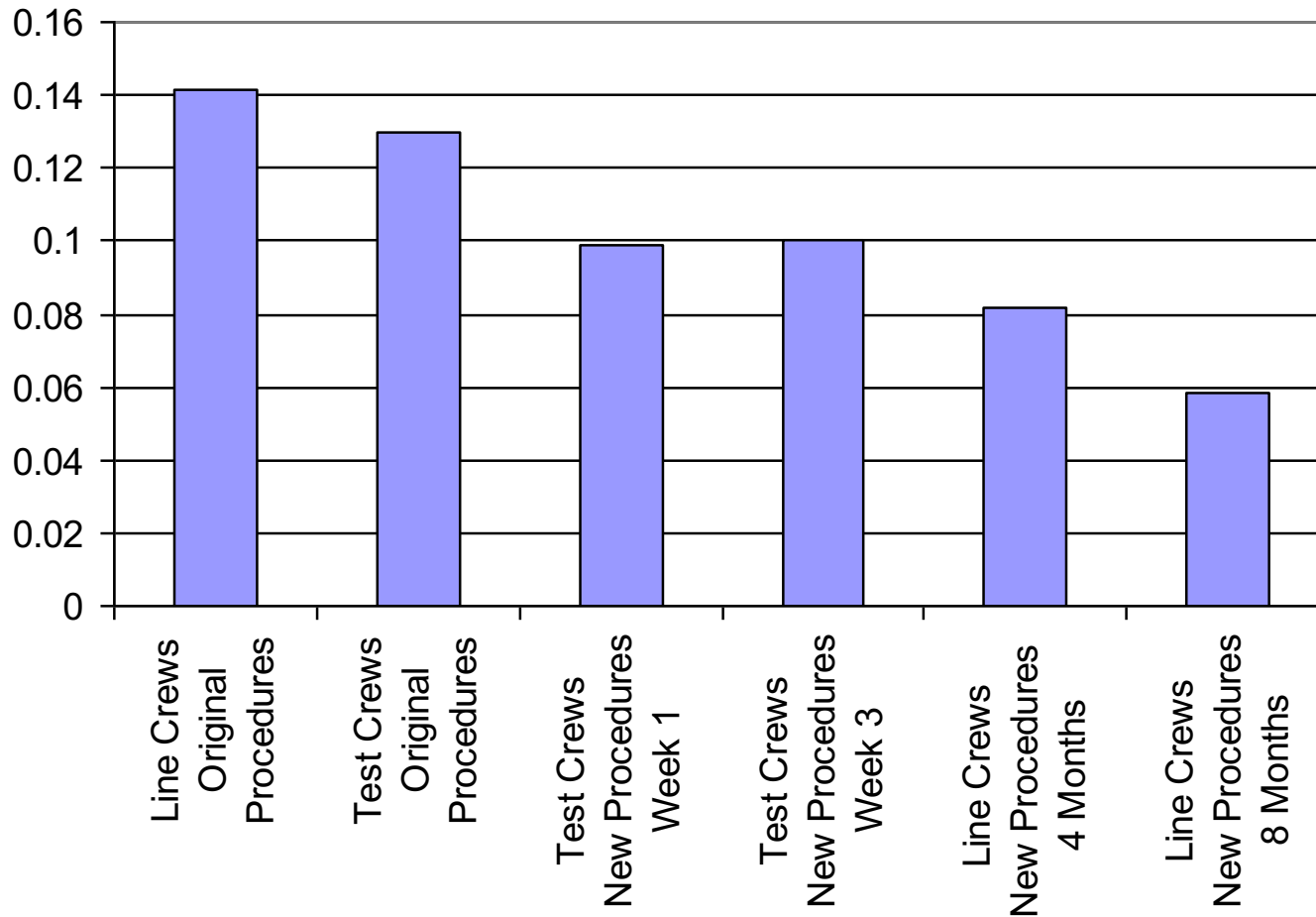


Figure 3. Problems on Target Items by Phase of Flight

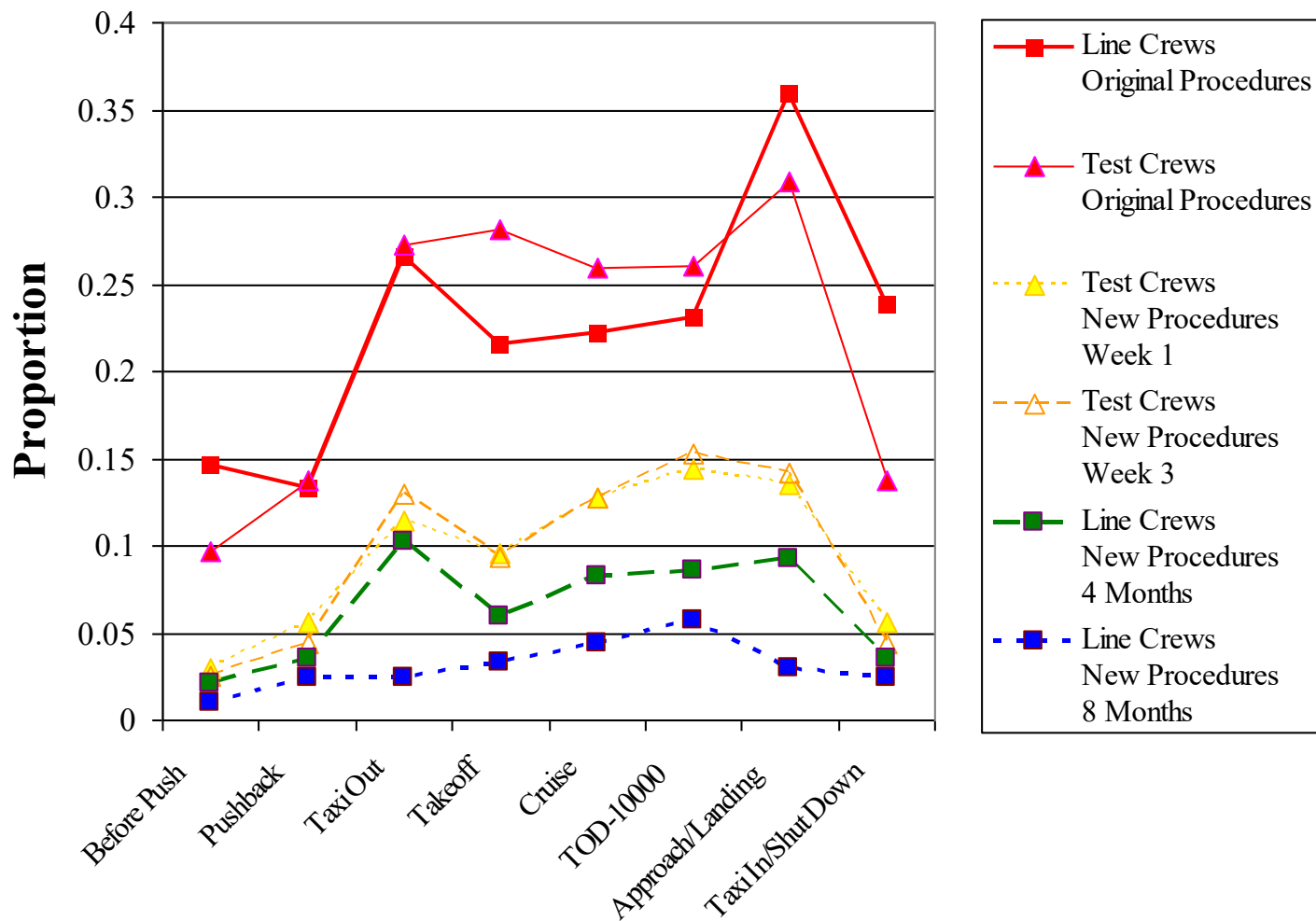


Table 1. Pilots' perceptions of flight under the new procedures as compared to flight under the old procedures 4 and 8 months following adoption of the new procedures.

Question		Response	
Compared to legs flown under the old procedures, on this leg:		Worse	Same or Better
How well did things go overall?	4 Months	10.0 % (12)	90.0% [26.9 (32); 63.1 (75)]
	8 Months	2.2% (2)	97.8% [18.7 (17); 79.1 (72)]
How well did you and the other pilot communicate?	4 Months	3.3 % (4)	96.6% [26.1 (31); 70.5 (84)]
	8 Months	2.2% (2)	97.8% [23.1 (21); 74.7 (68)]
How well did you and the other pilot check / monitor each other?	4 Months	2.5 % (3)	96.6% [22.7 (27); 73.9 (88)]
	8 Months	3.3% (3)	96.7% [17.6 (16); 79.1 (72)]
How well did you and the other pilot check / monitor the aircraft systems?	4 Months	2.5 % (3)	97.6% [38.7 (46); 58.9 (70)]
	8 Months	0.0% (0)	100.0% [31.9 (29); 68.1 (62)]
How tired were you?	4 Months	10.9 % (13)	89.1% [66.4 (79); 22.7 (27)]
