EASA Cockpit Automation Survey

This survey is aimed at consolidating the Automation Policy developed by the EASA Internal Group on Personnel Training (IGPT) following the EASA International Conference on Pilot Training of November 2009 and the International Conference Staying in Control Loss of Control Prevention and Recovery of October 2011.

This Policy addresses flight deck automation of complex aircraft and focuses on control automation.

The EASA Automation Policy adopts an innovative approach consisting of mapping crew-automation interaction issues, design and certification and training principles, and respective regulatory provisions to identify top issues and paths for improvement.

This survey evaluates your degree of agreement with the identified automation issues and suggested paths for improvement. Results will help orienting future EASA work on the subject and developing an action plan.

Thank you very much for your participation.

Michel Masson, PhD - michel.masson@easa.europa.eu
Coordinator of the EASA Internal Group on Personnel Training (IGPT)

Questions marked with an asterisk * require an answer to be given.

1. Identification

1.1. Please indicate the name of your organisation(s): * (between 3 and 100 characters)

1.2. Are you responding on behalf of your organisation or on a personal basis? *

- On behalf of my organisation
- On a personal basis
1.3. Please identify where your organisation is registered or where you are located:

- Europe / EASA States
- Commonwealth of Independent States (CIS)
- Africa
- Europe / non-EASA States
- China
- Oceania
- Unites States of America (USA)
- Asia / other than CIS and China
- Worldwide
- North America / non-USA
- South America

1.4. Please tick the category or categories that apply to you and/or to your organisation:

- Civil Aviation Authority
- Military Aviation Authority
- Commercial Pilot / Air Transport Pilot (First Officer)
- Commercial Pilot / Air Transport Pilot (Captain)
- Instructor
- Examiner
- Flight Training Organisation (FTO) / Type Rating Training Organisation (TRTO) / Approved Training Organisation (ATO)
- Military Pilot (First Officer)
- Military Pilot (Captain)
- Private Pilot
- Maintenance
- Aircraft Manufacturer
- Original Equipment Manufacturer
- Air Traffic Control (ATC) / Air Traffic Management (ATM) / Air Traffic Services (ATS)
- ATC / ATM / ATS Equipment Manufacturer
- Research organisation or academia
- Other

1.5. Do you have direct experience of flying highly automated aircraft as a pilot? *

- Yes
- No

- If yes, on what type of aircraft?

  - Aeroplane
  - Helicopter
  - Other
2. Introduction - Automation Advantages

Modern aircraft are increasingly reliant on automation for safe and efficient operations, whether commercially operated or not, and automation is required for precision navigation.

Automation has contributed to the safety improvements that aviation has enjoyed over the past decades, making aviation the safest means of transportation. Other advantages are:
- technical reliability as computer technology is more reliable than mechanical technology;
- it is light and cheap;
- it can be used to increase redundancy (multiple computers).

Advances in engine control technology have improved vertical and lateral navigation accuracy, have allowed fuel saving and have increased passenger comfort.

Automation relieves the pilots (and the air traffic controllers) from repetitive or not rewarding actions and from actions humans are not good at.

Automation has improved flight path control, reduced weather minima and allowed decommissioning of land-based navigation aids.

Furthermore, family concepts based on similarity of cockpit design and flight dynamics facilitate type transition. Automation also supports flight envelope protection.

Automation will become even more important in tomorrow’s aviation system, being developed for instance under the SESAR and NextGEN programmes in Europe and in the United States.

3. Automation Issues

Interacting with automated systems can however present certain difficulties that need to be mitigated either by design and/or through appropriate training and procedures to take maximum benefit of today’s and tomorrow’s technology. The automation issues listed below have been identified by the EASA IGPT in charge of developing the EASA Automation Policy.

You are invited to indicate your degree of agreement with these automation issues.

3.1. Basic manual and cognitive flying skills tend to decline because of lack of practice and feel for the aircraft can deteriorate.

- Strongly agree
- Agree
- Partially agree
- Partially disagree
- Disagree
- No opinion

3.1.1. Comments (between 1 and 2500 characters)
3.2. It is difficul to understand the situation and to gain/regain control when automation reaches the limit of its operation domain and disconnects or in case of automation failure.

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Partially agree</th>
<th>Partially disagree</th>
<th>Disagree</th>
<th>No opinion</th>
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3.2.1. Comments (between 1 and 2500 characters)

3.3. When automation fails or disconnects, the tasks allocated to the pilots / flight crews may fall beyond their capabilities, individually and or as a team.

