CONTINGENCY PLANNING of AIR NAVIGATION SERVICES

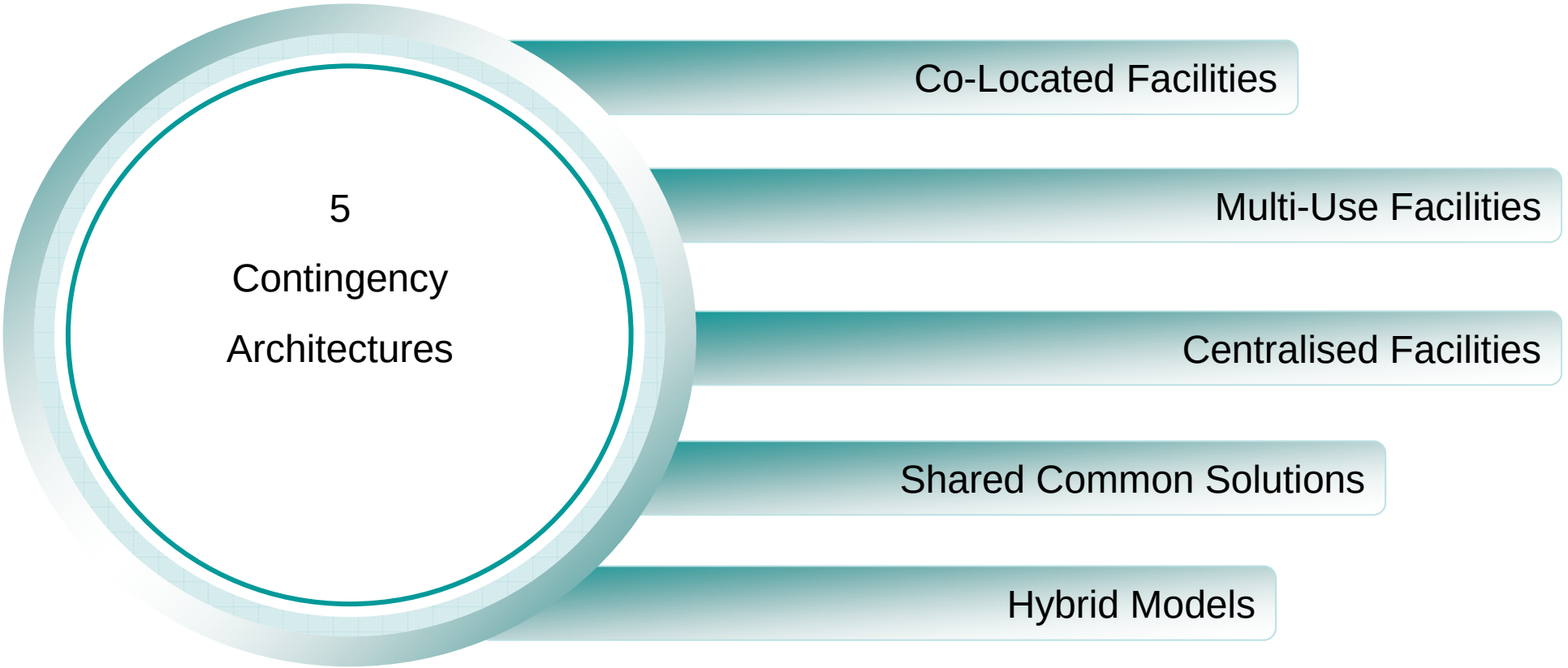
SASI Workshop

Current Practices for Contingency in ATM:

Strengths, Weaknesses and Opportunities

- **Professor Chris Johnson**

Glasgow Accident Analysis Group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Contingency
Architectures
Co-Located Facilities
Multi-Use Facilities
Centralised Facilities
Shared Common Solutions
Hybrid Models


EUROCONTROL
DELAYED
BOARDING
DELAYED
EUROCONTROL Guidance for Design of Contingency Strategies
In support of
EUROCONTROL Guidelines for Contingency Planning of Air Navigation Services