	8 Months	4.4% (4)	95.6% [69.2 (63); 26.4 (24)]
How stressed did you feel?	4 Months	12.5 % (15)	87.4% [53.8 (64); 33.6 (40)]
	8 Months	2.2% (2)	97.8% [58.2 (53); 39.6 (36)]
How much effort did you expend?	4 Months	15.0 % (18)	84.8% [44.5 (53); 40.3 (48)]
	8 Months	5.6% (5)	94.4% [42.2 (38); 52.2 (47)]
How rushed were you?	4 Months	13.4 % (16)	86.5% [21.0 (25); 65.5 (78)]
	8 Months	5.5% (5)	94.5% [22.0 (20); 72.5 (66)]

Note. Reported percentages are based on the total number of responses. Numbers in () parentheses are the actual number of responses. Values in [] brackets are: [percent responding "same" (number); percent responding "better" (number)].

Additional Information:

NASA/TM—2016–219421



Designing Flightdeck Procedures

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Designing Flightdeck Procedures: Literature Resources

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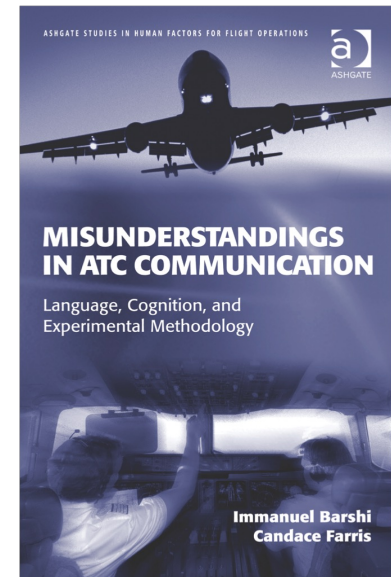
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Thank you!

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