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<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Partially agree</th>
<th>Partially disagree</th>
<th>Disagree</th>
<th>No opinion</th>
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3.3.1. Comments (between 1 and 2500 characters)

3.4. For highly automated aircraft, problems may occur when transitioning to degraded modes (e.g. multiple failures requiring manual or less automated flight).

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<thead>
<tr>
<th>Strongly agree</th>
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<th>Partially agree</th>
<th>Partially disagree</th>
<th>Disagree</th>
<th>No opinion</th>
</tr>
</thead>
</table>
3.4.1. Comments (between 1 and 2500 characters)

3.5. Flight crew are not sufficiently informed of automation failures or malfunctions or of their effects.

- Strongly agree
- Agree
- Partially agree
- Partially disagree
- Disagree
- No opinion

3.5.1. Comments (between 1 and 2500 characters)

3.6. Unexpected automation behaviour: engagement or disengagement of automatisms in an inappropriate context or un-commanded transition (for instance mode reversion) may lead to adverse consequences.

- Strongly agree
- Agree
- Partially agree
- Partially disagree
- Disagree
- No opinion

3.6.1. Comments (between 1 and 2500 characters)
### 3.7. Pilots interacting with automation can be distracted from flying the aircraft. Selection of modes, annunciation of modes, flight director commands may be given more importance than value of pitch, power, roll and yaw and so distract the flight/crew pilots from flying the aircraft.

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<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
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<th>Partially disagree</th>
<th>Disagree</th>
<th>No opinion</th>
</tr>
</thead>
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### 3.7.1. Comments (between 1 and 2500 characters)

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### 3.8. Unanticipated situations requiring to manually override automation are difficult to understand and manage, create a surprise or startle effect, and can induce peaks of workload and of stress.

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<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Partially agree</th>
<th>Partially disagree</th>
<th>Disagree</th>
<th>No opinion</th>
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</thead>
</table>

### 3.8.1. Comments (between 1 and 2500 characters)

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### 3.9. Diagnostic systems are limited with regard to dealing with multiple failures, with unexpected problems and with situations requiring deviations from Standard Operating Procedures (SOPs).

<table>
<thead>
<tr>
<th>Strongly agree</th>
<th>Agree</th>
<th>Partially agree</th>
<th>Partially disagree</th>
<th>Disagree</th>
<th>No opinion</th>
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</table>

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3.10. Flight crews may spend too much time trying to understand the origin, conditions, or causes of an alarm or of multiple alarms, which may distract them from other priority tasks and from flying the aircraft.

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<thead>
<tr>
<th>Agreement Level</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Partially agree</th>
<th>Partially disagree</th>
<th>Disagree</th>
<th>No opinion</th>
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3.11. In critical situations following disconnection or failure of the automation, although the action that the flight crew must take to regain control is known, the alarm system only indicates the condition met but not the action to take.

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<thead>
<tr>
<th>Agreement Level</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Partially agree</th>
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<th>Disagree</th>
<th>No opinion</th>
</tr>
</thead>
</table>

3.10.1. Comments (between 1 and 2500 characters)

3.11.1. Comments (between 1 and 2500 characters)
3.12. Data entry errors (either mistakes or typing errors) made when using Electronic Flight Bags (EFBs) in addition to avionics systems may have critical consequences. Errors may be more difficult to prevent and to detect as there is no system check of the consistency of the computed or entered values and technology gives a certain sense of confidence (if the data entered in the machine are accepted, they should be OK).

- Strongly agree
- Agree
- Partially agree
- Partially disagree
- Disagree
- No opinion

3.12.1. Comments (between 1 and 2500 characters)

3.13. Other automation issues that you would like to mention (optional): (between 1 and 2500 characters)

4. Paths for Improvement – Suggested Actions

From a review of the existing European regulations it can be concluded that the European aviation system is globally well protected against automation issues, provided that all regulatory provisions and best practices are well and uniformly implemented. Furthermore, regulatory developments, including the new Acceptable Means of Compliance (AMC) and Guidance material (GM), already planned by EASA in the Operations (OPS), Flight Crew Licensing (FCL) and Certification domains will introduce additional improvements and risk mitigation means.

However, the system could benefit from the additional paths for improvement suggested below. You are invited to assess their usefulness and to indicate whether they should be addressed through regulatory and/or safety promotion actions. Safety promotion includes the publication of Safety Information Bulletins (SIB) and of safety brochures or leaflets, presentations in conferences, diffusion of best practices through authority and industry channels and through safety partnerships such as ECAST and CAST, associations such as the Flight Safety Foundation, encyclopaedic systems such as SKYbrary and Wikipedia, etc.

