FAST is a new way of thinking, a new approach to look at the future.

It is not revolution, but evolution that follows from what aviation professionals normally do.

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  - **Origins**
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This presentation summarizes the results of a 6 year effort by the Future Aviation Safety Team, it is presented in 4 sections, this is Generic session 1. A complete report can be found in the Phase 1 folder on

http://rudi.den-hertog.org/fast/website

This North American-European team was established under the umbrella of the JSSI steering group, leading the JAA Safety Strategy Initiative.

The FAST now operates and is chartered by ESSI, the European Safety Strategy Initiative, and is an associated body under the European Commercial Safety Team (ECAST).

This presentation is intended to give the reader a broad overview of what FAST is in the ESSI (JSSI) context, present the FAST progress and show the FAST achievements in the area of “Increasing Crew Reliance on Flight Deck Automation” and in the area of Emergence of New Concepts for Airspace Management’.

HISTORY – JSSI Terms of Reference

- Reduce the annual number of accidents and fatalities in each JAA member state and its operators irrespective of the growth in air traffic
- Focused safety agenda with deliverables
- Partnership + cooperation + communication + implementation
- Structured complementary approaches, leading for:
  - Historic FAA/CAST
  - Prognostic JAA/JSSI

Reference JAA website http://www.jaa.nl/jssi/profile.html

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The JAA aim for safety "is the continuous improvement of its safety system, leading to further reductions in the annual number of accidents and the annual number of fatalities irrespective of the growth of air traffic".

We use complementary approaches to achieve maximum effect: a "Historic or Forensic" one based on accident analysis and a "Prognostic" one aiming at revealing Future Hazards. Finally a "Diagnostic" route is under development based on identification of "accident pre cursors".

The Future Hazards method, now FAST, was developed to cope with the inherent limitation of the "Historic/Forensic" one. It aims to provide solutions to Hazards that may result from changes in the aviation system. Examples of such changes include Very Large aeroplanes, UAV's mixing with normal traffic, "virtual companies", new responsibilities for crews and privatization of tasks traditionally done by goverments.

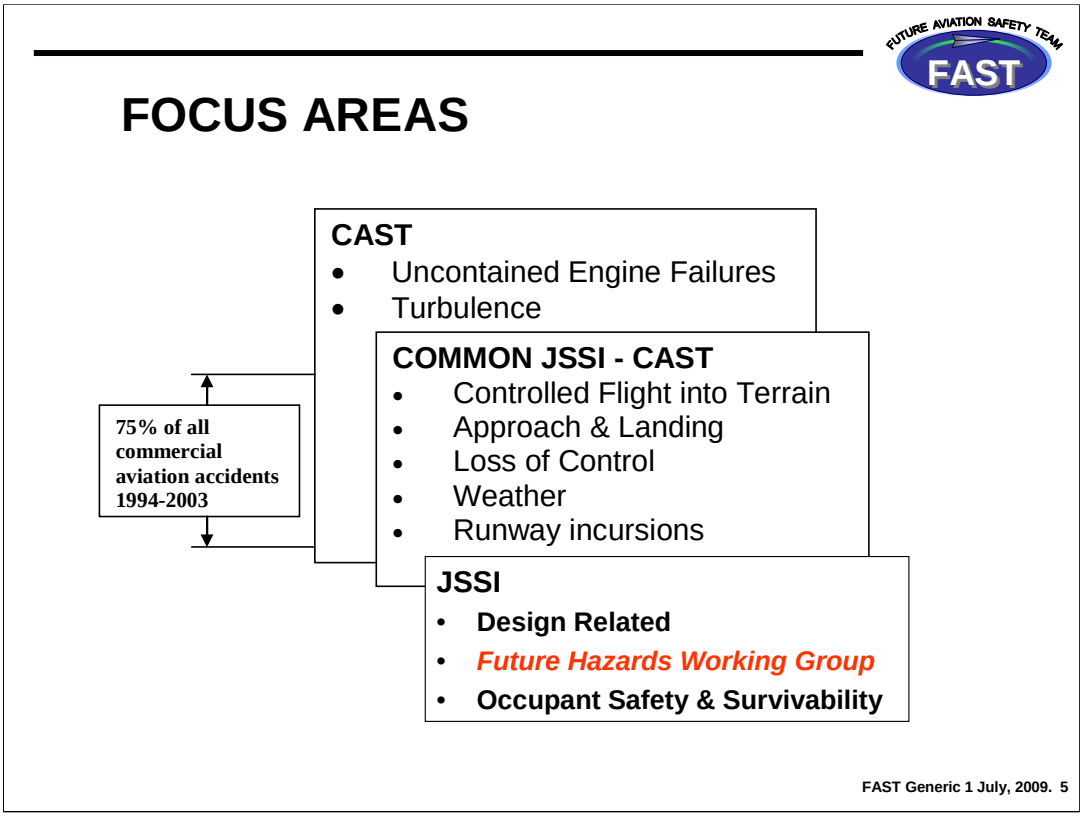
Solutions from these methods are monitored to ensure that they achieve their objective.