Planning
Preparation of Plans
• Establish requirements for contingency • Identify key resources including facilities management. o *Ensure key personnel in ANSPs (i.e. potential failing and aiding units) are provided with means to communicate at short notice.*
Fail to Safe
Phase 1 - Immediate Actions
A dangerous situation has been identified. Focuses on the safe handling of aircraft in the airspace of the failing unit, using all technical means still operationally available. •Secure actual traffic situation •Consider, evacuation of the airspace -'clear the skies' •Try to determine the magnitude of problem and the duration of the outage. •Prepare fall-back instructions to ensure the safety of operations allowing a 'smooth' transition to phases 2-5. •Appropriate authorities will identify the seriousness of the situation and initiate appropriate contingency measures. •Initiate process of informing all interested parties
Phase 2: Short/Medium Term Actions (<48 hours)
Focuses on stabilising the situation and, if necessary, preparing for longer term contingency arrangements: •Contingency measures should be initiated; •...
Service Continuity
Phase 3: Relocation
Starts when staff of the failing unit arrives at the aiding unit(s).: •Detach staff to aiding unit(s). •Open contingency working positions at aiding unit(s); •Stabilise new situation; •...
Phase 4: Optimisation
The aim is to optimise capacity gradually up to maximum potential (within the published or reduced ICAO route and sectorisation structures in line with previously agreed end-user and regulator expectations. •Upgrade means of communication as much as is possible. •...
Recovery
Phase 5: Longer-term Response and Recovery
The aim is to revert back to the original unit and working position in a safe and orderly manner: •Initiate Transition Plan – taking into account technical and operational conditions....
Maintenance of Plans
• Hold immediate 'hot' debrief • ...

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'clear the skies'

Prepare fall-back instructions to ensure the safety of operations.

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Recovery
Phase 5: Longer-term Response and Recovery
The aim is to revert back to the original unit and working position in a safe and orderly manner: Initiate Transition Plan – taking into account technical and operational conditions. Inform all interested parties of intention to revert to 'Normal' operations. Assign staff between failed unit and contingency facility for 'shadow' or parallel operations during transition period. Co-ordinate the time at which normal operations can be resumed. Implement updates to flight plan and radar data processing systems. Authorise the resumption of 'Normal' operations.
Maintenance of Plans
• Hold immediate 'hot' debrief • ...

Recovery Phase 5: Longer-term Response and Recovery

The aim is to revert back to the original unit and working position in a safe and orderly manner:

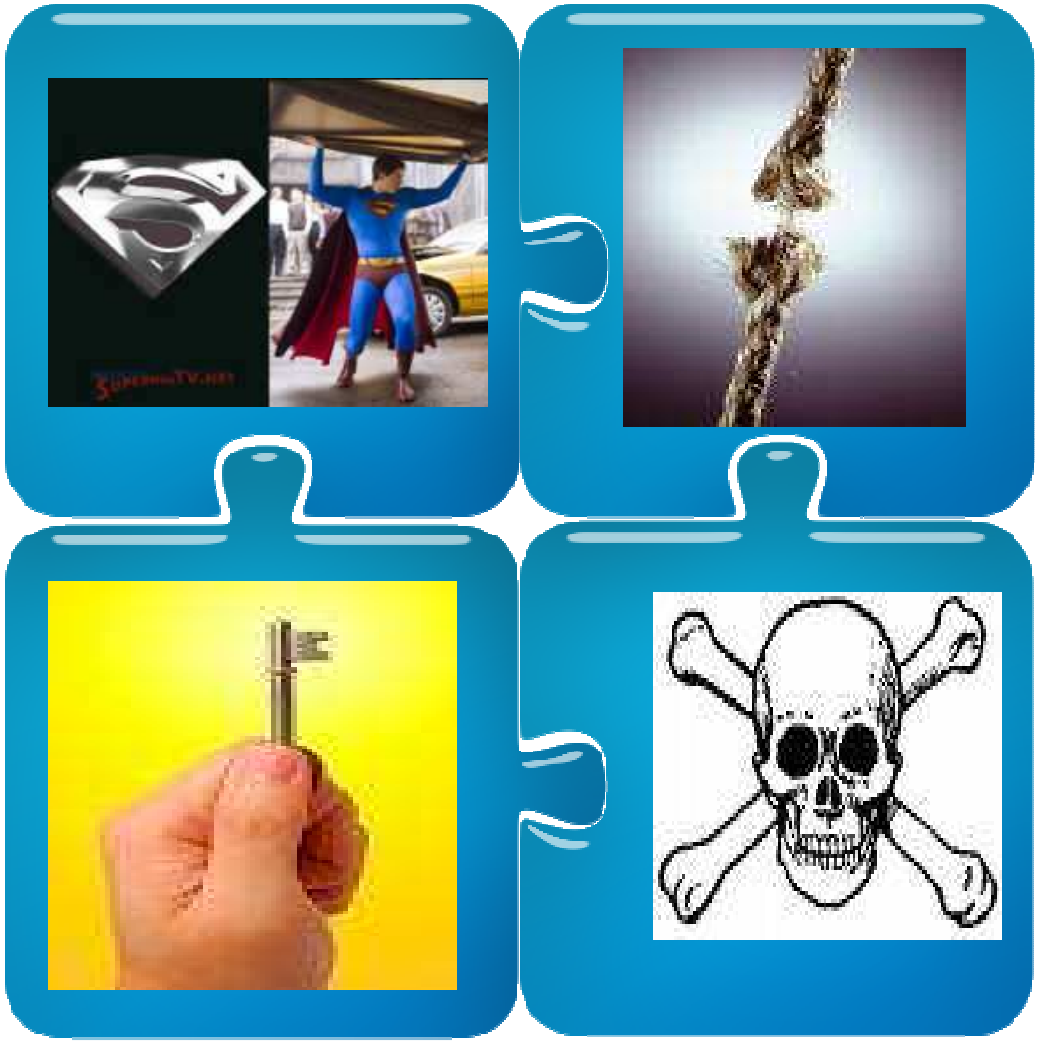
Initiate Transition Plan – taking into account technical and operational conditions.

