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**Levels of Automation  
Advantages & Disadvantages**  
.....

June 2<sup>nd</sup> , 2015

**BOMBARDIER**  
the evolution of mobility

# AGENDA



**Automation Dependency ( Complacency , Addiction etc...)**



**Advantages & Disadvantages**



**Levels of Automation – Tier Module**



**Going Forward**

# FOX NEWS – Jul 2013 .



# VOA – Nov. 2013 .



**BOMBARDIER**  
the evolution of mobility

## **Aviation Authority Warns of 'Overreliance' on Autopilots CAA says pilots need more training to keep their manual flying skills sharp**

November 29, 2014 – International Business Times

**"It's also vital that pilots do not become over reliant on automated systems and are able to retain the high level of flying skills required to operate as a qualified commercial airline pilot." UKCAA**

December 1, 2014 – Aviation Maintenance & Technology

**"Operating highly automated jets during demanding situations still tends to significantly increase the pilots task complexity and workload"**

February 2014 – Flight Safety Foundation Automation Vulnerabilities

## Asiana Crash Hearing Draws Attention to Pilots' Automation 'Addiction'

Dec 11, 2013

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**Air France Flight 447 Crash Causes in Part Point to Automation Paradox – Final Report July 5<sup>th</sup> , 2012**



# 3 **4** GOLDEN RULE OF AVIATION

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**AVIATE**

**NAVIGATE**

**COMMUNICATE**

**AUTOMATE**

# AGENDA

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**Automation Dependency ( Complacency , Addiction etc...)**



**Advantages & Disadvantages**



**Levels of Automation – Tier Module**



**Going Forward**

# Automation Dependency

## ***Automation Advantages***

- **Precision, Safety & Efficiency**
- **Never distracted**
- **Immune to fatigue**
- **Situational Awareness**
- **Reduces direct operational involvement**
- **Follows instruction without argument**
- **Reduces workload ?**

## ***Automation Disadvantages***

- **Automation -DM nil**
- **Garbage in / Garbage out**
- **Complacency/Sense of Security**
- **Situational Awareness**
- **Over reliability/reliance**
- **Inflexible**
- **Distraction**
- **Airmanship / Manual Flight Skills**
- **Silent failures (WOW)**
- **Does not respond to NOW**

# AUTOMATION DEPENDENCY

## IN SYNC - SYNCHRONIZE

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### ***Automation( Pilot)***

### ***Human ( Pilot)***

Automation	Pilot
<p>1-Perform routine and repetitive tasks</p> <p>2-Store , display and erase information</p> <p>3-Computability ability ( quickly)</p> <p>4-Handles complex operations</p> <p>5-Multi task</p>	<p>1-Detect visual and acoustic energy</p> <p>2-Percieve patterns of light/sound</p> <p>3-Improvise / flexibility procedures</p> <p>4-Inductive Reasoning( evaluates)</p> <p>5-Excercises Judgment</p>

## *Butter Finger Syndrome*

- Pushing the wrong button – right time
- Pushing the right button – wrong time
- Pushing the right buttons – wrong sequence
- Thinking that an automated function is off – WHEN ITS ON
- Thinking that an automated function is on – BUT ITS OFF
- Automation Bias – following the choice of the least cognitive effort (processing & interpretation of information)

# AGENDA

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**Automation Dependency ( Complacency , Addiction etc...)**