We work in close cooperation with the Commercial Aviation Safety Team [CAST] which is made up from members from American interested parties and the FAA. We learn from each other in this relationship, with CAST leading the way on Accident analysis and the JSSI taking the lead on Prognostic analysis using the FAST method.

Picture: Fin of a crashed CRJ-200 due to ground icing in China

Two approaches of a focused agenda:

- First approach based on study of past accidents and incidents (“historic approach”)
- Second approach aimed at revealing unidentified hazards (“predictive approach”)



This is an overview of the focus areas of CAST and the JSSI showing overlap and differences.

ESSI (JSSI)/FAST & CAST are complementory, the organisations are working together, where CAST has the lead on historic/ forensic analysis. The CAST objective is to reduce the U.S. Commercial aviation fatal accident rate by 80% by 2007, and to work together with airlines, JAA, ICAO, IATA, FSF, IFALPA, other international organizations and appropriate regulatory/government authorities to reduce worldwide commercial aviation fatal accident rate.

When the safety enhancements on the CAST plan are implemented it is estimated that a 73% reduction in risk will by achieved by 2007.

CAST safety enhancements developed with participation of Europe via co-operation with ESSI/ECAST and are introduced in by cooperation with ESSI/ECAST to avoid duplication and avoid unnessary work.

ESSI/FAST has the lead on prognostic analysis aimed at revealing future hazards.

Future Hazards

- Future Hazards can be grouped into at least two categories:

  1. Future Hazards that are dormant – have not revealed themselves yet, (we don't know what we don't know) and,

  2. Future Hazards that are a result of changes in the system.

- JSSI agreed to study Future Hazards created as a result of changes in the Global Aviation System.

- First meeting October 1999, in Paris, to start identifying "Areas of Change".

What is an Area of Change

- The Global Aviation System is in fact a "system of systems."
- Examples of "systems" include
  - airplanes,
  - air traffic control systems,
  - company processes, and
  - regulatory systems.
- The future will be fundamentally different than what exists today because changes will continuously occur as the system evolves into the future.
- The ongoing process of change including both evolutionary and sudden, disruptive events or paradigm shifts, must be considered for effective safety risk management.

Areas of Change: Some Principles

- Changes must be understood as broadly as possible.
- To bring consistency and coherence to the process, Areas of Change are grouped by categories.
- The diagram on the next sheet illustrates the eleven broad categories of Areas of Change affecting aviation identified by FAST.

FAST AREAS OF CHANGE CATEGORIES

Count	Category
41	Aircraft
15	Maintenance, Repairs, Overhaul
20	Operations
25	Crew
7	Passenger
10	Organization
16	Authority
25	Air Navigation System
8	Airport
39	Environment
5	Space Operations1
211	Total AoC's July 2009 including some "left intentionally blank"

The FAST continuously solicits submission of new, candidate AoC's via the process shown in Backup Charts.
Submissions should be made to Rudi den Hertog/Fokker Services, FAST Co-chair, rudi.denhertog@stork.com