Assign staff between failed unit and contingency facility for 'shadow' or parallel operations during transition period.

Implement updates to flight plan and radar data processing systems.

Shared International Systems

- Shared between nations in same region;
- Located in agreed single site within region;
- Under contingency state asks for use;
- Shared site then configured to their needs;
- Hardware/software maintained for each state;



SWOT ANALYSIS	
Strengths •Costs can be shared by participating organisations. •Avoids problems associated with another State's primary site/aiding unit providing the services of an ANSP using their existing capacity. •Additional resources imply better levels of technical provision of shared facility. •Encourages international cooperation between States and gets focus on contingency ops. •Transparency and commonality will enhance safety if all participants are 'talking the same language'. •A shared common facility might also be a mitigation strategy against potential terrorist activity. 	**Weaknesses** •High continuous (variable) costs so infrastructure can be configured to meet the needs of all participating States. •How to pay for these shared facilities – by traffic volume or equal split between States? •Some States have diverse traffic patterns. •Staff may have to be divided between the failing unit and the facilities that are provided at the shared site. •Once activated, other States lose access to their contingency site. •The strategy is only practical if the ANSPs that contribute to, and rely on, the shared facility also operate very similar systems and practices. •Additional training will be required •Legal issues (e.g. licensing and validation) are very complex •Relocation strategies may be unpopular with staff. •If one State is using contingency facility then what happens if another also has problems? (Solves N-1 but not N-2) 
Opportunities •Development of shared facilities, practices, procedures and processes may provide synergies in the move towards and SESAR concepts and objectives. 	**Threats** •Ability of shared facility may be perceived as a threat by national controllers/ANSPs. •States may want to retain control of backup facilities. •Security and air policing activities are especially sensitive. •A unilateral upgrade of system etc by one of the participating States may undermine the commonality approach. •ANSPs must be committed to long-term funding. •Some States may be more vulnerable to terrorist attack than others. 

Co-located Facilities

- Single state solution, facility not shared;
- Build contingency facility close to main site;
- Staff transfer from main to contingent site;
- May or may not be centralised (see later);
- May involve redundant infrastructure.

SWOT ANALYSIS	
Strengths •Relatively quick and easy to implement when such facility exists; •Reduces costs through potential dual use of facilities; logistics and facilities management are eased. •Use of redundant/obsolete systems provides considerable additional assurance during operations to 'clear the skies'. •Minimal relocation issues during Relocation (Phase 3).	**Weaknesses** •Old systems might not be approved for use during higher traffic loadings or prolonged periods. •Additional training may be required for staff who will be servicing and using the obsolete(fall back) systems •Competing requirements (contingency versus other usage (training, engineering etc)) may create problems. o *Resource cannot be used for 2 purposes at the same time, might induce delay.* o *Contingency systems may be needed to debug failure during contingency* •Changes in sectorisation will probably be required in most cases; there are unlikely to be as many positions in the contingency facility as there are in primary control rooms. •The possible take over of military control equipment would be subject to prior agreement. •Considerations must be given to ensure that military infrastructures can support civil operations with the same levels of safety. o *'Certification' of military facilities should be considered.* • Some scenarios would wipe out primary and contingency resources – *see Chapter 3 Section 3.2 on 'Common Mode Scenarios'.* •Over time, the focus on the contingency role (of the infrastructure) may be downgraded;
Opportunities •Optimise the replacement of older systems: roll-back and re-use older systems for contingency purposes. •May also help improve training/simulation facilities at same time. •Civil/Military cooperation could be improved if military facilities are chosen for contingency operations.	**Threats** •Could be difficult to sustain if seen to undermine the advance and facilitation of and SESAR concepts and objectives.

