Breakdowns in Coordination Between Air Traffic Controllers

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Aims

* Emphasise the complexity of coordination in ATC
* Outline NextGen Technologies
* Identify some of the common ways in which coordination breaks down
* Place these breakdowns in a theoretical framework of team functioning
* Examine the extent to which NextGen will change these breakdowns

Air Traffic Control

* ATC is a complex coordination system with multiple interacting components (people)
* Has both distributed teamwork and co-located teamwork
* Has formal (rule-book) and informal (opportunistic) work practices
* Is safety-critical

NextGen

* The FAA has forecasted that air traffic in the USA will double over the next two decades
* In order to meet this increased level of demand new technologies will need to be introduced
* These new technologies promise to provide considerable benefits in terms of
  * enhancing operations
  * improving safety
* However, there needs to be a thorough human factors evaluation of these systems

NextGen Technologies

* Automatic Dependent Surveillance-Broadcast (ADS-B)
* System-Wide Information Management (SWIM)
* NextGen Data Communications
* NextGen Network Enabled Weather (NNEW)
* National Airspace System Voice Switch (NVS)

Breakdowns

"A breakdown occurs when there is a failure of coordinated decision making that leads to a temporary loss of ability to function effectively."

[Bearman, Paletz, Orasanu & Thomas, 2010, p177]

Method

* 15 former air traffic controllers participated in an hour long interview
* Interviews were conducted in two parts.
  * In part one participants were asked to describe situations involving breakdowns in coordination between the controller and flight crew
  * In part two participants were asked a number of general questions about breakdowns and NextGen technologies.
* Participants had an average of 28 years of experience and an average age of 55. One participant was female.
* The data was analyzed using a bottom-up thematic analysis technique

Breakdowns occurred between

* Adjacent sector controllers
* Radar controller (r-side) and assistant (d-side)
* Relieving and handing-over controller
* Instructors and trainees,
* Supervisors and controllers
* Oceanic controllers and the service that relayed information to the pilots.

Causes of Breakdowns Language

* Using non-standard terminology and incorrect format
* Saying one thing and meaning something else
* Misunderstanding the intent of other controllers
* Not being clear about what authority has been transferred when another controller requests control of an aircraft in their airspace

Causes of Breakdowns
Lack of Information

* Forgetting to transfer control of aircraft to the next controller
  * Changes to the structure of sectors
* Neglecting to pass on information during handover
* Information about flow rates weren't always passed on to the controller
* Neglecting to pass on information that would have been extremely useful to another controller

Causes of Breakdowns Attention

* Neglecting to watch what the other controller was doing when there was an assistant
  * D-side controllers acting in unexpected ways
* Perceiving information without really comprehending it
* Instructors being out of the loop