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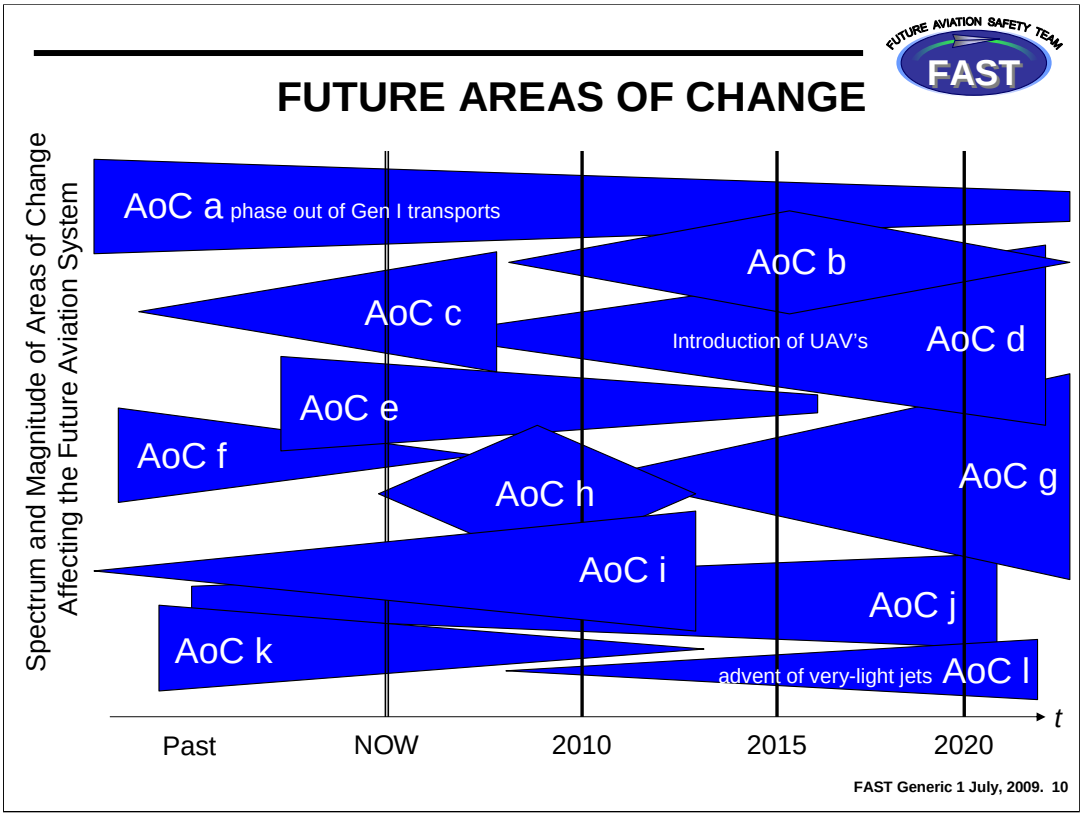
FOUNDATIONAL THINKING

Changes must be understood as broadly as possible. To bring consistency and coherence to the process, Areas of Change are grouped by categories. The above diagram illustrates the eleven broad categories of Areas of Change affecting aviation identified by the FAST

The Global Aviation System (GAS) is in fact a "system of systems." Examples of "systems" include airplanes, air traffic control systems, company processes, and regulatory systems. The future GAS will be fundamentally different than what exists today because changes affecting the GAS will continuously occur as the system evolves into the future. The ongoing process of change including both evolutionary and sudden, disruptive events or paradigm shifts must be considered for effective safety risk management.

It is important that aviation practitioners who are designing future systems have foreknowledge of potential future hazards. A change to any one system could affect other systems. Interactions of future changes to several systems could likewise affect the whole. These changes could have adverse impacts on the safety of the Global Aviation System. The goal of "discovering" future hazards is to eliminate, avoid or mitigate hazards in the future that may arise as a result of the changes. This will reduce the risk of future incidents and accidents.



The FAST Method uses the concept of "Areas of Change" (AoCs), considering that several possible futures may interact with the future under study, producing unanticipated hazards. For instance, the future will likely feature the gradual phase out of early-generation jet transports (AoC "a") coupled with the advent of fleets of micro-jet personal aircraft (AoC "l"). The above figure illustrates the concept of how Areas of Change ebb and flow with time and how different futures are composed of different sets of Areas of Change.