Multi-use Facilities

- Systems redeployed for training, simulation etc.
- Can be co-located or regional or…
- SOPs to switch back to contingency use;
- Reconfiguration/rewiring etc during switch?

SWOT ANALYSIS	
Strengths	**Weaknesses**
•Reduces costs through potential Multi-Use of facilities. •Multi use ensures that key elements of the contingency infrastructure are adequately maintained. •Use of redundant/obsolete systems provides considerable additional assurance during operations to 'clear the skies'. •If facility on or close to the primary failing site then there should be minimal Relocation issues.	•Multi-use facilities may not be approved for use during higher traffic loadings or prolonged periods. •Competing requirements (contingency v other usage (training, engineering etc)) creates problems. o Potential delays in switching to contingency configuration. o Resource cannot be used for 2 purposes at the same time, might induce delay in re-configuration. o Contingency systems may be needed to debug failure during contingency •Changes in sectorisation will probably be required in most cases; there are unlikely to be as many positions in the contingency facility as there are in primary control rooms. •If the dual use facility is located away from the primary failing site then there may be associated relocation issues to consider. •Some scenarios would wipe out primary and contingency resources - see Chapter 3 Section 3.2 on 'Common Mode Scenarios'. •Over time the focus on the contingency role (of the infrastructure) may be downgraded.
Opportunities	**Threats**
•May also help to improve training/simulation facilities at same time.	•Could be difficult to sustain if seen to undermine the advance and facilitation of and SESAR concepts and objectives.

Centralized Facilities

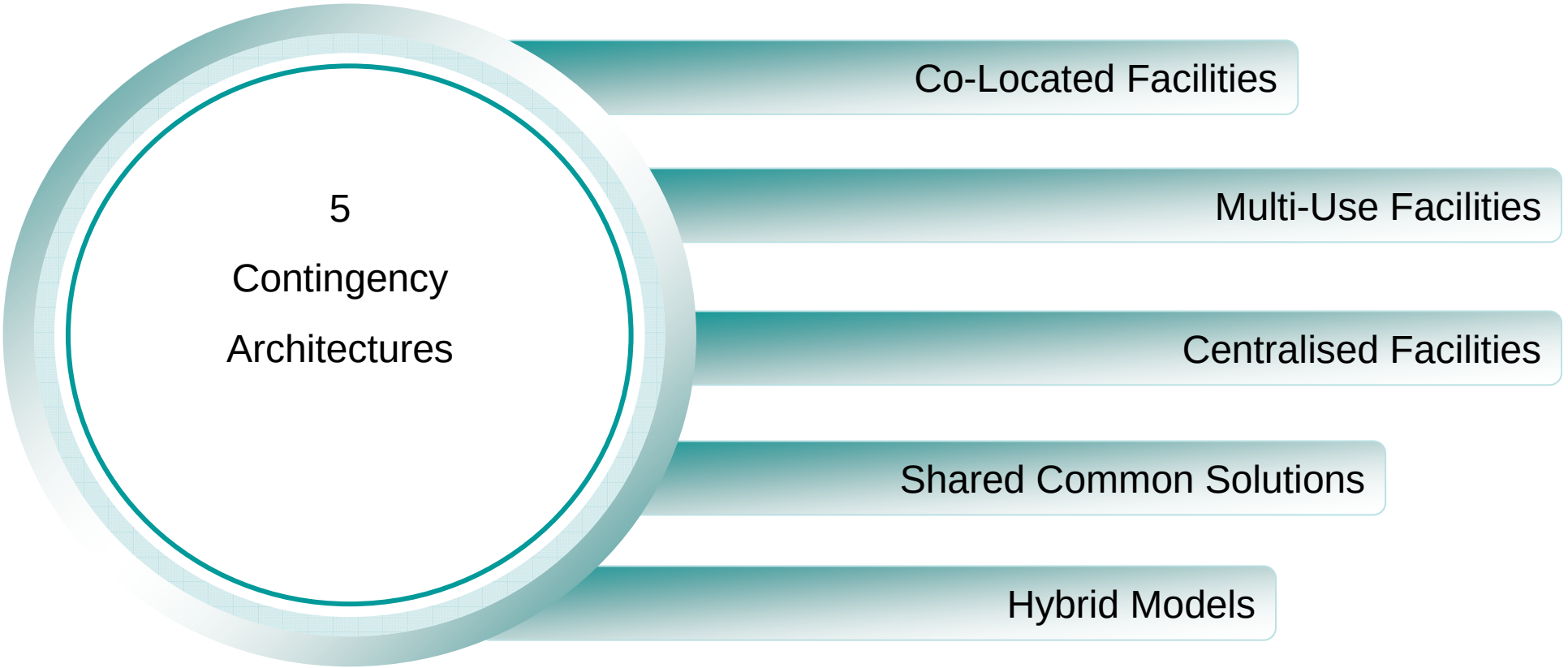
- Single national contingency center;
- National control and decision making processes;
- Staff moved from regional centers if needed;
- May or may not be collocated with main center (see earlier);
- Software/hardware reconfigured if needed.

