

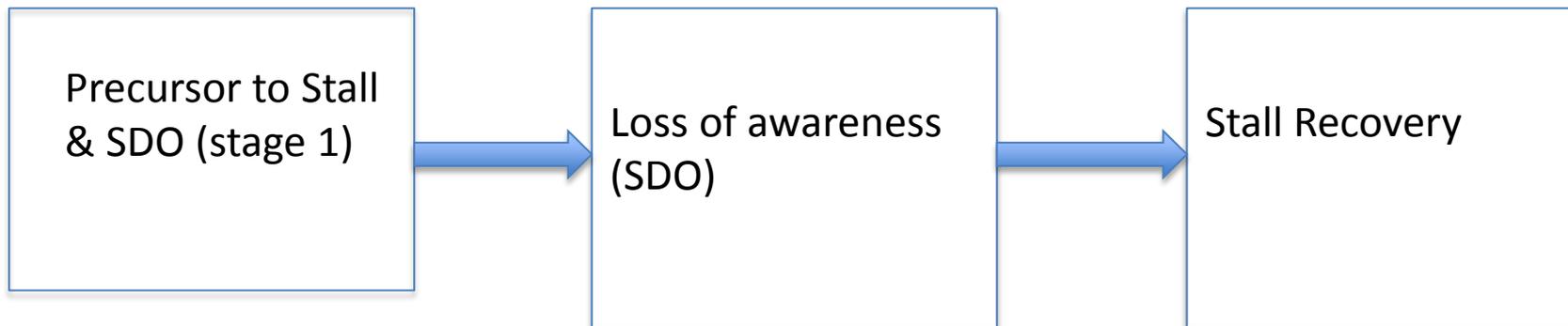
Attention & Loss of Control

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Many LOC accidents have an attentional component.

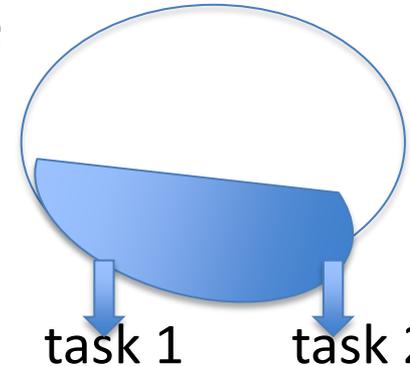
- Stall: Loss of awareness of AOA (pitch – airspeed)
- Spatial disorientation (SDO): Loss of awareness of attitude.
- Attention failures underlie this loss of situation (AOA & attitude) awareness.
- When coupled with loss of **skill** at stall and attitude recovery, accident results
- Stall recovery also has an attentional component



Attentional components: Two modes of attention

- **Parallel (concurrent) processing mode**

- Flying (controlling attitude) and talking
- Controlling pitch and roll
- Monitoring OTW for traffic and listening.



The resource sharing model

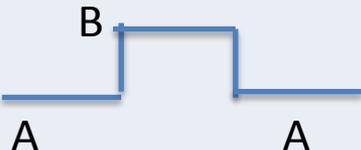
- Is the total demand less than the supply?

- **Sequential Mode: task selection, switching & Interruption Management.**

- Vision: OTW scan, instrument scan and EFB or PED scan
- cognition: listening to (and understanding) ATC and planning.
- The switching model



* Research informs the strengths and weakness of each mode.

	Strengths	Weaknesses
<p>Parallel (concurrent). Pilot shares resources between concurrent tasks</p>	<ul style="list-style-type: none"> * Multiple Resources in the brain: Multimodal perception * Reduced attention demand on resources through automaticity 	<ul style="list-style-type: none"> * Excessive demands on a single resource: Visual resources. Central cognitive resources (executive control). * Stress reduces resource pool.
<p>Sequential (attention switching)</p>	<ul style="list-style-type: none"> * Good mental model says when to attend where. * Skill at task switching  <p>The diagram shows a blue step function on a white background. It starts with a horizontal line at a lower level labeled 'A'. This line rises vertically to a higher level labeled 'B', remains horizontal at that level for a short duration, and then falls vertically back to the lower level labeled 'A'.</p>	<p>Attentional tunneling: stay too long on a task or a visual channel before a switch</p> <p>Attention capture (by vestibular system)</p>

Mitigating Attentional Weaknesses through

	DESIGN	TRAINING
PARALLEL		
SEQUENTIAL		

Mitigating Attentional Weaknesses through

	DESIGN	TRAINING
PARALLEL	Command rather than status displays for recovery. Command Displays require fewer resources	
SEQUENTIAL		

Resource Demands of:

Situation awareness

AOA too high?

- Airspeed?
- Pitch?

Unusual attitude?

- pitch
- bank?

corrective response

“Speed”

“Pitch up”

“Bank Left”

Resource Demands

Unaided	HIGH	MEDIUM
Status display	MEDIUM	MEDIUM
Command display	LOW	LOW

- * Resource Demands of command display are less

- * Performance is better

Particularly under stress when fewer resources are available.

	DESIGN	TRAINING
PARALLEL	<p>Multiple perceptual resources present cues for stall, attitude recovery (auditory, tactile, peripheral visual)</p>	
SEQUENTIAL		

SOAS: (Wickens Small et al. (2006)International Journal of Aviation Psychology

SDAT: (Spatial disorientation analysis tool): Small et al., 2006)

	DESIGN	TRAINING
PARALLEL		Use fewer attention resources: develop automaticity of stall recovery process: overlearning Stress Inoculation Training
SEQUENTIAL		

	DESIGN	TRAINING
PARALLEL		
SEQUENTIAL	Selective attention capture. How do we break through the tunnel (a) prior to stall (b) to command recovery action.	

Mitigating Attentional Weaknesses through

	DESIGN	TRAINING
PARALLEL		
SEQUENTIAL		Cockpit Task Management training; for task selection in emergency. Off-nominal scan training.

CONCLUSION

- Attention failures can cause
 - - lack of awareness of stall margin, spatial disorientation,
 - - Unwanted attentional tunneling to hamper recovery

Corrections and remediations can enhance attention strengths

*Exploiting multiple resources

- through design (multi-modal and visual display) and through training to develop automaticity.
- Reducing resource depletion through stress-inoculation training
- Exploiting effective tasks switching (through cueing, and through scan training and task management training)

Computational MODELS of pilot attention are useful in mishap investigation and in predicting where attention will fail (Wickens Sebok et al (2014., Wickens Helleberg Goh et al, 2003)

Thank you for YOUR attention

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CONCLUSION