**Advantages & Disadvantages**

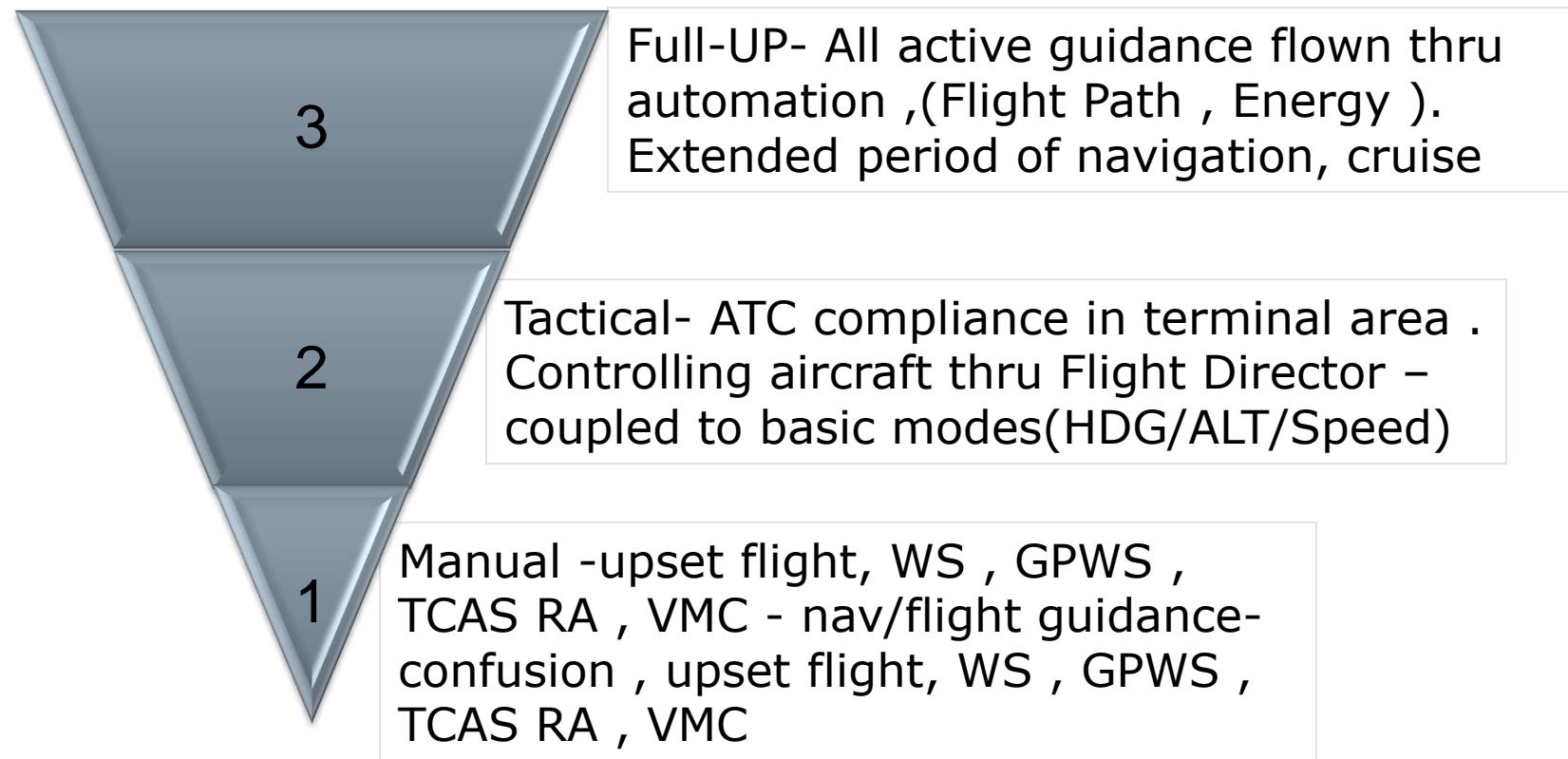


**Levels of Automation – Tier Module**



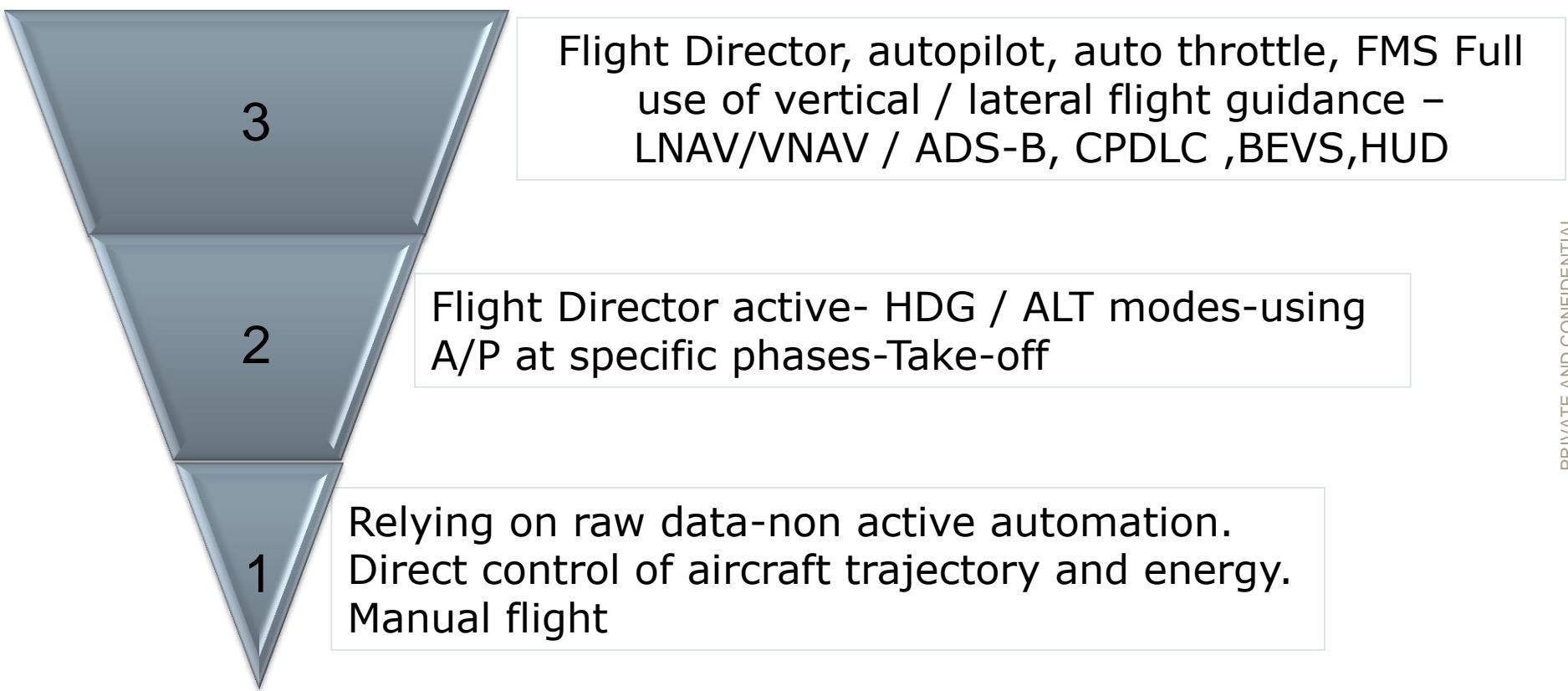
**Going Forward**

## Automation Tier Module<sub>2</sub>- Defined

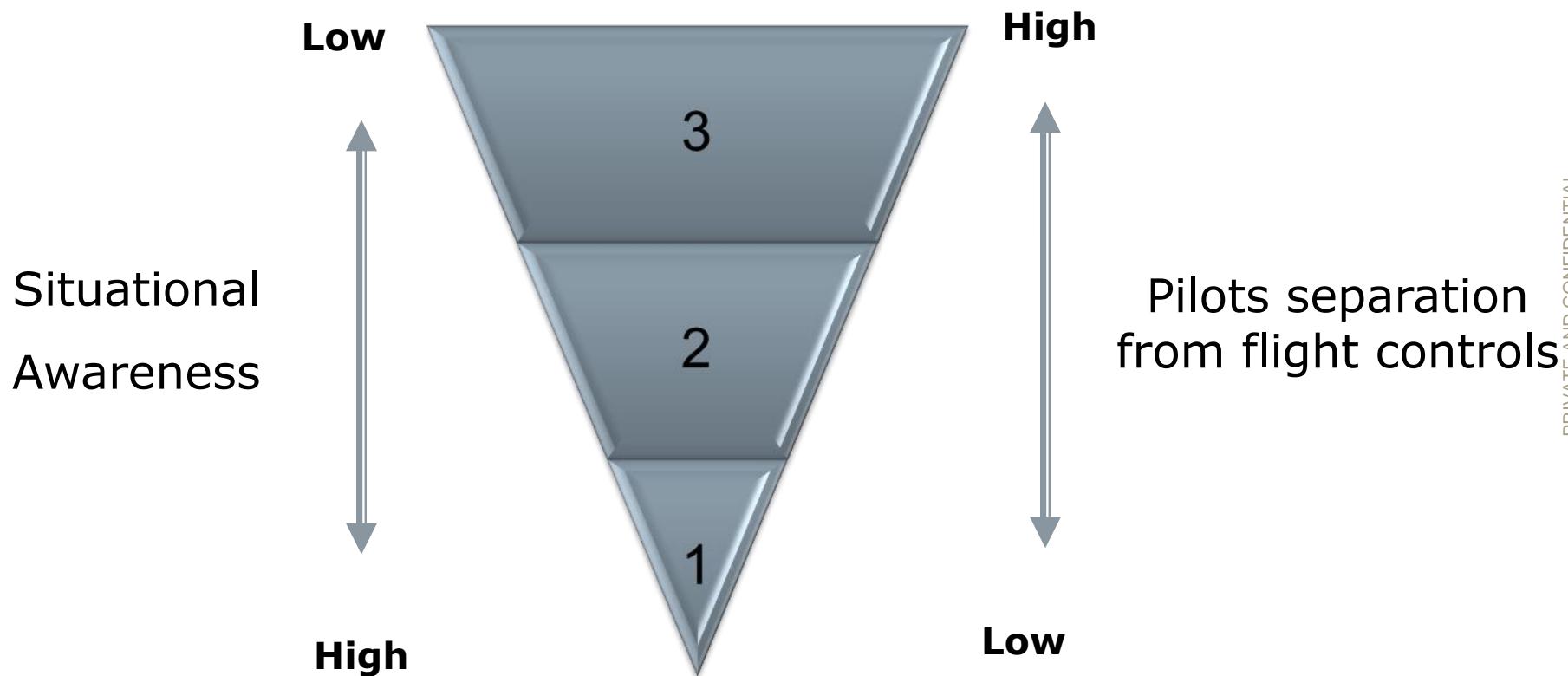


# AUTOMATION DEPENDENCY

## Automation Tier Module<sub>2</sub> - Cockpit



# AUTOMATION DEPENDENCY



# AGENDA

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**Automation Dependency ( Complacency , Addiction etc...)**



**Advantages & Disadvantages**



**Levels of Automation – Tier Module**



**Going Forward**

## Going Forward

- Aviate( PFD), Navigate (MFD) , Communicate (RTU ) and Automate( FMS- A/T, FCP , CDU etc.. )
- Head Up / Head Down . Defined and incorporated in SOP's .Critical SA
- Navigation/ Automation Mode Accuracy
- Correct level of Automation

## Going Forward (2)

- III - Informed , Involved , Initiate 

  - Informed – Monitor , Cross check , STAY in – the – loop , STAY informed
  - Involved – Active role in automation , normal/abnormal failure modes. SA!