Please rate the usefulness of the following suggestions:

4.1. Improve basic airmanship and manual flying skills of pilots.

- Must do
- Very useful
- Useful
- Not useful
- No opinion
4.1.1. Should it be addressed through safety promotion?*
- [ ] Yes
- [ ] No
- [ ] No opinion

4.1.2. Should it be addressed through rulemaking?*
- [ ] Yes
- [ ] No
- [ ] No opinion

4.1.3. Comments (between 1 and 2500 characters)

4.2. Improve the Competence Based Training (CBT) and Evidence Based Training (EBT) approaches to better address automation management *(for a definition, click the info button).*

*Competency Based Training* (Subpart E MPL). Training and assessment that are characterised by a performance orientation, emphasis on standards of performance and their measurement, and the development of training to the specific performance standards embedded in a continuous assessment against a predefined objective. The Multi-crew Pilot License (MPL) programme is designed on a competency-based framework of learning objectives: combining the skills, knowledge and attitude required to perform any given task to the prescribed level of skills.

*Evidence Based Training* applies the principles of competency-based training for safe, effective and efficient airline operations while addressing relevant threats. ICAO has defined competency as the combination of Knowledge, Skills and Attitudes (KSAs) required to perform a task to a prescribed standard under a certain condition. EBT prioritises the development and assessment of a relevant global competency framework and aligns training content with the actual competencies necessary in context. EBT is part of the IATA Training and Qualification Initiative (ITQI). Phase one of the EBT project addresses recurrent training and phase two will address type-rating training.

- [ ] Must do
- [ ] Very useful
- [ ] Useful
- [ ] Not useful
- [ ] No opinion

4.2.1. Should it be addressed through safety promotion?*
- [ ] Yes
- [ ] No
- [ ] No opinion

4.2.2. Should it be addressed through rulemaking?*
- [ ] Yes
- [ ] No
- [ ] No opinion
4.3. Improve the Multi-crew Pilot Licence (MPL) programme to better address automation management *(for a definition, click the info button)*.

| Multi-Crew Pilot License *(Part FCL Subpart E, FCL.400.A, FCL.415.A)* is an alternative approach to traditional pilot training that concentrates on very specific training for line operations in modern transport aircraft. MPL programs incorporate ab initio, bridge and type rating training, and emphasise crew resource management and operations in a multi-crew environment. These programs use competency based training/assessment, mandatory upset recovery training, and increase the use of flight simulation training devices. The MPL concept provides an alternative to traditional pilot training approaches that date back to the 1940s. |

<table>
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<tr>
<th>Must do</th>
<th>Very useful</th>
<th>Useful</th>
<th>Not useful</th>
<th>No opinion</th>
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4.3.1. Should it be addressed through safety promotion? *

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<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>No opinion</th>
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4.3.2. Should it be addressed through rulemaking? *

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<th>Yes</th>
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<th>No opinion</th>
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4.3.3. Comments *(between 1 and 2500 characters)*
4. Improve the Multi Crew Cooperation (MCC) concept and training (instruction and testing) practices to better address automation management. Note: EASA has already planned to improve Crew Resource Management (CRM) guidance - Rule Making Task RMT.0411 (OPS.094). (For a definition, click the info button).

Multicrew Cooperation Course (FCL.735 and AMC). The objectives of MCC training are to develop the technical and non-technical components of the knowledge, skills and attitudes required to operate a multi-crew aircraft. Such skills include communication, leadership and team working, maintaining situation awareness, workload management, problem solving and decision making, monitoring and cross-checking, task sharing, use of checklists, briefing, flight management, FMS use, performance and monitoring of normal, abnormal and emergency systems operations in accordance with SOPs, and environment, weather and ATC related communications and procedures.

- Must do
- Very useful
- Useful
- Not useful
- No opinion

4.4.1. Should it be addressed through safety promotion? *

- Yes
- No
- No opinion

4.4.2. Should it be addressed through rulemaking? *

- Yes
- No
- No opinion

4.4.3. Comments (between 1 and 2500 characters)

4.5. Improve recurrent training and testing practices with regard to automation management. *

- Must do
- Very useful
- Useful
- Not useful
- No opinion

4.5.1. Should it be addressed through safety promotion? *

- Yes
- No
- No opinion

4.5.2. Should it be addressed through rulemaking? *

- Yes
- No
- No opinion
4.5.3. Comments (between 1 and 2500 characters)

4.6. Improve air operator Automation Policies / provide guidance for the improvement of air operator Automation Policies.*

- Must do
- Very useful
- Useful
- Not useful
- No opinion

4.6.1. Should it be addressed through safety promotion? *

- Yes
- No
- No opinion

4.6.2. Should it be addressed through rulemaking? *

- Yes
- No
- No opinion

4.6.3. EASA published on 18 November 2010 the Safety Information Bulletin (SIB) 2010-33 “Flight Deck Automation Mode Awareness Energy State Management”. Recommendations are provided to air operators to develop and/or improve their Automation Policy and to ensure that each topic is regularly reinforced in operating procedures and training programs.