2001 AoC list snap shot

ANNEX C: Categories of Change and Individual Precursor Circumstances Affecting The International Aviation System

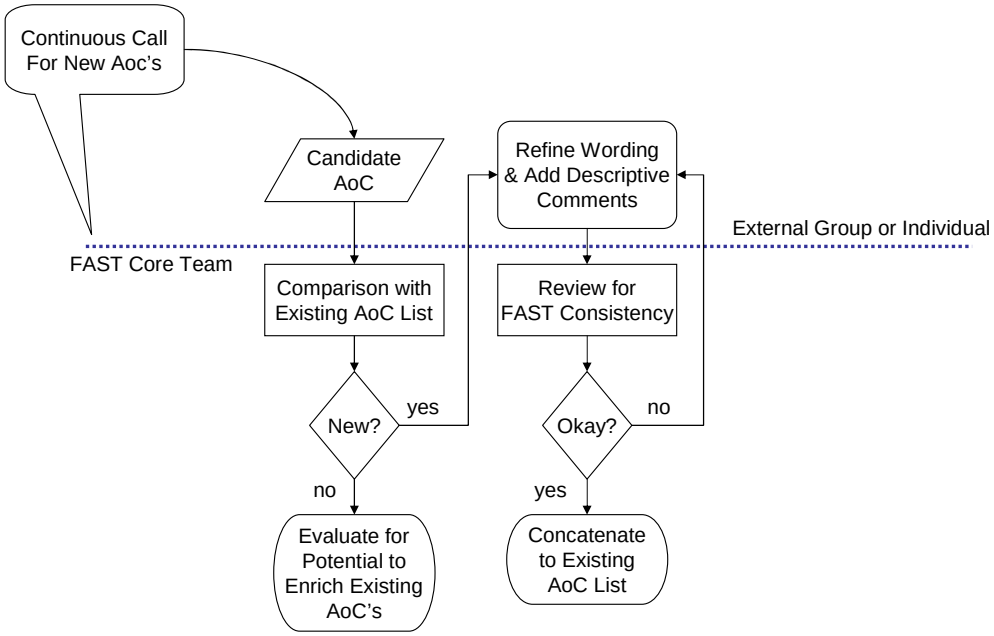
Brian E. Smith, NASA Ames Research Center, Version 4.6, 2 August 2000

CATEGORY:		MATRIX OF AFFECTED CATEGORIES OF AREAS OF CHANGE										ONSET TIMEFRAME	VALIDATION TOOL	Comments on Aircraft Category	oni
Aircraft (A/C)		A/C	MRO	OPS	CREV	PASS	ORG	AUTH	ANS	AP	ENV	SPACE				
AC1	Introduction of new aircraft types		X	X	X	X	X	X	X	X	X		ongoing	application for certification and/or aircraft projects in advanced developmental stages	Improvements to the modern airplane may occur as a result of breakthroughs in many fields permitting evolutionary improvements in performance, improved computational capabilities permitting multidisciplinary analysis and design, and exploiting novel ideas to redesign the airplane. http://aero.stanford.edu/AA241/intro/futureac.html	1
AC2	Introduction of Very Large Aircraft (>600 passengers)		X	X	X	X	X	X	X	X	X		2005	application for certification	Although the basic airworthiness standards should ideally be the same for VLA, wake turbulence considerations and separation standards, inability of ground infrastructure to manage large numbers of passengers, emergency evacuation, and a variety of other potentially new considerations should be addressed for this new class of aircraft.	2
AC3	Rapid growth in use of advanced regional jets		X	X	X	X	X	X	X	X	X		2000-2010	firm orders for new aircraft	Many Regional Jets are all new, not derivatives, where past experience may be more applicable to derivative equipment selection, design solutions and its validation and certification. At the same time Regional Jet manufacturers also delegate much of the design responsibility to partnering companies and equipment manufacturers. This dual development may well result in inadequate transfer of expertise and/or inadequate interface management. Finally, lessons learned from past Regional Jet manufacturers may not be sufficiently covered by FAR's and JAR's..	3
AC4	Introduction of new design concepts for general aviation aircraft		X	X	X		X	X	X	X	X		2005-2008	application for certification of experimental aircraft	Affordable flight systems that allow near-all-weather flying for light GA airplanes, intuitive cockpit display technologies that provide improved situational awareness and weather/traffic/terrain information to the pilot, and guidelines and certification standards for these technologies may be required in the future. Guidelines and certifications standards may need to be developed for these aircraft in addition to supplementary pilot training requirements which may include uniques aspects of operation at higher Mach numbers. http://www.nasatech.com/NEWS/OCT99/agate_top.html	4
AC5	Introduction of new runway independent aircraft concepts		X	X	X	X	X	X	X	X	X		2003-2007	application for certification	Operation of Runway-Independent Aircraft (tilt-wing, tilt-rotor, VSTOL, airships, wing-in-ground-effect) may have significant effects on safety and capacity, airspace operations, and ATC systems integration.	5