  - Initiate- TURN IT OFF ! Choose appropriate level of automation to maintain safety of flight. Revert to manual flight . MAKE the choice clearly apparent to the crew.

- Training – Re-evaluate Standards DOC 24( Skill Test and DOC 29 ( CRM).
  - Recognise , detect and deal with situations in non-normal automation degradation. Intervention Point .....
  - Less “ how it works ” to “ how to respond to failures ”.
  - Better defined checklists for abnormal malfunctions

## Going Forward (3)

- Automation Interface – NOT a common language
  - 60 % of ALL accidents has identified as a leading factor
    - Manual Handling Error
      - Incorrect Upset handling Recovery Technique
      - Inappropriate control inputs
      - Lack of manual handling after Autopilot /Auto thrust disconnect or combination of .....
      - Lack of recognition of any disconnection of Autopilot/Auto thrust or combination of resulting in poor monitoring of energy and speeds
      - Re-active ----Watching things happen vs.  
Pro-active----Making things happen

## We remain Pilots – not Automation Managers

- We must be able to choose our level of automation based on flight conditions. Moving from Tier 1 thru 3 during all phases of flight
- When descending thru MDA on A/P , it a natural instinct to push “ ALT ” ? Or should we disconnect A/P and immediately return MDA .
- Tactile connected to aircraft below 10,000 – even with A/P
- Recognize human factor issues such as – absorption (single task focused) , fixation (locked on) , complacency ( over relying)
- Famous last words: “ what’s it doing ?” ( would rather hear) “ why did it do that”

# Automation Dependency



The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency.

(Bill Gates)

[izquotes.com](http://izquotes.com)

# AUTOMATION DEPENDENCY

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## Reference Material :

- FAA- Operational use of Flight Path Management Systems [www.faa.gov](http://www.faa.gov) ( 2013)
- C.E. Lauber Billings, Aviation Safety – AMES Research Centre( 1976)
- P.Fitts – Human Engineering for an Effective Air Navigation and ATC system (2000)
- Capt. Warren Vanderburgh , Automation Dependency –American Airlines ,( 1997 )



Q&A