SWOT ANALYSIS	
Strengths	**Weaknesses**
•Possibly a reduction in overall costs and resources when compared with an alternative strategy of providing individual contingency facilities for all other national sites operated by a service provider. •If the principle of 'minimal differences' is applied, (between an ANSP's units and Centralised centre) then there should be no major training, process and procedures issues. •Simplified logistics and management; equipment economies of scale possible if common systems adopted. •Centralised centre could provide a corporate focus for resources and training. •No need for international agreements (LoAs). •Offers the possibility of recruiting additional Operational and Engineering System staff (including contractors) from other units to support staff both at the Centralised contingency facility and at a failing unit.	•Significant overheads to ensure that the single national contingency centre keeps pace with changes in all of the other national sites •Relocation can be problematic if staff are unwilling to move. •Relocation would be particularly difficult under pandemic conditions or in the aftermath of terrorist attacks. •May also be a problem to persuade key staff to stay behind at the failing unit rather than rushing off to set up the alternate facility. •As a technical solution Centralisation addresses the N-1 scenario but does not adequately address N-2 secondary redundancy issues. •Unrealistic expectations about scenarios covered by contingency centre.
Opportunities	**Threats**
•Provides a resilient approach with the potential for State backing where significant security risks exist.	•Possible internal social and politics concerns may arise within ANSPs if the central site can take over responsibility for their traffic under contingency operations: • *Social concerns: employees in other sites may feel threatened in their activity.* • *Political concerns about the status of neighbouring centres* •These concerns should be solved by social dialogue •Developing national contingency centres could be difficult to sustain if seen to undermine the advance and facilitation of and SESAR concepts and objectives.

Hybrid Facilities

- Combinations of the previous models.
- National and regional approaches?
- Centralised and co-located facilities.
- Short term LoA for immediate aftermath then move to multi-use facility?

SWOT ANALYSIS	
Strengths	**Weaknesses**
•Depending on the mix of options taken, then financial costs could be reduced when compared with taking a single option •Flexible pragmatic approach. •Allows international participation but does not rely entirely on LoAs etc. •Could provide 'defences in depth' (e.g. solving the N-1 N-2 problem), e.g. – use local site as primary contingency and if that fails use a shared common system solution? •Inherent strengths from other strategies.	•There is likely to be a lack of political will to fund more than one contingency strategy. •Multiple contingency strategies could be labour intensive and therefore incur considerable managerial and/or organisational costs. •Inherent weaknesses of other strategies. •Complexity to define when to use the right resource/strategy; who use what and when?
Opportunities	**Threats**
•Even if significant investments have been made in a particular strategy, for example through the development of a national centre for contingency provision, there will be opportunities to consider alternate approaches. •In the future, with plans for the development of FABs, shared common solutions may become increasingly attractive as ANSPs perhaps seek to share the costs of contingency provision with neighbouring states. •If the mix of options taken includes shared facilities, practices, procedures and processes then it may provide synergies in the move towards and SESAR concepts and objectives.	•The choice of selecting purely local solutions (with no international involvement) might undermine cross-border or shared approaches including the move towards and SESAR concepts and objectives.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ATS Delegation

- Summary:
  - Letters of agreement for mutual support.
  - May simply be transfer of traffic.
  - Short term help to ‘clear the skies’.
  - Or may be closer to regional solution?
  - May include levels of service/training.

- But the details are very hard to sort out.

- Can we really rely on LoAs?

Common Mode Issues

- Software failures.
- Pandemics.
- Regional power disruption.
- Earthquakes and natural disasters.
- Terrorist attacks...

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