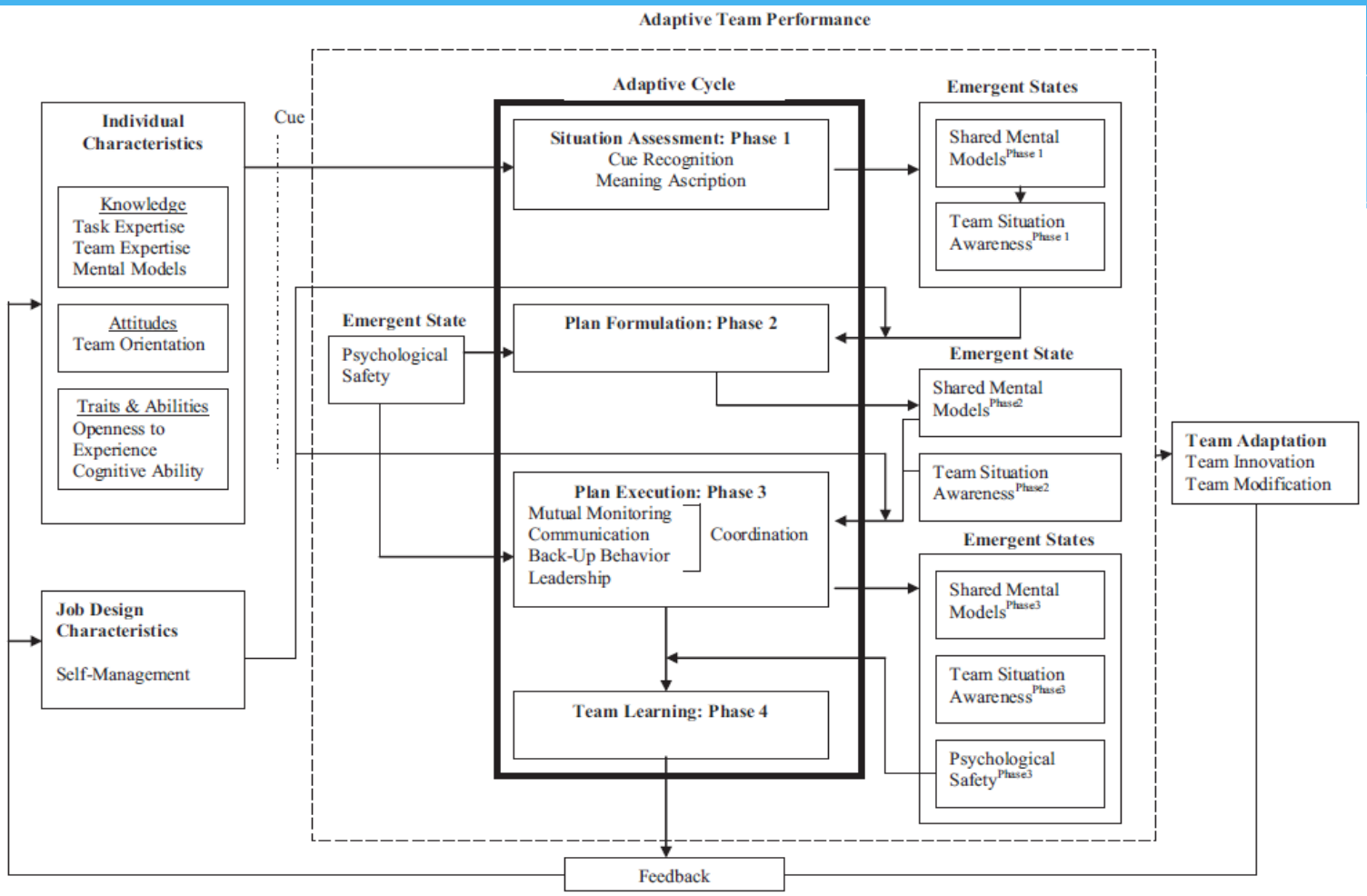
Causes of Breakdowns Individual Differences

* Different comfort levels with non-standard solutions
* Personality
  * Ongoing conflict between controllers
  * Non-communicative people
  * Prickly individuals
* Unprofessional behaviour
* Expectation
  * People taking short-cuts (e.g. dropping call signs)
  * Assuming that the other controller will do something

Causes of Breakdowns Environmental and Technology

* Dividing a sector into two
* Aircraft falling between sector boundaries
* Handing off an aircraft that does not fulfil the requirements for the next controller
* Noise in the control rooms
* Incorrect data entry

Adaptive Teamwork



Burke, Stagl, Salas, Pierce, and Kendall (2006)

NextGen Technologies

* It seems likely that NextGen technologies will reduce at least some of these causes of breakdowns because of
  * Automation reducing the interaction between controllers
  * Datalink communications
  * The ability to drag and drop routes
  * Common information sources
* However, NextGen technologies are still at an early stage of implementation
* There are likely to be other issues that are created by NextGen technologies that need to be considered

Conclusions

* ATC represents a complex coordination network
* A number of causes of breakdowns could be identified
* Breakdowns tend to disrupt controllers shared situation awareness
* NextGen Technologies will reduce some of these issues