Interactions – a key item

- A line-by-line review of the full matrix was carried out by the full Working Group at several meetings – the FHWG met 6 times for 3 days - during which both
  - the identified dependencies as well as
  - onset timeframe,
  - validation tools, and
  - comments columns were discussed.

Area of Change (AoC) Submission Process



Worksheet: Submit Candidate Areas of Change

Use this form during brainstorming activities to document new Candidate AoCs.

Area of Change		
AoC	Title: ANSP Regulatory oversight.	Relevant AoC(s) / Category (ies) AU_04, also AU_08
	Estimated Onset Date: 1998-2000.	Onset Trigger: ANSP privatization

AoC Category		
☐ 1. AIRCRAFT	☐ 5. PASSENGER	☐ 9. AIRPORT
☐ 2. MAINTENANCE, REPAIRS, OVERHAUL	☐ 6. ORGANIZATION	☐ 10. ENVIRONMENT
☐ 3. OPERATIONS	X 7. AUTHORITY	☐ 11. SPACE OPERATIONS
☐ 4. CREW	X 8. AIR NAVIGATION SYSTEM	Comments:

Rationale

Since ANSP's are gradually be privatized, and pay scales between privatized companies and government are becoming vastly different, the usual change over of senior AT controllers to become inspectors performing oversight is not taking place anymore. Hence the Government has no other option than to hire redundant controllers [who will have to take a significant pay cut] or hire inspector's fresh from university with a lack of practical expertise.

AoC Importance to potential ConOps 2011 Hazards

Level:

FAST Team Disposition		
☐ Already on AoC List No._____	☐ Supplements existing AoC No._____	☐ Accepted as new AoC. Added to list as No._____

Submitter Information		
Name: Randall de Garis	Date: June 6, 2006	

FHWG agreed process at that time

- Step 1 Identify areas of change
- Step 2 Prioritise and select of areas of change
- Step 3 Define methodology, determine future hazards and prioritise future hazards for each selected area of change
- Step 4 Global review and synthesis of future hazards from each area
- Step 5 Validate, prioritise and select synthesised future hazards
- Step 6 Develop, validate, prioritise and select interventions
- Step 7 Propose action to JSSI Steering Group
- Step 8 Monitor the effect of intervention and iterate the process from the beginning

Any Questions?

Acronyms

- ADREP ICAO Accident/Incident Data Reporting System
- AoC Area of Change developed by FAST
- AGS Air Ground Space System
- ANSP Air Navigation Service Provider
- ATC Air Traffic Control
- AWOS Automatic Weather Observation System
- CAST Commercial Aviation Safety Team (North America)
- CICTT CAST/ICAO Common Taxonomy Team
- ConOps In FAST context: Eurocontrol's Concept of Operations for 2011
- ConOps General: air traffic providers concept of operations
- ESSI European Safety Strategy Initiative
- ECAST European Commercial Aviation Safety Team (EuroCAST)
- ECCAIRS European Co-ordination Centre for Aviation Incident Reporting Systems

Acronyms - continued

- FAST Future Aviation Safety Team
- GTG Gate-to-Gate
- ICAO International Civil Aviation Organization
- JAA Joint Aviation Authorities (Europe)
- JSSI JAA Safety Strategy Initiative
- JSAT Joint Safety Analysis Team (CAST)
- JSIT Joint Safety Implementation Team (CAST)
- JPDO Joint Planning and Development Office (part of NGATS in USA)
- NGATS Next Generation Air Transportation System (USA)
- SESAR Single European Sky ATM Research Programme
- TCAS Traffic Collision Avoidance System
- TAWS Terrain Avoidance Warning System