Do you consider this SIB sufficient? *

- Yes
- No
- No opinion

4.6.4. Comments (between 1 and 2500 characters)
4.7. Develop automation policies specific to aircraft types and variants to account for differences regarding automation and flight path management.

<table>
<thead>
<tr>
<th>Must do</th>
<th>Very useful</th>
<th>Useful</th>
<th>Not useful</th>
<th>No opinion</th>
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</table>

4.7.1. Should it be addressed through safety promotion?

<table>
<thead>
<tr>
<th>Yes</th>
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4.7.2. Should it be addressed through rulemaking?

<table>
<thead>
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<th>Yes</th>
<th>No</th>
<th>No opinion</th>
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4.7.3. Comments (between 1 and 2500 characters)

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4.8. Manufacturers to publish automation philosophies and policies, generic and specific to aircraft types and variants, for communication to the training (instructors and trainees) and operations communities.

<table>
<thead>
<tr>
<th>Must do</th>
<th>Very useful</th>
<th>Useful</th>
<th>Not useful</th>
<th>No opinion</th>
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4.8.1. Should it be addressed through safety promotion?

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<thead>
<tr>
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<th>No opinion</th>
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4.8.2. Should it be addressed through rulemaking?

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<th>No</th>
<th>No opinion</th>
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</table>
4.8.3. Comments (between 1 and 2500 characters)

4.9. Transfer the certification assumptions regarding flight crew competences required to safely fly the aircraft to the training and operations communities through appropriate means such as the Operational Suitability Data (OSD). (For a definition, click the info button).

Operational Suitability Data (EASA Opinion 07/2011 proposing changes to Regulation 1702/2003 (Part-21) and the implementing rules for OPS, FCL and Part-66 to implement the OSD). The objective of OSD is to ensure that certain data, necessary for safe operation, is available to and used by the operators. This data is considered specific to an aircraft type and should therefore be produced by the designer of that type. It consists of: minimum syllabus of pilot type rating training; aircraft reference data to support the qualification of simulators; minimum syllabus of maintenance certifying staff type rating training; type specific data for cabin crew training; and master minimum equipment list (MMEL). The operational suitability data proposed by the designer will be approved by EASA as part of the airworthiness certification. Once approved, the core of the operational suitability data must be used by operators and training organisations when establishing their customised training courses and MEL. The OSD is expected to contribute to closing the gap between airworthiness and operations and therefore improving safety. Furthermore it will enable setting one standard in the EU for type training and MEL.

Must do Very useful Useful Not useful No opinion

4.9.1. Comments (between 1 and 2500 characters)

4.10. Review Certification Specifications (CS) and Acceptable Means of Compliance (AMC) 25.1302 “Installed Systems and Equipment for Use by the Flight Crew”, 25.1322 “Flight Crew Alerting” and CS 25.1329 “Flight Guidance System” with regard to automation management, and the assumptions made regarding the flight crew capabilities required to take appropriate action.

Must do Very useful Useful Not useful No opinion
4.10.1. Comments (between 1 and 2500 characters)

| 4.11. Extend the applicability of CS and AMC 25.1302 and CS and AMC 25.1322 to Part 23 (Normal, Utility, Aerobatic and Commuter Aeroplanes), Part 29 (Large Rotorcraft) and Part 27 (Small Rotorcraft). *
| **Must do** | **Very useful** | **Useful** | **Not useful** | **No opinion** |

| 4.11.1. Comments (between 1 and 2500 characters) |

| 4.12. Consider introducing requirements regarding flight deck software customisation (e.g. electronic checklists and procedures, Flight Warning Systems) and enhancing the approval of safety critical functions of Electronic Flight Bags (EFBs) or introducing this approval in the frame of aircraft certification. *
| **Must do** | **Very useful** | **Useful** | **Not useful** | **No opinion** |

| 4.12.1. Comments (between 1 and 2500 characters) |
4.13. Other suggestions that you would like to make (optional): (between 1 and 2500 characters)

<table>
<thead>
<tr>
<th>Have you read and do you accept the Confidentiality Statement?</th>
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<tbody>
<tr>
<td>Yes</td>
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